GET WITH THE ACTION

Change agency in sustainable food systems transformations

Insights from Chile

Maria Eugenia Contesse Ayala

Propositions

1. Change agency for sustainable food systems transformations depends on multiple relations amongst humans and non-humans.
   (this thesis)

2. The Multi-Level Perspective is a flawed framework for a nuanced examination of change agency in sustainability transitions.
   (this thesis)

3. Scientists who want their work to impact society need to be able to challenge their own assumptions and thoughts.

4. NWO programs based on PhD projects leave too little space for real transdisciplinarity.

5. Condescendence and racism are two sides of a same coin.

6. The most meaningful expressions of our humanity are realised in our diverse relations and every day ordinary actions.

Propositions belonging to the thesis, entitled

Get with the action. Change agency in sustainable food systems transformations – insights from Chile

Maria Contesse
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Maria Eugenia Contesse Ayala

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In memory of Alberto Contesse B.,
Thank you for teaching me to reflect and make questions about life

En memoria de Alberto Contesse B.,
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If this is thesis is successful, those who read it should understand that actions with potential to transform food systems are not carried out by a single actor. Of course, this thesis is no exception. Therefore, I must thank the many people who made this work possible.

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Si éxitosa, quiénes lean esta tesis debiesen comprender que uno de sus mensajes es que ningún actor por si sólo puede realizar acciones que puedan transformar los sistemas alimentarios. Obviamente, esta tesis no es la excepción. Por eso, debo agradecer a las múltiples personas que hicieron este trabajo posible.

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Summary

Food is vital for human survival and wellbeing. However, it is now widely acknowledged that our current mainstream food systems are unsustainable. There is a growing global consensus on that these food systems must undergo significant changes in order to effectively nourish a growing population in sustainable ways. The objective is to establish food systems that provide access to healthy and nutritious food to all the population, produced in environmentally sound manners, and ensure a decent income to all individuals involved in food provision, from production to disposal.

The scientific fields of sustainability transitions and transformations studies are actively addressing this challenge. Their aim is to identify pathways and solutions that facilitate desirable environmental and societal change, allowing us to transition from our current unsustainable food systems to sustainable alternatives.

To contribute to this objective, this thesis aims to enhance both empirical and theoretical understandings of sustainable food system transition pathways. It achieves this by addressing identified gaps in the existing literature regarding the role of change agency in food systems transitions and transformations studies. Within the context of this thesis, agency is defined as the capacity to take action that makes a difference over the unfolding of events. Change agents are thus the actors who challenge, disrupt or alter the prevailing values, assumptions, behaviors, modes of operation, organizational structures of knowledge systems that underpin mainstream food systems. The following gaps have been identified as key areas for exploration in this thesis: i) insufficiencies in conceptual and analytical tools for understanding agency in transitions and transformations; ii) limited empirical studies that investigate collective agency throughout processes of food systems transitions; iii) the lack of consideration of non-human agency. By addressing these gaps, this thesis aims to contribute to a more comprehensive understanding of sustainable food systems transitions.

To address these gaps, this thesis focus on a main research question, which is further explored through four sub-questions. These questions are as follows:

How does agency play out in sustainable food systems transitions in the making in Chile?

SRQ1: *How does the institutionalization of different logics influence the capacity of agents to direct transformation pathways? (Chapter 3)*

SRQ2: *What are the transformative roles and relations of diverse change agents in transitions towards sustainable food systems? (Chapter 4)*

SRQ3: *How does the relational agency between human and non-human change agents emerge and play out in the transition towards sustainable food systems? (Chapter 5)*

SRQ4: *What are the implications of institutional logics and relational agency for sustainability transitions frameworks?*

This thesis is divided into six Chapters. Chapter 1 serves as an introduction, outlining the problem statement, introducing the analytical concepts that have structured the research questions, and explaining why Chile was chosen as a relevant site of inquiry. Chile was selected due to the urgent challenges faced by its unsustainable mainstream food systems and the presence of diverse organizations striving to transform them. The chapter also discusses the existing knowledge on agency in sustainability transitions, identifies gaps in that knowledge, and justifies the integration of theories on change agency in transition studies (namely, the Multi-Level Perspective), institutional theory, and relational approaches to enhance our understanding of agency in food systems sustainability transitions and transformations.

Moving forwards, Chapter 2 provides a historical background, delving into the key events that have influenced the development of Chile´s current mainstream food systems. The aforementioned research questions are addressed through three empirical research chapters (Chapters 3-5). Each of these chapters focuses on answering one sub-research question by investigating a specific a transformative pathway within Chile´s food systems.

Chapter 3 focuses on analysing the formal institutionalization of a food pathway with the potential for transition, organic agriculture. The chapter examines how the institutionalization of different institutional logics influences the capacity to direct transformation pathways (SRQ 1). The chapter examines the various institutional logics held by different actors within Chile´s organic agriculture organizational field, as well as the logics underlying the country´s organic agriculture policy. Findings reveal that the public sector has institutionalized logics that align with Chile´s mainstream food system policies. However, transformative logics that challenge the prevailing food system have been intentionally downplayed by the public sector. As a result, the organic agriculture policy implemented in Chile hinders, rather than supports, the possibility of food system transformation. The Chapter concludes about the need to further unpack and make visible the way in which different drivers (i.e. laws) are constituted through and by diverse, and often competing, institutional logics.

Chapter 4 delves into the transformative roles played by multiple human change agents organizations, including farmers, NGOs, scientists and from the public sector, in the ongoing agroecology transition in Chile (SRQ2). These change agents exhibit distinct activities and play diverse roles aimed at food system transformation. However, the majority of these change agents engage in activities that align with multiple roles. Moreover, the chapter reveals that when issues arise that have implications across different sites of change, the roles of these changes agents converge, resulting in contestations due to their different perspectives. The chapter concludes by highlighting the fluid and messy nature of change agency, as well as the importance to overcome idealized notions of collective change agency that solely focus on cooperative or synergistic relations among change agents. It acknowledges that change agents working within the same transformative pathway can also compete or contest each other´s framings. Addressing these contestations, which also requires cooperation, is crucial. Specially in this case, in relation to the potential institutionalization of agroecology at the policy level. To ensure perceived fairness and legitimacy by the majority of change agents, it is necessary to open-up space to address these contestations.

Chapter 5 examines the role of non-human change agents in relation to human agency by taking as a case the agricultural *Bagrada hilaris* pest (SRQ 3). It shows how this pest was an actor that supported a transition from conventional farming practices based on high use of pesticides towards integrated pest management; destabilizing regime practices associated with pesticides, and creating and mediating relationships between different human actors. Theoretically, this chapter also reinforce the argument that change agents categories are fluid, and that change agents are linked in networks of relations that make change happen. The Chapter concludes about the relevance to consider the agency of non-humans, to further understand how to mobilize them for normative goals can be a catalyst for sustainability transitions.

The last sub-research question (SRQ4) '*What are the implications of institutional logics and relational agency for sustainability transition frameworks?*' is partly answered in each of these chapters. The answer to this question is more fully developed further in the discussion of this thesis (Chapter 6), through an integrative analysis of the three cases described above.

The final chapter, Chapter 6, presents this thesis discussion and conclusions derived from this research. The main conclusion drawn is on the messy, contingent, situational and relational nature of change agency in sustainability transitions. Also, that agency is fluid, dynamic, multi-faceted –encompassing both complementarities and antagonisms that can occur simultaneously–, and unfolds in unpredictable ways. Research into change agency needs to pay attention to where change agents adopt multiple, overlapping roles,

also in relation to the fluidity of relations to particular (contingent) issues. Furthermore, agency cannot be attributed to nor controlled by single change agent organizations; if so, there are risks for the possibility of food system transformations. Rather, meaningful transformation always involves a multiplicity of diverse actors –both humans and non-humans– in plural ways.

Multi-level Perspective offers a useful heuristic to examine food systems transitions, to the degree that it allows for a systemic perspective. However, for a nuanced examination of change agency in food systems transformations, Multi-level Perspective can benefit from being complemented with institutional and relational approaches. These approaches can assist current transitions frameworks to account for the dynamic, fluid and multi-faceted nature of agency. Also, to problematize the formal institutionalization of transformative pathways, to critically examine whose interests institutionalization processes serve and the extent to which these processes support or hinder the advancement of transition processes. Similarly, agency-focused approaches need support from systemic perspectives –such as the one provided by Multi-level Perspective– to deepen their contribution to understanding societal change. The chapter ends with further recommendations for sustainable food system policy, food systems practitioners and further research.

Resumen

La comida es vital para la supervivencia y bienestar humanos. No obstante, nuestros sistemas alimentarios predominantes son insostenibles. Siendo creciente el consenso global sobre la necesidad de realizar cambios significativos en estos sistemas alimentarios para nutrir a una población en crecimiento de una manera que sea efectivamente sostenible. Esto es, a través de sistemas alimentarios que entreguen acceso a alimentos saludables y nutritivos a toda la población, producidos bajo manejos que cuiden el medio ambiente y aseguren un ingreso digno a todas las personas involucradas en la provisión de alimentos, desde su producción a disposición.

Los emergentes campos científicos de las transiciones y transformaciones sostenibles abordan este desafío. Su objetivo es identificar vías y soluciones que faciliten cambios ambientales y sociales deseables, que nos permitan transitar de nuestros actuales sistemas alimentarios insostenibles a alternativas sostenibles.

Con el fin de contribuir a este objetivo, esta tesis busca aportar a una mejor compresión tanto empírica como teórica sobre las vías de transición a sistemas alimentarios sostenibles. Para ello, investiga actuales brechas en los estudios de las transiciones y transformaciones sostenibles sobre nuestro conocimiento acerca de la 'agencia de cambio'. Entendiendo como 'agencia', la capacidad de realizar acciones que cambien el curso de los acontecimientos. Los agentes de cambio son, por lo tanto, los actores que desafían, irrumpen o alteran los valores, suposiciones, comportamientos, modos de operación y las estructuras organizativas que subyacen a los sistemas alimentarios dominantes e insostenibles. Las tres brechas de conocimiento identificadas e investigadas son:

i. Insuficiencia de los actuales marcos teóricos de los estudios de las transiciones sostenibles para comprender e investigar la agencia en procesos de transición y transformación de los sistemas alimentarios
ii. Falta de estudios empíricos que investiguen la 'agencia colectiva' en los procesos de transición y transformación de los sistemas alimentarios
iii. Falta de consideración de la agencia no-humana.

Para abordar estas brechas de conocimiento, esta tesis se centra en una pregunta principal, que a su vez es respondida por cuatro sub-preguntas. Estas preguntas son las siguientes:

> *¿Cómo se manifiesta la agencia en las transiciones sostenibles de los sistemas alimentarios en Chile?*
>
> P1: ¿Cómo la institucionalización de diferentes lógicas influye la capacidad que tienen los agentes de cambio para dirigir la transformación de los sistemas alimentarios? (Capítulo 3)
>
> P2: ¿Qué roles transformadores juegan diversos agentes de cambio y cómo éstos se relacionan entre sí en procesos de transición hacia sistemas alimentarios sostenibles? (Capítulo 4)
>
> P3: ¿Cómo emerge y se manifiesta la agencia relacional en la transición hacia sistemas alimentarios sostenibles entre agentes de cambio humanos y no-humanos? (Capítulo 5)
>
> P4: ¿Qué implican las teorías de las lógicas institucionales y de agencia relacional para los actuales marcos teóricos de las transiciones sostenibles?

La tesis se divide en seis capítulos. El Capítulo 1 es una introducción, donde se plantea la problemática, se presentan los conceptos analíticos que estructuran las preguntas de investigación, y se explica por qué Chile constituye un buen caso de estudio para cumplir con el objetivo de esta investigación. Esto último, en parte, debido a los urgentes desafíos que Chile hoy enfrenta respecto de la insostenibilidad de sus sistemas alimentarios dominantes. También, por la alta presencia de organizaciones que hoy se están esforzando por transformar estos sistemas. El Capítulo 1 además presenta el conocimiento existente hasta hoy sobre el rol de la agencia en las transiciones y transformaciones sostenibles de los sistemas alimentarios, las actuales brechas existentes en dicho conocimiento, y las teorías utilizadas en esta tesis para investigar dichas brechas. Estas teorías son: la Perspectiva de Multi-Nivel (Multi-Level Perspective; MLP), la teoría institucional (institutional theory), y la Teoría del Actor-Red (Actor-Network Theory; ANT). El Capítulo 2 entrega un contexto histórico de Chile. Explicando los principales eventos históricos que han dado forma a los actuales sistemas alimentarios dominantes de Chile. A continuación, en los siguientes capítulos se responden las preguntas de investigación arriba mencionadas (Capítulos 3–5). Respectivamente, cada uno de estos capítulos responde una de las tres primeras sub-preguntas planteadas.

En el Capítulo 3 se analiza la institucionalización formal de un sistema alimentario alternativo con potencial de avanzar una eventual transición de los sistemas alimentarios dominantes; este es la agricultura orgánica. Así, este capítulo responde la primera pregunta de investigación. Lo hace a través de la investigación y análisis de las diversas lógicas institucionales que existen dentro del campo organizacional –o sector– de la agricultura orgánica Chileno. Tanto las lógicas sostenidas por diversos actores dentro de este campo organizacional, así como las lógicas que han sido institucionalizadas por el sector público a través del 'Sistema Nacional de Agricultura Orgánica'. Los resultados revelan que, en la institucionalización formal de la agricultura orgánica, el sector público sólo ha institucionalizado las lógicas que son compatibles con las lógicas del sistema alimentario dominante. Mientras que, las lógicas transformadoras –es decir, áquellas que desafían las lógicas del sistema dominante– han sido deliberadamente excluidas y silenciadas por el sector público. En Chile esto ha resultado en que, la política de agricultura orgánica obstaculiza –en vez de apoyar– la posibilidad de transformar el sistema alimentario imperante. Además de deslegitimizar y reducir el potencial transformador de la agricultura orgánica. El Capítulo concluye sobre la importancia de de-construir y hacer visible la forma en cómo se construyen las leyes y políticas alimentarias, donde participan diferentes lógicas; frecuentemente, en competencia las unas con las otras y en condiciones desiguales de poder.

El Capítulo 4 examina los roles transformadores que juegan diferentes agentes de cambios humanos en la transición agroecológica Chilena (Pregunta de investigación 2). Entre estos agentes de cambio se incluyen diversas organizaciones; tales como: organizaciones de campesinos y agricultores, ONGs, organizaciones de científicos y del sector público. Se encontró que, con el objetivo de avanzar una transformación del sistema alimentario dominante a través de la agroecología, cada uno de estos agentes de cambio realiza acciones y roles diferentes. Sin embargo, la mayoría de estos agentes de cambio realiza acciones que se alinean con múltiples roles. Es decir, aunque a través de diferentes actividades y acciones, todos los agentes de cambio juegan los mismos y casi todos los roles transformadores. Los resultados también indican tanto una escasa cooperación entre los diferentes agentes de cambio así como la existencia de controversias entre ellos. Por ejemplo, sobre cómo se define y debiese implementarse la agroecología. Dado que los diferentes agentes de cambio juegan simultáneamente los mismos roles, el capítulo concluye sobre la naturaleza 'fluida' y 'caótica' de la agencia de cambio. En otras palabras, un tipo de agente de cambio en particular no está determinado a un rol transformador específico. También, sobre la importancia de superar concepciones idealizadas tanto de los agentes de cambio como de la agencia colectiva. Es decir, concepciones que se centran en relaciones cooperativas o sinérgicas. Los agentes de cambio trabajando por un mismo objetivo –en este caso, promover la agroecología–, pueden cuestionar las perspectivas de otros agentes y, a veces, competir por quién tiene la razón. Abordar

estas controversias y relaciones de competencia –lo cual, también significa cooperar– es fundamental. Particularmente en este caso, para institucionalizar formalmente la agroecología en la política pública. Para lograr una política pública agroecológica que sea percibida como legítima, justa y equitativa por la pluralidad de agentes de cambio y actores que practican la agroecología en Chile.

El Capítulo 5 investiga el rol de los agentes de cambio no-humanos, y en relación a los agentes humanos (Pregunta de investigación 3). Lo hace a través del caso de la agresiva plaga agrícola *Bagrada hilaris* o Chinche Africano, que afectó a las comunas del centro de Chile en el año 2017. El capítulo muestra el poder de agencia de la Bagrada. Por un lado, por su capacidad de apoyar una transición en las prácticas de agricultores convencionales. Desde prácticas basadas en un alto uso de pesticidas, hacia prácticas de control biológico y de 'Manejo Integrado de Plagas'. Por otro lado, por facilitar y mediar relaciones entre varios actores no-humanos. En un principio, mediando relaciones de conflicto entre estos diversos actores. Para luego, facilitar su organización y colaboración en la búsqueda de soluciones biológicas y de manejo integrado de plagas para controlar el Chinche. El Capítulo concluye que la capacidad de transformación de sistemas alimentarios dominantes –es decir, la agencia– depende de múltiples y diversas relaciones entre agentes tanto humanos como no-humanos. También, concluye sobre la relevancia de considerar y comprender mejor la agencia no-humana para mobilizarlos con el objetivo de transitar hacia sistemas alimentarios más sostenibles.

El capítulo final, Capítulo 6, presenta la discusión y conclusiones de esta tesis. La principal conclusión es sobre la naturaleza desordenada, relacional, contextual y contingente de la agencia de cambio en las transiciones hacia sistemas alimentarios sostenibles, que se despliega de maneras impredicibles, siendo difícil de controlar y planificar. También, que la agencia de cambio es fluida, dinámica y multi-facética; abarcando tanto relaciones de complementariedad como de antagonismo entre diferentes agentes de cambio, que a veces pueden ocurrir simultáneamente. Además, la agencia de cambio no puede ni atribuirse ni ser controlada por una sola organización; en tales casos, la posibilidad de transformación de los actuales sistemas alimentarios dominantes es muy limitada. La posibilidad de una transición hacia sistemas sostenibles necesariamente significa la inclusión pluralista de una multiplicidad y diversidad de agentes de cambio (y eventualmente otro tipo de actores), tanto humanos como no-humanos.

En cuanto a la Perspectiva de Multi-Nivel (Multi-Level Perspective; MLP) como teoría para conceptualizar y analizar las transiciones sostenibles esta tesis concluye lo siguiente. Esta teoría es útil como heuristica para examinar procesos de transición y transformación. En cuanto, nos permite abordar la complejidad de estos procesos de manera concisa y sistémica. No obstante, para una examinación detallada de la agencia y su rol en

los procesos de transformación, la Perspectiva de Multi-Nivel puede beneficiarse al ser complementada con otros enfoques teóricos; tales como la teoría institucional y teorías relacionales (por ejemplo, la Teoría del Actor-Red). Éstos últimos pueden contribuir a los estudios de las transiciones –y los principales marcos teóricos desarollados ahí, incluyendo la Perspectiva de Multi-Nivel– a abordar la naturaleza dinámica, fluida y multi-facética de la agencia. También, pueden aportar a problematizar la institucionalización –tanto formal como informal– de los sistemas alimentarios sostenibles alternativos con potencial transformador. Es decir, pueden contribuir a una examinación crítica sobre la medida en qué los procesos de institucionalización de sistemas alimentarios alternativos están contribuyendo –o no – a la transformación de los sistemas alimentarios dominantes. Por ejemplo, ¿a qué o los intereses de quién sirven? A su vez, los enfoques teóricos que permiten una examinación más detallada del fenómeno de la agencia, se benefician de la Perspectiva de Multi-Nivel y su enfoque sistémico. Pues, ésta les permite profundizar y posicionar su aporte en el contexto de los grandes cambios sociales que hoy se necesitan. Finalmente, el capítulo entrega recomendaciones de políticas públicas para generar sistemas alimentarios, los actores que buscan impulsar la transformación de los actuales sistemas alimentarios dominantes y para futuras investigaciones.

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Introduction
"The need for mainstream food systems sustainable transformations"

1.1 The need for mainstream food systems sustainable transformations

Chile: 34 % del país fuma, 86% es sedentario, 27% es hipertenso, 74% tiene obesidad o sobrepeso, sólo 15% consume la cantidad diaria recomendada de frutas y verduras. Ahí están las causas de los infartos, no nos engañemos

Chile: 34% of the country smokes, 86% are sedentary, 27% are hyper tense, 74% are obese or overweight, only 15% consume the recommended daily intake of fruits and vegetables. These are the causes of heart attacks Let´s not fool ourselves

@juancarlossaid, MSc in Public Health,
Imperial College London
(Twitter, 22 of June 2023)

On the 16th of October 2019, I presented a part of my research at the International Transformation Conference in Santiago, Chile. The title of my presentation was somehow provocative: "Distributed Agency in Food System Transformation in Chile: Collective Action or Fragmented Individualism?". Though the title adequately reflected the perspectives of the people I had interviewed, looking back, I think it might have been a bit naïve and unfair to those engaged with organic agriculture in Chile.

Before my field work, I had read many papers about change agency in transitions. The literature emphasized the relevance of change agents in transitions, their willingness to share information, create networks and stimulate others to cooperate. As a researcher with little background in social sciences, I very innocently, imagined that in my field work I would find super-cooperative change agents acting in a "let's all shake hands and transform Chile's food systems" mode. Of course, reality was much more complex.

On the third day of the Transformation Conference, the 19th of October, there were protests in Santiago. Between 19:00 and 21:00, seven fires were recorded in Santiago´s metro stations and other strategic physical infrastructure. The activities of the conference were suspended for two days. This was sad, especially for the conference organizers and researchers coming from all around the world. I condemn violence and the burning and destruction of both public and private infrastructure. Still, I could not help but think that it was extremely interesting for us researchers of transformation processes to experience a social upheaval seeking the transformation of Chile's unequal society.

The 19th of October marked the outbreak of Chile's *Estallido Social* (Social Outburst). Under the mottos "*Chile Despertó*" and "*Dignidad*" ("Chile has awoken" and "Dignity'"), thousands of people in all the country's cities went out onto the streets to demand social justice, and to a lesser extent, environmental justice. The protests were a response to the cumulative effects of a neoliberal economic system, established almost five decades ago by former dictator Augusto Pinochet, that had deregulated markets and privatized social security (Kanter & Boza, 2020; Sarabia & Peris, 2021). Over the succeeding thirty years, Chile had transitioned from being one of the poorest countries in Latin America to being one of the leading most economies of the continent, and had make it into the OECD. Yet, at the same, Chile remains one of Latin America's most socially and economically unequal societies (UNDP, 2021).

As the protests continued and intensified across the country, on the 15th of November the government and all political parties in parliament (with exception of the *Republicano* and the Communist parties, the two poles of the political spectrum) signed the "*Acuerdo por la Paz*" (Agreement for Peace). The agreement was for citizens to stop mobilizations (although this did not happen) and for the public sector to work on developing a new constitution. The latter was meant to overcome Chile's current constitution, made under the military dictatorship: one of the most –if not the most– shameful periods of Chile's history due to the severe violation of humans rights; which included the disappearance of thousands of people, whose location still remains unknown to their loved ones. The first step of the "*Acuerdo por la Paz*" was to convoke a national referendum to approve or reject the proposal for Chile to move towards developing a new constitution.

On the 25th of October 2020 (with 50.95% voter participation) 78% of Chilean citizens voters approved the *Convención Constituticional* (CC) drafting a new constitution. After voting for the members of the CC, the *Convención* was established and started to operate. Gender parity was assured –although the parity mechanism actually played in favor of men, as more women would have been elected without it– and seats were reserved for indigenous citizens. Since the *Estallido*, a transformation process had been set in motion, with the possibility of Chile transiting towards a more just and environmentally-sound country. Some of the articles contained within the *Convención´s* constitution proposal related to i) integrating gender parity in all spheres of Chilean society, ii) the right to food, iii) food sovereignty, iv) the freedom of access to seeds, v) collective rights and self-determination for indigenous people, and: vi) the rights of nature.

The possibility of having a new constitution also encouraged new forms of citizen action. The discontent of the people turned into specific demands when the protestors started to organize themselves in *cabildos,* in which people openly discussed their demands concerning the Chilean economic and political system (de Jong, 2020; Kanter

& Boza, 2020). These also included food *cabildos* organized by a variety of food system practitioners. I participated in two of these in the Valparaíso Region. According to '*Las Alimentantes*', one of the food *cabildos* organizers, food constituted an opportunity to address some of the demands raised by the *Estallido* since food is essential for the social, economic and political progress of nations, making it necessary to incorporate the right to healthy, secure, environmentally sound and culturally appropriate food (the right to food) within the new constitution (Luco et al., 2019).

At a personal level, I agree(d) with the need for a broader transformation of Chile's society, including its food systems. For instance, I was particularly shocked during my fieldwork when a civil servant said that they could not support a '5 a day' fruits and vegetable campaign. He indicated that his department had considered doing so, but after seeing the results of samples from the *Instituto de Nutrición y Tecnología de los Alimentos* (INTA - Nutrition and Food Technology Institute) they realized that pesticide residues in fruits and vegetables were so high that such levels of intake would increase health risks for people (Observation 23 June 2018, National Commission for Horticulture[1] (Chapter 3)).

Fruit and vegetables are essential for a nutritious and healthy diet (Liu, 2013; Wallace et al., 2019). Increasing their consumption has been shown to address serious problems linked to unhealthy diets prevalent in Chile today that are related to malnutrition, chronic diseases and high levels of obesity (including among children) (Azar et al., 2015; Kanter et al., 2019; Rodriguez-Osiac et al., 2021). Yet, Chile's public sector is unable to campaign for a higher fruit and vegetable intake as, under the existing food regime, this would undermine food safety and compromise people's health.

While the *Convención* worked on writing a constitutional proposal, I continued working on this thesis about a less visible and high-profile process of transformation: the transformation of Chile´s mainstream food systems. My focus was on less well known and less influential change agents, compared to the *Convención Constitucional* members but, as I will show in this thesis, not at all less important. Food is vital for human survival and wellbeing.

The constitutional reform was not the only transition process relevant for this thesis. The COVID 19 pandemic hit in during this period and for eight months I worked on this thesis under lockdown conditions. The pandemic demonstrated that change can happen suddenly and dramatically, creating great uncertainty (Blay-Palmer et al., 2020).

1 The National Commission of Horticulture is a public-private sector partnership convoked by the Ministry of Agriculture, with the main aim of allowing the private sector to articulate their demands to the public.

Besides triggering a health crisis, COVID 19 disrupted the economy and almost every sphere and scale of society –from the global to the household and individual– and at unprecedented levels. COVID 19 had strong impacts on food security and nutrition, especially on countries and cities that are highly dependent on food imports, and especially their citizens with the lowest incomes (Kanter & Boza, 2020; Rivera-Ferre et al., 2021).

COVID 19 also drew attention to the relevance of food systems for human survival, health and wellbeing (Jensen, 2021). During the pandemic many people lost their jobs, others had to turn to home-working, and many shops had to close during the periods of lockdown. Yet, food systems could not just stop functioning but had to cope with the challenges imposed by COVID 19 and keep feeding the population. In Chile, low-income citizens self-organized in preparing *ollas comunes* (common meals) to help their neighbors who had lost their jobs and now had no income, displaying outstanding solidarity and resilience (Fuentes et al., 2022). COVID 19 also highlighted the vulnerabilities of mainstream food systems and the need to speed up the transformation towards more sustainable and resilient ones (Rivera-Ferre et al., 2021).

This thesis was written during moments of disruption and transition and, as such, it is about more than just transitions towards sustainable food systems. More specifically, it is about the role that different human and non-human (e.g., laws, human organizations, non-humans) change agents play in advancing the possibility for the sustainable transformation of existing mainstream food systems. The research has been part of the Horteco project. This project aimed at investigating and supporting sustainable horticultural systems in Uruguay and Chile as a way of addressing the interconnected challenges related to the sustainability of these countries' food systems. This project was aligned with the emerging global consensus around the need to transform current mainstream food systems in order to feed a growing population in sustainable and equitable ways (De Schutter, 2019; Duncan et al., 2022; Foran et al., 2014; HLPE, 2020; IPES-Food, 2015; Melissa Leach et al., 2020).

The term 'food systems', as used in this research, refers to "all the elements (environmental, people, inputs, processes, infrastructures, institutions, etc.) and activities that relate to the production, processing, distribution, preparation and consumption of food, and the output of these activities, including socio-economic and environmental outcomes" (HLPE, 2014). These are not static systems, but are dynamic and continuously evolving. That said, a shift in the direction of food systems towards sustainability remains a distant prospect (Conti et al., 2021). Adopting a 'food systems' lens can deepen our understanding of how the components of food systems interact and provide insights

into the trade-offs and synergies between sustainable development objectives and interventions in a given food system (Leeuwis et al., 2021).

Sustainable food systems are conceptualized in this thesis as socially just, environmentally sound and stable in the face of shocks and crises (resilient) (HLPE, 2020). They are productive and prosperous, equitable and inclusive, empowering and respectful, resilient, regenerative, healthy and nutritious. In other words, sustainable food systems ensure the availability of sufficient food that can be accessed by all people, including the most vulnerable and marginalized. Central to this is ensuring that all people can make choices and exercise their voices in shaping these systems: that is, to ensure their *agency*. Moreover, sustainable food systems are conceptualized as ensuring that those working in the food system (from production to disposal) earn a decent living and work under safe and fair conditions.

1.2 The importance of agency in the sustainable transformation of food systems

1.2.1 Transitions towards sustainable food systems

Sustainable transition and transformation studies are focused on identifying pathways and solutions for desirable environmental and societal change, moving beyond the analysis and understanding of problems (Hinrichs, 2014). They also often have to transcend modernist and dualist paradigms, for example by conceiving of humans and nature as interconnected within hybrid systems (Ollivier et al., 2018). Sustainable transition and transformation studies share an explicitly normative component, which makes them different from studies of other transition and transformation processes (Béné, 2022; Juri et al., 2022).

These studies resonate with the growing consensus that, due to the characteristics of sustainability problems (e.g., ambiguity, interconnectedness, complexity and multidimensionality), business-as-usual or incremental innovations centered around technical fixes are insufficient for keeping humanity within a 'safe operating space' (Hölscher et al., 2018). Instead, both research fields signal the need for profound, radical (i.e., transformative) systemic change so that the ways in which (food) systems function can contribute towards sustainable societies.

Following other scholars of food systems, in this thesis I understand transformative change as involving a change in mental modes, social practices and even the development of *new values*, which tend to destabilize existing behaviors, social practices, infrastructures,

technological systems and business and administration models, while building new ones. Transformative change implies dismissing obsolete knowledge and ceasing obsolete behavior while developing new paradigms, assumptions, models, methods and practices (Duncan et al., 2022).

Sustainability transitions and transformations come from different research communities, whose departure point may be socio-technical systems or more socio-ecological perspectives, respectively. While these perspectives have their differences, they are not mutually exclusive, and can be complementary approaches that enrich each other in terms of understanding and interpreting changes in food systems[2] (Hölscher et al., 2018; Ollivier et al., 2018). To date, both fields have contributed complex systems perspectives and nuanced frameworks on how to describe, interpret and support desirable, radical and non-linear societal change.

In this thesis, I understand transformations of current unsustainable mainstream food systems as the final goal. Whereas, I understand sustainability transitions as the complex journey to advance towards that goal. To frame and analyze the actual and potential changes towards sustainable food systems I will mainly use insights from transition studies, though I will also draw on insights from transformation studies that complement the understanding and examination of change agency.

Broadly, sustainability food system transitions refer to a transformative movement from unsustainable mainstream food systems towards sustainable ones (Elzen & Wieczorek, 2005; Hinrichs, 2014). These are complex large-scale, long-term, non-linear, multi-actor processes (Köhler et al., 2019). Thus, transitions are not smooth transformative processes, or a matter of simply 'scaling-up' sustainable technology and social innovations. Nor can they be understood as a 'shift' from one dominant food system to another, as argued for instance by Fuenfschilling & Truffer (2014).

By nature transitions are inherently political processes. This is because they imply a transformation of the power relations that lead to unsustainable food outcomes; which is often resisted by incumbent and powerful actors who benefit from the status quo (EL Bilali, 2019a; Rossi et al., 2019). In addition, there will be a whole range of hotly contested issues, even amongst those that share a broad consensus over the need for sustainability transitions. For instance, there is no clear agreement about the meaning of sustainability (Leeuwis et al., 2021; Scoones et al., 2017). This leads to the co-existence of different –at times competing– framings proposed by different individual actors and

2 For more extensive insights about both sustainability transitions and transformations studies and their relations see (Feola 2015; Hölscher et al. 2018; Loorbach et al. 2017; Olsson, Galaz, and Boonstra 2014; Patterson et al. 2016).

groups, who often disagree about the desirable directions of transitions and appropriate ways to steer such processes. Here, one should be mindful that such transitions may well create winners and losers (Köhler et al., 2019; Scoones et al., 2017). As such, transitions are messy processes that inevitably involve contestations, tensions, and contradictions which, over time may change the details of different actors´ visions, aims and actions (Elzen et al., 2012; Stirling, 2009). In line with previous authors, I view transitions as the continuously negotiated accomplishments of heterogeneous actors, with different motivations and frames of references (Garud & Gehman, 2012; Jørgensen, 2012)

1.2.2 A multilevel perspective for framing transition towards sustainable food systems: processes of (de)structuration resulting from the interplay of three analytical levels

The Multi-Level Perspective (MLP, Figure 1-1) is a prominent framework for describing and analyzing complex transition processes (Köhler et al., 2019), including within food systems (El Bilali, 2019b; Leeuwis et al., 2021; Sarabia et al., 2021). MLP offers opportunities to enlarge our thinking about future sustainable food systems (Hinrichs, 2014) due to its engagement with the dynamics of large-scale socio-technical systems that often present obstacles towards achieving sustainability (Smith et al., 2010). Furthermore, although MLP initially had an explicit emphasis on sustainable technological innovation, it has expanded and diversified to include recognition that social innovations are important for sustainability transitions (Hinrichs, 2014). Social innovation refers to changes in social relations, involving new ways of doing, organizing, framing and/or knowing (Haxeltine, Avelino, et al., 2016).

The Multi-Level Perspective views transitions as resulting from the interplay of developments at three analytical levels: niches (the locus of radical innovations); socio-technical regimes (the locus of established practices and associated rules), and; the exogenous socio-technical landscape (Darnhofer, 2015). Throughout, it is crucial to recognize that these transition processes involve purposeful actors asking normative questions and operating through *structured* relations (Smith et al., 2010).

Figure 1-1 shows that, in simplified terms MLP assumes that (a) niche innovations can create a sound institutional environment capable of competing with the established regime, (b) landscape developments put pressure on the regime and (c) as a consequence of these two developments, regimes may be destabilized and give way to new socio-technical configurations (Fuenfschilling & Truffer, 2014). The dynamic interplay between these 'levels' can lead to a whole set of different pathways of regime re-configuration, ranging from incremental, less transformative, innovations, to radical, more transformative, transitions (Geels & Schot, 2007; Smith et al., 2005).

The regime forms the 'deep structure' that accounts for the functioning and stability of an existing socio-technical system. The concept of socio-technical systems emphasizes the interdependence of all the social and technical or material structures which, over time, co-evolve into a stable configuration that enables the fulfillment of a societal function (Fuenfschilling & Truffer, 2014), such as food provision. This 'deep structure' includes the material aspects of the system, the embedded actors and organizational networks and the established practices and associated semi-coherent set of rules that guide actors' expectations and actions; for instance, by orienting, coordinating and stabilizing the activities of the social groups that reproduce the various elements of the system (Geels, 2011; Genus & Coles, 2008). A regime is composed of several sub-regimes or dimensions (e.g., market, policy, science) which have their own dynamics but interpenetrate and co-evolve with each other (Geels, 2011).

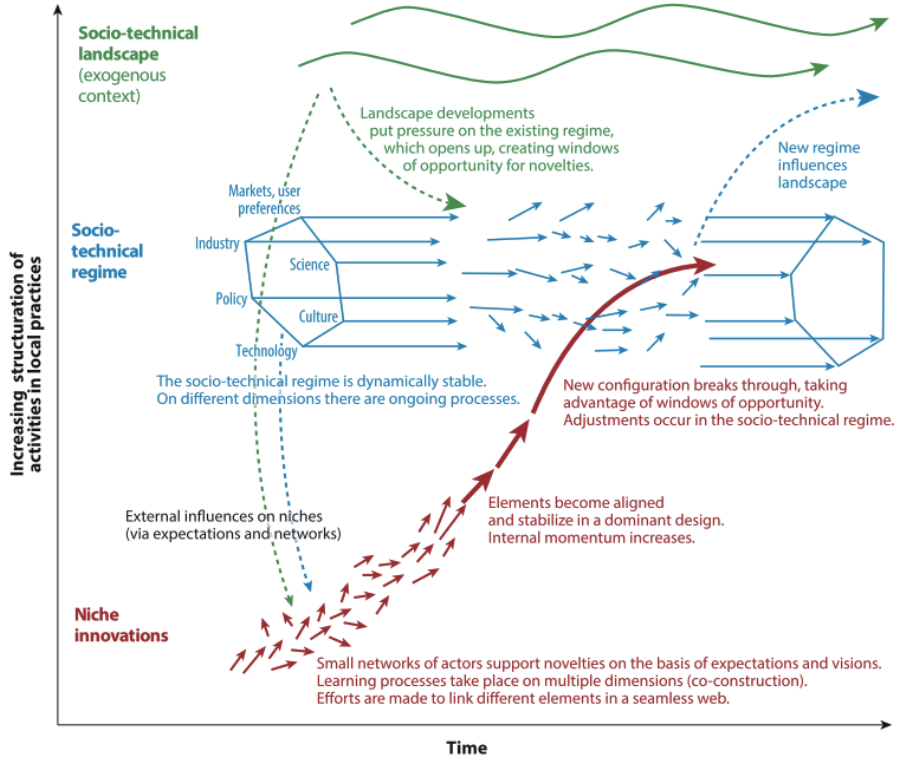

Figure 1-1: The Multi-level Perspective framework of sustainability transitions.
Taken from Loorbach, Frantzeskaki & Avelino, 2017.

The concept of regime explains the persistence and rigidity of socio-technical systems which are resistant to radical transformation and are more usually path-dependent and locked into incremental innovation pathways, with small adjustments accumulating into stable trajectories. Path-dependency reminds us that 'history matters': choices made in the past influence present decisions – or 'initial moves in one direction elicit further moves in that same direction' (Conti et al., 2021). Lock-ins lead to the exclusion of competing views and practices, making the system blind to possible alternatives and keeping it moving along the established trajectory (Conti et al., 2021). Analyzing the regime is of central importance in MLP, since it is this that upholds unsustainable societal systems that need to be reconfigured or transformed if transition is to occur (Darnhofer, 2015; Fuenfschilling & Truffer, 2014). Current mainstream food systems are conceptualized as 'regimes' within the MLP perspective.

Niches are the spaces where transformative socio-technical innovations, with a potential to transform the regime, are developed by small networks of dedicated actors; often, outsiders or fringe actors (in relation to the regime). These niche actors work through alternative socio-technical configurations, which are usually loosely structured, but potentially represent embryonic nuclei for future (radically different) regime structures. Over time some niches become established and stabilized through a range of different activities. These might include: the articulation and adjustment of expectations or visions; building social networks and enrolling more actors and/or developing organizational skills and those related to technical design, user preferences, viable business models, policy instruments and symbolic meanings. Eventually at some point, a niche may be able to 'break through', achieve broader acceptance and reconfigure the regime (Darnhofer, 2015; Fuenfschilling & Truffer, 2014; Hinrichs, 2014). Niches are the foundation of transitions because they provide the seeds for systemic change, even if many of these seedlings will prematurely perish (Elzen & Wieczorek, 2005).

The landscape level provides the backdrop (e.g., larger bio-physical and environmental changes, legal and regulatory shifts, or cultural developments) and long-term *exogenous* trends (e.g., demographic, societal values, macro-economic patterns, etc.) which, in the short-term, cannot be influenced by either niche or regime actors (Darnhofer, 2015). Nonetheless, the landscape has an influence and can either stabilize or destabilize regimes. As such it can often provide opportunities for niches to be (further) developed. Landscape changes might include new national or international policy mandates, a sudden shortage of a critical supply input, a new technology, a natural disaster or a serious food safety scare (Darnhofer, 2015; Fuenfschilling & Truffer, 2014; Hinrichs, 2014). Current landscape pressures which favour a transition to a more sustainable food supply system include climate change and water shortages and the increasing evidence of the detrimental effects of mainstream food systems on people's health. All these

landscape pressures provide incentives to develop new niches and opportunities for them to become mainstreamed.

These three levels within the MLP have very distinct degrees of structuration, ranging from the very strong to very weak. Fuenfschilling & Truffer (2014) thus refer to 'levels of structuration'. This implies that transitions involve de-structuring regimes and structuring niches in order to take advantage of the pressures that the landscape level puts on the regime.

1.2.3 Change agency in sustainability transitions

Transitions towards sustainability require individual and collective capacity and capability to act so as to bring about the needed changes within current, unsustainable, regimes (Huttunen et al., 2021). It is acknowledged that a diversity of actors (e.g., civil society, policy makers, business interests) engaged with transforming mainstream food systems into sustainable ones can be crucial drivers of change by setting sustainable food systems transitions in motion (Darnhofer, 2015). In this thesis, I understand agency as "the capacity to take action that can influence the course of events" (Giddens, 1984).

Transition studies have developed different conceptualizations to denote the human actors who take action to advance transitions. Some studies talk about agency in transitions and interchangeably use the terms 'actors', 'agents' (Hassink et al., 2018; Koistinen et al., 2018; Werbeloff et al., 2016), or 'change agents' (de Haan & Rotmans, 2018). In this thesis, I use the concept of 'change agents' as, to my thinking, it better describes the human actors engaged in transition processes. Change agents can be individuals or collective actors (e.g. organizations or networks) and can include policy makers, civil servants, private entrepreneurs and other food producers (e.g., farmers, peasants), scientists, grassroots activists (i.e., those engaged in bottom-up processes of change emanating from communities and users (Hargreaves et al., 2013)), NGOs and other civil society actors.

Transition and transformation studies have used different theoretical approaches to explain agency in these processes. This is not surprising, given the complexity of these processes, which involve multiple and diverse (change) agents, that cannot be comprehensively addressed by single theories or disciplines (Köhler et al., 2019). In what follows I elaborate how agency has been examined in transitions, and where relevant, transformation studies.

Understanding agency through MLP

MLP conceptualizes actors as being located in the niche, the regime or intermediary (these latter are sometimes referred to as hybrid actors or boundary spanners) (Elzen et al., 2012; Smink, et al., 2015; respectively). MLP usually regards the landscape as being void of agency (Fischer & Newig, 2016; Koistinen et al., 2018). This, however, has been challenged by studies indicating that human agency can trigger changes at the landscape level (see for example, Antadze & McGowan, (2017)).

Intermediaries are those actors who operate between the niche and regime levels. They can be influential in transition processes by linking different actors' activities, skills and resources; creating new collaborations around niche technologies, ideas and markets (Fischer & Newig, 2016; Kivimaa, 2014; Kivimaa, Boon, et al., 2019; Kivimaa, Hyysalo, et al., 2019). More recently, Kivimaa, Boon et al. (2019) proposed a more nuanced typology of five intermediary types, which identifies niche and systemic intermediaries as the most crucial forms of intermediary actors. Niche intermediaries work by experimenting and advancing the activities of a particular niche, and try to influence the prevailing socio-technical system for that niche's benefit. Systemic intermediaries can operate on all levels (niche, regime, landscape), promote explicit transition agendas and take the lead in aiming for change on the whole system level. Nonetheless, these authors conclude that successful transitions need the involvement of a full range of intermediaries, including regime-based intermediaries, process intermediaries and user intermediaries (*ibid.*).

Early applications of MLP suggested that regime actors resist fundamental change from niche and intermediary actors who wish to change the regime (Huttunen et al., 2021). Regime actors are usually aligned with governments, the public sector or the dominant food regime (El Bilali, 2019a; Geels, 2011, 2014). For transitions to emerge, niche actors need to develop the political capacity to position their niche favourably in the light of the regime's perception of current priorities (e.g. environmental or economic crises), mobilize support, influence agendas and re-direct investments and policy commitments away from incremental repair work and towards a more radical transition (Darnhofer, 2015). This classic MLP model distinguishes change agents from incumbent regime actors representing vested interests and that use their agency to prevent or resist any transition of the status quo (Koistinen et al., 2018).

This classic MLP approach has been critiqued for presenting oversimplified conceptualizations of actors and their interactions in transitions. Attributing static roles and interests to actors who are often depicted as being either proponents or opponents of sustainability transitions, or 'challengers' and 'incumbents' (Brown et al., 2013; Pesch,

2015; Upham et al., 2018). This can lead to an arbitrary separation between niche and regime actors (Fischer & Newig, 2016; de Haan & Rotmans, 2018; Huttunen et al., 2021; Smith et al., 2010) as such a conceptualization can downplay the complexities involved in human behavior, the different roles that people engage in in their daily lives and different actors' interactions (Huttunen et al., 2021; Wittmayer et al., 2017).

More recent MLP applications point out that transformative change is not only, or always, driven by niche actors. Empirical studies have shown that regime actors can also advance transitions (Smith et al., 2005; Turnheim & Geels, 2019). Moreover, in order to advance sustainable socio-technical innovations, niche actors, at some point, need to enlist supporters from the regime (Diaz et al., 2013; Elzen et al., 2012; Hargreaves et al., 2013; Rossi et al., 2019). The concept of 'hybrid' actors enables us to understand regime actors who are (or become) sympathetic to the proposals of a niche, who illustrate the heterogeneity and potential dissent inherent within a regime (Darnhofer, 2015; Elzen et al., 2012).

Previous studies have contributed to further developing our understanding of the interactions between niche and regime actors (Diaz et al., 2013; Ingram, 2015). The latter authors point to the importance of understanding niche-regime interactions as reflexive, networking processes that may be facilitated and/or driven by individuals and organizations from both levels. Following on from earlier work (Jørgensen, 2012), Diaz et al. (2013) show that it is empirically difficult to attribute actors to a specific level, and conclude that niches are fluid, continuously evolving, networks that (dis)enroll regime actors. In summary, more recent MLP studies recognize that both niche and regimes have agency.

This has broader implications and some authors question the analytical usefulness of these concepts in examining agency in transitions (de Haan & Rotmans, 2018; Jørgensen, 2012). Other authors argue that MLP's conceptual preoccupation with niches, regimes and landscapes can obscure the importance of human agency and the inevitable contest and politics of transitions towards sustainability (Hinrichs, 2014).

Recently, some transition scholars have proposed more nuanced conceptualizations of actors and their interactions to overcome MLP's simplified conceptualizations of actors as niche, regime or intermediaries (de Haan & Rotmans, 2018). In this article, these authors proposed a typology of four transformative roles that human actors can play to advance transitions, independently of their positions within the regime or a niche, or in between. These transformative roles are: frontrunners, connectors, topplers and supporters: these roles can be played by different types of societal actors, and when they complement and cooperate with each other can bring about transitions (de Haan & Rotmans, 2018). However, this framework has not yet been empirically validated.

Understanding agency through institutional theory

Institutional theory is broadly concerned with advancing knowledge about the stability (i.e., the reproduction) and change (i.e., the disruption) of institutions (Barley & Tolbert, 1997). In this thesis I apply the concept of institutions as determining the "'rules of the game' that structure (e.g., enable [or] constrain) human interaction and activity" (North 1990, p. 3). Institutions can be formal or informal, overt or implicit (Darnhofer, 2015). Informal institutions include cultural and social norms (e.g., value systems), while formal institutions are the explicit rules (e.g., constitutions, laws, property rights) designed and enforced, for example, by governments and other institutions (Conti et al., 2021).

Recent literature on agency in relation to the MLP draws from theories of sociological institutionalism (Duygan et al., 2019; Fuenfschilling & Truffer, 2016; Geels, 2020; Hassink et al., 2018; Hermans et al., 2013; van Doren et al., 2020; Westley et al., 2013). These studies elucidate the ways in which institutions affect the specific context that underlies the preferences or identities of actors, while in turn change agents can transform the institutions in which they are embedded (Huttunen et al., 2021).

Institutional theory introduces the concept of embedded agency to account for actors being embedded in societally defined institutions that structure their cognitions, define their interests and produce their identities. Yet, actors also have agency to imagine new, and change current, institutions. These structures (or dominant institutions) do not simply generate constraints on agency but, also provide a platform for the unfolding of activities aimed at changing dominant institutions (Garud et al., 2007). The paradox of embedded agency is that if actors are embedded in an institutional field and subject to regulative, normative and cognitive processes that structure their behavior, how are they able to envision new practices and subsequently get others to adopt them (Garud et al., 2007)? One of the values of institutional theory for transition frameworks is helping to better embed changing institutions and agency, while providing analytical tools for more empirically derived explanations of the co-evolutionary dynamics between actors and institutional change (Brown et al., 2013).

Some transition scholars indicate that institutional theory is consistent with the ontologies of MLP, noting that MLP's 'levels of structuration' can be conceptualized as differing in their degree of institutionalization, and the process of 'increasing [niches] structuration' as synonymous of 'institutionalization' processes (Fuenfschilling & Truffer, 2014; Haxeltine, Avelino, et al., 2016). They argue that regimes can be described as highly institutionalized regulative, normative and cognitive structures (or institutions) and that sustainability transitions can thus be framed as processes of institutionalization

or institutional change: with regimes being de-institutionalized and being gradually replaced by further institutionalizing initially loosely institutionalized alternative sustainable socio-technical configurations (Fuenfschilling & Truffer, 2014). In short, transitions involve de-institutionalizing regimes while simultaneously institutionalizing niches.

By taking this institutional approach to transitions, thus, transformative change can be also defined as change that challenges, alters, or replaces the existing institutions underlying regimes for new (sustainable) ones (Haxeltine, Avelino, et al., 2016) (see above section 1.2.1). From this perspective change agents are the actors who create sustainable institutions, or disrupt or replace existing dominant ones (Duygan et al., 2019; Fuenfschilling & Truffer, 2016; Haxeltine, Avelino, et al., 2016; Haxeltine, Jørgensen, et al., 2016; Rogers et al., 2015).

So far, three main institutional theory concepts have been used to analyze agency in transitions; namely: 'institutional entrepreneurs' (or institutional entrepreneurship) (Duygan et al., 2019; Geels et al., 2016; Hassink et al., 2018; Hermans et al., 2013; Westley et al., 2013); 'institutional work' (Duygan et al., 2019; Fuenfschilling & Truffer, 2016; van Doren et al., 2020) and 'institutional logics' (Fuenfschilling & Truffer, 2014; Haxeltine, Avelino, et al., 2016; Haxeltine, Jørgensen, et al., 2016; Huttunen et al., 2021; Koehrsen & Huber, 2021; Smink et al., 2015).

Some transformation scholars have proposed more comprehensive theories on transformative agency based on the concept of institutional entrepreneurs (Westley et al., 2013), though these remain theoretical. Yet, the institutional entrepreneur concept has been challenged for its lack of attention to actors' relations and collective change agency. Furthermore, it has been challenged for contributing to depicting heroic notions of –usually powerful– change agents who are able to transform systems by themselves (Duygan et al., 2019; Fuenfschilling & Truffer, 2016; Jolly, 2016). It is clear that change agents seldom operate alone, but rather advance change through relationships, networks and cooperation (Köhler et al., 2019; Renting et al., 2012; Rossi, 2020; Rossi et al., 2019). Nonetheless, scholars indicate some concepts from institutional entrepreneurship help make practitioners' implicit competencies explicit and hence a legitimate subject for organizational development and joint learning about the political aspects of sustainability transitions (Heiskanen et al., 2019).

The concept of institutional work extends beyond a heroic rendition of institutional entrepreneurs and refers to the practices of individual and collective actors aimed at creating, maintaining, and disrupting institutions (Lawrence et al., 2013). Institutional work problematizes how and with whom individuals gain their (institutionally

embedded) agency, highlighting processes rather than agents (Heiskanen et al., 2019). While institutional work and institutional entrepreneurship emphasize different understandings of agency (Lawrence et al., 2013), both are potentially valuable concepts for practitioners, with the former relevant for practices and processes, and the latter highlighting purposive action in opposition to existing institutional arrangements and the role of opportunity for agency (Heiskanen et al., 2019).

More recently, some transition scholars have examined agency in transitions through the concept of 'institutional logics'. The core of this approach is the coexistence of multiple simultaneous institutional norms, values, beliefs and material practices (i.e., logics) among which actors navigate (Huttunen et al., 2021). Some of these institutional logics are dominant, while others are not. For instance, in MLP, a socio-technical regime is often understood as a fairly stable set of dominant institutional logics, whilst other systems (e.g., niches) may rely on partially different (not dominant) logics (Fuenfschilling & Truffer, 2014). In other words, socio-technical regimes denote the most deeply institutionalized ('core') logics in a field or system (Hacker & Binz, 2021). Nonetheless, according with the idea of embedded agency, while institutions and institutional logics shape individuals and organizations (Osei-Amponsah et al., 2018; Thornton, 2012), they are not simply passively adopted by them: actors draw from, construct and enact logics according to their values, needs or goals (Haedicke, 2016). Actors also have the agency to (re)shape and resist prevailing institutional logics (Hayes & Rajão, 2011).

Institutional logics have also been used to unpack and further analyze regime institutions (structures). Such work concludes that institutional logics is a fruitful approach to understand which institutions need to be disrupted and which ones should be further strengthened (Fuenfschilling & Truffer, 2014). Other scholars have fruitfully applied institutional logics to examine the difficulty of cooperation amongst niche and regime actors due to their divergent practices and belief systems (i.e., logics) (Koehrsen & Huber, 2021; Smink et al., 2015). In the attempts to develop a framework for transformative social innovation in sustainability transitions (Haxeltine, Avelino, et al., 2016), and to further advance theory on the agency and dynamics of transformative social innovation, Haxeltine, Jørgensen, et al. (2016) include institutional logics within their framework for:

i) resolving how change agents and processes are influenced by their institutional context, and how they in turn respond;

ii) influencing the make-up of a particular dominant institutional logic;

iii) playing a part in the dynamic of competing or contested institutional logics within a particular organizational field in which they operate; and

iv) exploring multiple competing or contested institutional logics (that may be in flux) within one organizational field (Haxeltine, Avelino, et al., 2016; Haxeltine, Jørgensen, et al., 2016)

Overall, there has been a growing interest by transition scholars on institutional theory. On the one hand this allows them to enrich MLP with analytical tools that permit a more nuanced examination and description of regimes and their underlying institutions (Fuenfschilling & Truffer, 2014). On the other hand, it facilitates further examination of the institutional and agency dynamics within transition processes.

Understanding agency through relational approaches

Another way to approach agency in transitions is through relational approaches. Relational approaches represent a heterogeneous field of thinking and research. Yet, they are united in their distancing from substantialist approaches that conceive the social world as consisting of primarily various kinds of distinct 'substances' (e.g., things, beings, essences) (Emirbayer, 1997; Settersten et al., 2022) in which different classes of entities, be they social, material or ecological interact (West et al., 2020).

Relational approaches move away from distinct entities and portray reciprocally-constituted aspects that unfold in broader assemblages (West et al., 2020). Relational theorists reject the notion that one can posit discrete, pregiven units, such as the individual or society, as starting points of sociological analysis (Emirbayer, 1997). "Things [including humans] are not assumed as independent existences present anterior to any relation, but gain their whole being first in and with the [symbolic and material] relations which are predicated of them. Such 'things' are terms of relations, and as such can never be 'given' in isolation but only in ideal community with each other" (Cassirer 1953, p. 36, in Emirbayer, 1997).

Being 'in community with each other' is what relational approaches refer to the entanglements of both human and non-human 'actor-networks' or 'assemblages', which consist of multiple, heterogeneous parts linked together (through both material and symbolic relations) to form a whole – a relational assemblage (Müller, 2015). In other words, relational approaches conceive of humans and things as being mutually constitutive; for instance, 'who we are', 'what things are', or 'what we know' are questions that are determined by the multiple, ever-changing, actor-networks within which things (including humans and non-humans) exist (Garud & Gehman, 2012). The nature of these relations is dynamic, unfolding through a perpetual state of 'becoming' (Emirbayer, 1997). Furthermore, relational approaches ask why orders (e.g., actors

networks, assemblages) emerge in particular ways, how they hold together, (sometimes somewhat precariously), how they reach across or mold space and how they fall apart (Müller & Schurr, 2016).

Relational approaches have different implications for our understanding of agency. The first is that relational approaches decenters the human and focuses instead on the relationships between entities, the processes of connection, on becoming over being (Tynan, 2021). The implication is, that in relational approaches agency emerges from, and is distributed across, these networks of relations (Müller & Schurr, 2016). It is through the mutual entanglement of social and material actors that meaning emerges and is translated into practice or action (Garud & Gehman, 2012). Human agency, particularly, is a quest to imbue these entanglements with meaning through narratives in action that are driven by the contrasts and contradictions that emerge within actor networks (Law, 2009). Yet, nothing circulates intact; there is always friction, resistance and transformation as actor networks are reconfigured (Garud & Gehman, 2012). Importantly, relational approaches are not concerned with mapping the emergent network. Their focus is on *how* the network forms, and thus, on the work that the entities within the network do to create and sustain those networks and relationships (Müller & Schurr, 2016).

Another implication is that relational thinking expands agency beyond humans. By conceiving humans and things as mutually constitutive, and action and agency as distributed within humans, things and networks of relations, relational approaches attribute all entities –humans, animals, things and matters– the same ontological status in terms of the capacity to act, affect and be affected by others (Müller & Schurr, 2016). The 'actant' concept refers to something that acts or to which activity is granted by others. An actant can literally be anything provided it is granted to be the source of action (Latour, 2005; p. 54).

Most studies examining agency in sustainability transitions –including food transitions– through relational approaches have used Social Practice Theory (SPT) (Cohen & Ilieva, 2015; Hargreaves et al., 2011; Shove & Walker, 2010; Spaargaren, 2011; Spaargaren & Oosterveer, 2010), either as a complementary or competing framework to MLP. Instead of looking into the contradictions between institutional rules (logics) or actors' capacities (e.g., institutional entrepreneurship), SPT examines the composition and performance of ordinary, everyday, social practices (Hargreaves et al., 2011). Socio-technical systems are composed of everyday practices that are (re)produced as they are performed in specific places. Transitioning these systems toward sustainability involves changing the practices that constitute and reproduce them (Cohen & Ilieva, 2015).

Practices are simply the things people do to achieve various goals in life. They consist of three elements: meanings (e.g., cultural understandings, ideologies, goals); material items (e.g., technologies, infrastructure); and competences (i.e., knowledge of how to do things) (Reckwitz, 2002). Changes in practice can occur due to changes in any of these three elements or a combination of them. In addition, because practices are bundled, they change as related practices change; and a change in a shared element can change multiple practices. For example, changes in people's food shopping habits are connected with practices such as mobility and food preparation; thus, are shaped by how practice performances follow one another in established 'circuits of reproduction' (Cohen & Ilieva, 2015). According to this literature, the value of a practice approach is to place actors firmly in their contexts, to make it visible that everyday behavior is important for transitions, and enabling the examination of the agency of ordinary people in their daily lives as opposed, for instance, to a focus on purposive, committed change agents (Huttunen et al., 2021).

Other studies have examined agency in transitions through Actor-Network Theory (ANT). For instance, Diaz et al. (2013) propose a targeted 'inter-ontological crossover' between ANT and MLP in order to examine the network around the niche, and the interactions between niche and regime actors. Pel (2016) also combines MLP concepts with ANT in order to examine the politics and power relations involved in transition processes. Yet, in their application of ANT these studies do not consider non-human agency.

Relational approaches are not without their critics. For instance, the symmetrical stance between humans and non-humans has been criticized for diluting the concept of agency so that it is applicable to a wide variety of 'things', leading to a devaluation of the analytic purpose of the concept; and eventually, failing to explicate the difference between power, action and agency (Kok et al., 2021; Müller & Schurr, 2016). Others argue that agency is essentially a human attribute, even though materiality and non-humans produce effects and have consequences (Kok et al., 2021; Müller & Schurr, 2016). Another criticism, specially towards ANT, is that it risks describing endless chains of associations without ever arriving at an explanation for the reasons and differences in network formation processes. Also, that it discards social context, for example, cultural or historical factors as *explanans*; unless, these can be traced in the formation of concrete networks (Müller & Schurr, 2016).

Finally, while relational approaches are currently quite fashionable, they nonetheless draw on a long history of social theory that has not always explicitly alluded relationality (Settersten et al., 2022). Also, it is worth noting that relational thinking is not only advanced by Western scholars but also has a longstanding history in indigenous scholarship and practice (Tynan, 2021).

So far, I have elaborated on how agency has been understood and examined in transition studies through different analytical approaches; namely: MLP, institutional theory and relational approaches. In Table 1-1 I provide an overview about some actions by which change agents can contribute to advance transitions. In the following section I elaborate on the current gaps about change agency in sustainability transitions studies.

Table 1-1: Ways in which change agents can contribute to advancing the transition towards sustainable food systems

Actions	Authors
Framing, discursive work, the construction of expectations and mobilizing visions	Bakker et al., 2012; Klerkx & Aarts, 2013; Westley et al., 2013; Antadze & McGowan, 2017; de Haan & Rotmans, 2018; Duygan et al., 2019; Charli-Joseph et al., 2022
The mobilization of resources –for example, economic, political, or knowledge	Farla et al., 2012; Fischer & Newig, 2016; Bush et al., 2017; Duygan et al., 2019
The creation of alliances and networking at different scales or levels; mediating between dispersed, diverse or as yet unconnected actors: 1. By connecting, coordinating, or helping to distribute relevant information amongst them 2. Mediating negotiations (e.g., developing common visions, resolving contested issues)	Musiolik et al., 2012; Westley et al., 2013; Fischer & Newig, 2016; Bush et al., 2017; Duygan et al., 2019; Kivimaa, Hyysalo, et al., 2019
The creation of legitimacy and of formal and informal institutional support	Kivimaa, Hyysalo, et al., 2019; Kivimaa, Boon, et al., 2019

1.2.4 Current knowledge gaps about agency in food system transitions and transformations studies

The previous section outlined recent scientific contributions about agency in sustainability transitions and transformation studies. While these studies have contributed to further our understanding about agency in food system transitions, there remain some gaps and shortcomings, of which the following can be identified.

i) The lack of more actor-based sensitive analysis to conceptualize the diversity of change agents, as well as their (inter)actions and (power) relations through transitions (Fischer & Newig, 2016; Huttunen et al., 2021; Kortetmäki & Huttunen, 2022; Rauschmayer et al., 2015).

ii) The study of single types of actors' organizations, at the expense of more systematic inclusion of diverse change agents.

iii) In relation to the first two, a lack of consideration of the role of non-human agents.

These critiques apply to all main transition (de Haan & Rotmans, 2018) and transformation frameworks (Ollivier et al., 2018); including in their application of food systems transitions and transformations (El Bilali, 2019 a,b; Ollivier et al., 2018; Stahlbrand, 2016). In what follows, I explain each of them in more detail.

First, the need has been recognized to overcome pre-established or deductive (theoretical or empirical) role categorizations assigned to relevant actors and thus enable unknown –for instance, to scholars, practitioners or policy makers– agencies to be observed in transition processes (Huttunen et al., 2021). There is also a need to examine, in more detail, the varying values, identities, motivations, purposes and actions of different agents (Hinrichs, 2014; Huttunen et al., 2021; Scoones et al., 2020). Hence, a detailed focus on diverse actors with different positions is needed to analyze how they strategically navigate different logics as individuals and collectives, but also in small and less purposeful actions in everyday life (Huttunen et al., 2021). In this respect, previous authors have made calls to continue exploring how institutional and relational approaches can contribute to facilitating a more nuanced and dynamic analysis of agency in sustainability transitions (Huttunen et al., 2021; Köhler et al., 2019).

Second, while it is recognized that no single change agent organization can bring food system transformation by their own, food system transitions and transformation studies often continue to study actors in isolation. For instance, focusing on single types of organizations (Koehrsen & Huber, 2021), or between one organization at the niche level in relation to another regime actors' organization (Smink et al., 2015). Hence, we need more studies that take a systemic perspective and examine how different change agents' organizations involved within the same niche or transformative pathway relate to each other through the process of transition. This approach needs to account for the fact that change agents' interactions can be complementary and synergic, but also antagonistic (or, what these authors call 'interferential' interaction). This is needed to counter understandings of niches as monolithic and coherent configurations, in which all the change agents involved agree, for instance, about the niche's meaning and whether and how it should be further institutionalized within the regime (Scoones et al., 2017; Stahlbrand, 2016). Thus, further studies are needed about the diversity of change agents involved in transitions and how agency emerges (or not) from diverse both agents and relations (Haxeltine, Avelino, et al., 2016; Haxeltine, Jørgensen, et al., 2016; Huttunen et al., 2021). This thesis contributes directly to filling this gap.

Third, research about agency, in both transformation and transition studies, remains mostly limited to human agency. As earlier authors have signalled, this is somehow surprising within transformation studies (which builds on socio-ecological systems thinking), given the role that these frameworks attribute to the natural environment (Ollivier et al., 2018). Whereas, in transition frameworks, technological innovations, infrastructures or artefacts have been found to be decisive in facilitating or locking-in transitions (Loorbach et al., 2017), and for creating contexts for (sustainable) innovation (Hoholm & Araujo, 2011). At the same time non-human biological actors, such as pests, diseases or viruses, can be considered a material foundation from the landscape level influencing change at regimes and niches, as I make visible in this thesis (especially Chapter 5).

Despite this, 'real agency' is often only attributed to humans in transitions (as well transformation frameworks) and there is thus a need to better account for ecological materiality and processes with their own agency (Huttunen et al., 2021; Ollivier et al., 2018). Agency in transitions is not just limited to humans, especially considering the inherent biological basis of the food and agricultural systems, its inextricable links to living land and bodies and the precepts of ecological forms of agriculture (Hinrichs, 2014). Yet, we know little about these or other non-human forms of agency in food system transformations, with artefacts and other living non-humans entities reduced to a secondary phenomenon in MLP (Kok et al., 2021; Svensson & Nikoleris, 2018). This is also true of other transition and transformation frameworks in general, which often do not (sufficiently) mention or consider these as categories with their own agency (Hinrichs, 2014; Ollivier et al., 2018).

This section has presented an overview of current understanding about stainability transitions towards transformed food systems and the role of agency therein. It has presented the key concepts surrounding sustainability and transformations using the Multi-Level Perspective as the main framework to analyze the dynamics of sustainability transitions, and how agency in transitions is understood and approached through different theoretical perspectives. It concludes by identifying the current knowledge gaps concerning agency in transitions. In view of these theoretical approaches and the current gaps in knowledge about agency in transitions, in the following section I elaborate on research aims and questions that drive this thesis.

1.3 Research aim and research questions

1.3.1 Research aim

Building on the conceptual framework developed above, this thesis aims to advance empirical and theoretical understandings of sustainable food system transitions in Chile and beyond. It does so through an examination of identified gaps in the literature about the role of change agency in sustainability transitions.

First, this thesis explores the theoretical institutional and relational approaches towards the role of agency in food system transitions in order to better understand how, and the extent to which, these approaches can contribute new knowledge about change agency in the transition towards more sustainable food systems.

Second, the thesis considers the roles of diverse change agents, both human and non-human, and seeks to further understand and explain how collective agency is constituted within transition processes –taking into account synergies and antagonisms. It also explores the implications for either advancing or hindering transitions towards more sustainable food systems. In doing so, this thesis also aims to provide further knowledge on agency in food-system transitions, and the implications of these insights for sustainable food system policies and for those practitioners engaged in promoting transition towards sustainable more food systems.

1.3.2 Research questions

Primary Research Question (PRQ):

> ***How does agency play out in sustainable food systems transitions-in-the-making in Chile?***

To structure an answer to this question, four sub-questions emerged:

SRQ1: *How does the institutionalization of different logics influence the capacity of agents to direct transformation pathways?* (Chapter 3)

SRQ2: *What are the transformative roles and relations of diverse change agents in transitions towards sustainable food systems?* (Chapter 4)

SRQ3: *How does the relational agency between human and non-human change agents emerge and play out in the transition towards sustainable food systems?* (Chapter 5)

SRQ4: *What are the implications of institutional logics and relational agency for sustainability transitions frameworks?*

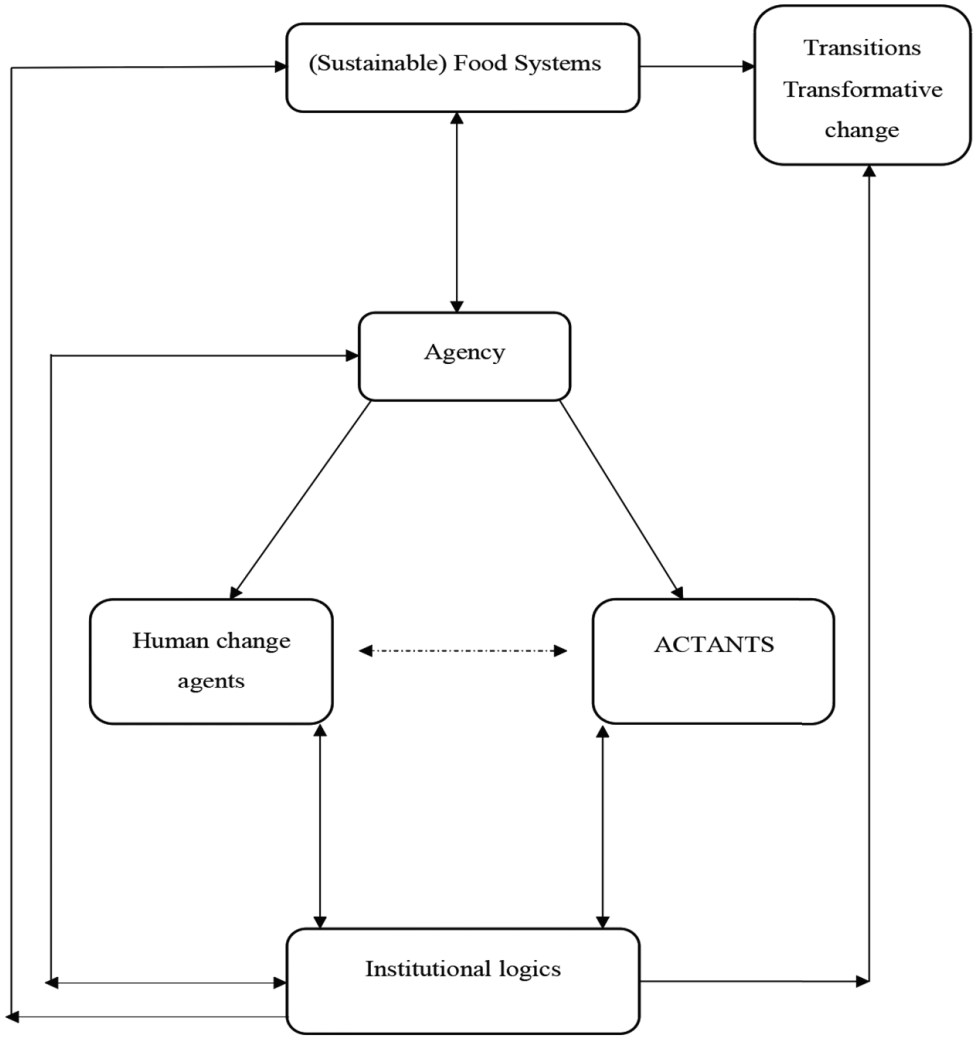

Figure 1-2: Conceptual Framework

1.4 Methods

This research is based on qualitative case studies (Yin, 2014), drawing on both historic and ongoing food system transitions within Chile. Below, I give an overview of the methods used, which are further elaborated in the relevant chapters.

1.4.1 Research design

Case studies are an appropriate method to deal with questions of 'how' and 'why' and enable an extensive and in-depth description of social phenomena (e.g., agency in food systems transitions). A case study approach is particularly useful for studying contemporary –as opposed to entirely or largely historical– phenomena (Yin, 2014).

This research is based on analysis of both historical and ongoing transitions. A retrospective analysis enabled me to reconstruct the history and development of Chile's mainstream horticultural food systems, as well as to identify relevant ongoing cases and transition pathways against that background (Chapter 2). Likewise, especially for Chapters 3 and 4, a retrospective analysis allowed me to identify relevant niches (or transformative pathways) in Chile, their history and the milestone events in their development. It also allows for an analysis of who were the most relevant change agents and why. However, retrospective analysis fails to provide a nuanced understanding of actors' actions and interactions (Genus & Coles, 2008; Jørgensen, 2012), and how they collectively deal with the choices, controversies, compromises and challenges they face (Klerkx et al., 2010).

To finely capture change agents' actions and interactions, I conducted a transitions-in-the-making analysis. A transition-in-the-making refers an on-going transition process and covers a limited period of time (Loconto et al., 2017). Though we cannot be certain that a transition-in-the-making will progress to an overall transition (e.g., the complete elimination of chemical pesticides in the Chilean vegetable food system), we can see the emergence of (new) practices, networks and frames that question and destabilize the existing regime, having the potential to start and lead to a broader transition (Elzen et al., 2011). Whether or not these efforts will lead to a transition (e.g. a regime change affecting a broader spatial scale) can only be determined retrospectively (Diaz et al., 2013), and such an exercise is beyond the scope of this thesis.

1.4.2 Case study area and specific case studies

Chile as the site of inquiry

There are three strong reasons why Chile is a good site for examining how agency is played out in sustainable food system transformations.

First, Chile is often referred to as an illustrative example of current unsustainable mainstream food systems (Sarabia & Peris, 2021), exemplifying a neoliberal or corporate food regime, which has become more deeply embedded globally since the 1970s (Friedmann, 2005; McMichael, 2009, 2016). This coincides with the period during which Chile's mainstream food systems were established and have been consolidated (Chapter 2).

The main goals of neoliberal or corporate food regimes are profit maximization and increasing market share, with little or no regard to other food systems' components or their environmental and social consequences (HLPE, 2020; McMichael, 2016). Food to them is a commodity, to be produced at a low price (Vivero-Pol, 2017). These systems employ industrial modes of production, transformation and distribution of large quantities of standardized foods under the Green Revolution paradigm (Friedmann, 2005). From a political economic perspective, a few transnational agrobusinesses and retail companies have concentrated a high degree of power –including over governments–, and have quasi-absolute control of the governance of food systems (Clapp, 2021; IPES-Food, 2017).

Second, Chile's food system policies (though in reality, mainly agricultural) have at times been referred as a model for other Latin American countries or other developing countries in other continents to follow (Agosin & Bravo-Ortega, 2009; Bell & Juma, 2007; Lebdioui, 2019). However, as shown in Section 1.1. (and to be further elaborated in subsequent chapters), there are a range of social, environmental and economic concerns related to Chile's food system that need to be further unraveled, understood and considered in order to have a more comprehensive (and critical) understanding about the term 'an example of food or agricultural policies to be followed' and what this actually implies.

Third, previous studies have identified the presence of multiple, diverse and promising alternative sustainable vegetable food systems in Chile, although these are highly marginalized and disempowered (Rossing et al., 2020). The actors behind these initiatives range from civil society, to the private, public and third (e.g., scientific) sectors (Cid-Aguayo, 2011; Cid, 2014; Cid & Latta, 2015; Gaitán-Cremaschi et al., 2020; Hruschka

et al., 2021; Letelier et al., 2021; Montalba et al., 2017). This makes Chile a promising case study to identify change agents' organizations.

Selected case studies: organic agriculture, agroecology and integrated pest management

There are several different food system transformation trajectories (Lajoie-O'Malley et al., 2020; Pigford et al., 2018). Often, these are competing and contested pathways; though, at times, they also overlap and complement each other. For example, some authors have looked at ecological intensification at the farm and landscape level, without addressing the political dimension (Tittonell et al., 2016; Tittonell, 2014). Although, somewhere else, the same author (Tittonell, 2014) does emphasize the importance of combining technological and institutional change. Elsewhere there is ambiguity and a lack of clarity about what different terms mean to different actors, especially in the case of agroecology (Levidow et al., 2014; Loconto & Fouilleux, 2019; Norder et al., 2016). Whereas, there has been a lively debate about organic agriculture and its conventionalization (Guthman, 2005; Nikol & Jansen, 2021; Poméon et al., 2018). Conventionalization theory argue that organic farming has become a slightly modified version of modern conventional agriculture, replicating the same history and relations and resulting in it having many of the same social, technical and economic characteristics of conventional agriculture (Darnhofer et al., 2010).

In this thesis I empirically examine three food system sustainable pathways, which were identified on the ground by research participants: organic agriculture (Chapter 3), agroecology (Chapter 4), and integrated pest management (Chapter 5). All three pathways, in different, at times overlapping ways, challenge –to a greater or lesser degree– mainstream food systems' institutions ('the regime'). Each chapter addresses a different sub-research question.

Chapter 3 raises the question '*How does the institutionalization of different logics influence the capacity of agents to direct transformation pathways?*'. It does so through the case of Chile's Organic Agriculture Law, which provides an example of a public policy process that formally institutionalized (at the national level) a potentially transformative food system pathway (Bendjebbar & Fouilleux, 2022; Lehtimäki & Virtanen, 2020). This is particularly relevant for the overall aims of the thesis because organic agriculture has been acknowledged as a promising transformative food system pathway (Eyhorn et al., 2019), but is not without critique.

One critique concerns the conventionalization of organic agriculture. Here, it is important to note that organic agriculture is not a monolithic category: it includes

a range of practices from multifunctional, small-scale, biodiverse farms to globally standardized and business-oriented industries targeting export markets, that are reliant on input substitution-based methods (Darnhofer et al., 2010; Migliorini & Wezel, 2017; Niederle et al., 2020; Poméon et al., 2018). The latter clearly represent a conventionalized form of organic agriculture; that, in the view of transitions and transformation studies, has little potential to drive food system transitions beyond incremental innovations.

Despite critiques and concerns over the conventionalization of organic agriculture, the organic movement initially developed by farmers and movements as an alternative form of food production with the ambition of changing mainstream food systems (Michelsen, 2001a; Niederle et al., 2020; Tovey, 1997). This remains a priority today for large parts of the movement. Furthermore, despite strong pressures towards the conventionalization of organic farming, this is something the organic movement may be able to resist and revert (Campbell & Liepins, 2001). Other authors have made calls about the need to shift the debate about conventionalization to one that does not appear to 'throw out the baby with the bathwater' (Nikol & Jansen, 2021).

Chapter 4 focuses on agroecology, and the different change agents' organizations involved. It raises the question of *'the transformative roles and relations of diverse change agents in transitions towards sustainable food systems'.* Agroecology was selected because of its increasing profile as a sustainable food system transformative pathway (HLPE, 2019; IPES-Food, 2016) which is advocated by many organizations in Chile (Cid-Aguayo, 2011; Cid & Latta, 2015; Gaitán-Cremaschi et al., 2020; Muñoz et al., 2021; Nicholls & Altieri, 2018). As such, the case enables the examination of multiple change agents' organizations, the transformative roles they play in this particular transition-in-the-making, how they relate to each other within this emergent movement.

As a transformative food pathway agroecology has a relatively long-stand history (HLPE, 2019; IPES-Food, 2016). In the eighties agroecology emerged as a distinct scientific conceptual framework with holistic methods for the study of agroecosystems. This defined agroecology as a way to protect natural resources, with guidelines for designing and managing sustainable agroecosystems (Gliessman, 2016). These farm guidelines are very similar to those described by ecological intensification (Tittonell et al., 2016; Tittonell, 2014), as well as those outlined in organic agriculture.

At the beginning of this century agroecology as a scientific discipline went through a major change, moving beyond field or agroecosystem scales towards a focus on the whole food system (Wezel et al., 2009). This entailed a new and larger definition of agroecology as "the integrative study of the ecology of the entire food systems, encompassing ecological, economic and social dimensions, or more simply the 'ecology of food systems'" (Francis

et al., 2003). More recently agroecology has moved beyond the scientific domain and has come to be seen as a collective movement and practice (Wezel et al., 2009). However it is difficult to precisely define agroecology as a movement, due to the broad diversity of its organizations, advocates, priorities and practices in different contexts (Wezel et al., 2009; Wezel, Goris, et al., 2018).

Chapter 5 answers the question *'How does the relational agency between human and non-human change agents emerge and play out in the transition towards a sustainable food system?'*. It follows the case of *Bagrada hilaris,* an agricultural pest which disrupted conventional farmers practices and led them from heavy pesticide use to integrated pest management (IPM), including biological pest control methods.

I do not consider IPM to be a radical innovation or a radical transition pathway, especially compared to organic agriculture and agroecology. The transition to more responsible pesticide use may well be a small intervention in the broad scheme of agricultural systems, and can easily be envisioned as simply involving spraying fewer pesticides (or less often). Nonetheless, it remains relevant because it forms part of the transition trajectories of conventional farmers towards more ecological practices, including (sometimes) towards organic agriculture (Lamine, 2011). Moreover, moving away from routinely applied, broad-spectrum chemicals to targeted chemicals applied strategically and in combination with other pest-management strategies requires a shift in basic, long-practiced cultural norms in farming. Earlier food system transition studies have regarded IPM as a niche (Loconto et al. 2017), that might lead to transitions towards more sustainable agricultural practices, and a more general 'ecologization' of agricultural practices (Lamine, 2011). Hence, the adoption of IPM should not be underplayed due to its supposed lack of radicalism as it can serve as a breeding ground for further transitions.

The last sub-research question (SRQ4) '*What are the implications of institutional logics and relational agency for sustainability transition frameworks?*' is partly answered in each of these chapters. The answer to this question is more fully developed further in the discussion of this thesis (Chapter 6), through an integrative analysis of the three cases described above.

1.4.3 Data gathering and analysis

Empirical qualitative data was gathered between August 2018 and March 2020 during field work in Chile using a combination of methods including secondary data reviews (news, reviews of the academic literature and policy documents), purposive semi-structured interviews, and observation. Data was mainly gathered in Chile's central-

south area; namely, from the Valparaíso and Metropolitan Regions to the BioBio Region; though some interviewees were also located in the Araucanía Region, the Región de Los Ríos and the Región de Los Lagos (see Figure 2-1, Chapter 2).

For chapters 3 and 4, I first conducted interviews with field actors identified through my secondary data review. These included domestic farmers from OAEs (*Organizaciones de Agricultores Ecológicos* – Ecological Farmers Organizations), domestic farmer-market developers, export farmers, extensionists, representatives from (organic) certifying companies, scientists and NGOs, and civil servants from different Ministry of Agriculture agencies. This provided me with an overview about the history of the development of both organic agriculture and agroecology in Chile, identifying the main actors, milestones and relevant ongoing processes. This allowed me to identify and map (some of) the relevant change agent organizations (from the public, private and civic sectors) within Chile's transitions-in-the-making. Through snowball sampling (Miles & Huberman, 1994), these initial interviews allowed me to identify other relevant actors within both organic agriculture and agroecology, many of whom overlap.

Second, I conducted interviews with members from organizations identified as influential change agents by other actors and my own analysis. The purpose of these interviews was to further examine the actions, framings, and practices that they engage(d) in order to develop these niches or transformative food system pathways, as well as their interactions with other change agents and actors.

These interviews were complemented with observations of interviewees in their working spaces (farms, farmer-markets, NGOs demonstration farms) and by attending five meetings of Chile's *Comisión Nacional de Agricultura Orgánica* (CNAO – National Commission of Organic Agriculture). Attending these meetings enhanced my understanding of the ongoing political issues around both organic agriculture and agroecology in Chile (Wooten & Hoffman, 2016).

In Chapter 5, about non-human agency, I adopted the 'follow the actant' approach of Actor-Network Theory (ANT). This involves following an actant and tracing the emergent networks of relations that surround it (Latour, 2005; p. 143). The identification of *Bagrada* as a potential relevant change agent emerged almost deductively out of field work observation, when I noticed that many human actors were organizing and connecting to each other due to the effects of the *Bagrada* (actions that have been attributed to driving sustainability transitions). I then started to follow the *Bagrada*, undertaking observation in different activities related to the *Bagrada* (further explained in Chapter 5) and by complementing these observations with purposive semi-structured interviews conducted with human actors engaged in the network around *Bagrada*.

Data, including all interviews, were transcribed, coded and analyzed using Atlas.ti software. In each chapter a combination of deductive and inductive coding was applied. Deductive codes were derived from the theoretical frameworks applied in each chapter. At the same time, I remained open to inductive codes that emerged through my reading of the interview transcripts. Further explanation is provided in each chapter.

Interviewees were guaranteed full anonymity to allow them to feel free to speak freely. The interviews will continue to be kept confidential, following WUR's data management policy.

1.5 Overview of the thesis

The remainder of this thesis consists of five further chapters. Chapter 2 provides a descriptive background of Chile's current (mainstream) food system; including the historical developments that have contributed to the institutionalization of this export-based food system. This chapter aims to provide a better understanding and contextualization for the analysis that follows in chapters 3-5. Understanding Chile's past and present, is key to understanding its future: specifically, how different change agents participating in different transition pathways might contribute to developing transitions towards a (more) sustainable food system in the Chilean context.

Chapter 3 examines Chile's legally-enshrined national organic agriculture certification system, to examine the political and policy-making dynamics surrounding the formal institutionalization of a food pathway with a potential for transition, and their influence on the practical realization of a sustainable food system. I examine the motivations of different actors within Chile's organic sector using institutional theory (namely the concepts of organizational fields and institutional logics), as well as the institutional logics underpinning the law. Further analysis of the relations between different logics, enable me to understand the effects of this law on hindering or supporting sustainable food system transformation. The chapter shows the importance of making visible the way(s) in which different drivers (i.e., laws) are constituted through, and by, diverse, and often competing, institutional logics.

Chapter 4 examines change agency: the transformative roles of multiple and diverse organizations of human change agents –including farmers, NGOs, scientists and from the public sector– and their relations within the Chilean agroecology transition-in-the-making. This chapter makes visible, and theorizes, how the adoption of fluid, relational, approaches –such as 'roles'– can add social complexity within collective change agency in transitions. This allows us to better address the multi-faceted and changing dynamics (both complementarities and antagonisms) that emerge through collective agency.

Chapter 5 examines the role of non-human change agents in relation to human agency by taking as a case the agricultural *Bagrada hilaris* pest. Here I show how this pest was an actor that supported a transition from conventional farming practices based on high use of pesticides towards integrated pest management (IPM). Using a combination of the Multi-Level Perspective (MLP) framework and Actor Network Theory (ANT) this chapter shows how the *Bagrada* has been a key actant in provoking changes towards sustainable pest management in Chile, destabilizing regime practices associated with pesticides, and creating and mediating relationships between different human actors. Theoretically, this chapter reinforces the argument that change agents can operate across

the boundaries of niche, regime and landscape categories, and that these categories are fluid. It also shows that change agents are linked in networks of relations that make change happen. In this chapter, I argue that relating to non-human actants and understanding how to mobilize them for normative goals can be a catalyst for sustainability transitions.

This thesis concludes with Chapter 6 in which the research questions are addressed and the most important research findings are discussed in terms of both theoretical and methodological implications for agency in transitions and policy practical implications in consideration of advancing towards sustainable food systems. It also contains recommendations for sustainable food system practitioners and for further research.

Figure 1-3: For emergency use soft shoulder. Corita Kent. 1966

Transcribed text: Get with the action. Wine that rejoices man´s heart. Powerful enough to make a difference. For emergency use soft shoulder.

Courtesy of Corita Art Center, Los Angeles, CA.

CHAPTER 2

2

Chile's mainstream food systems: a general background

2.1 Introduction

Food system transformations are inherently based in local contexts and experiences: geographical, historical and current contextual institutional or structural processes that have shaped mainstream systems in a determinate context (Fuenfschilling & Truffer, 2014; Köhler et al., 2019). Understanding local contexts and experiences, geographical, historical structural processes is thus important to understand the possibilities for food system sustainable transformation.

For instance, they are important in order to identify and comprehend the relevance of opportunities and obstacles for transformative change in a given context (Tittonell, 2014). Also, understanding the context is relevant in order to understand what practices, institutions –and their relations– need to be disrupted and which ones need to be (re) built. Furthermore, change agency to initiate and enact transformative processes –the focus of this thesis– emerges situationally, and is played in the daily lives of people (Jørgensen, 2012; Scoones et al., 2020). Therefore, change agents' practices should always be reflected, developed, and assessed in relation to specific historical processes, as well as current structures, cultures, and dynamics (van Poeck et al., 2017).Their various strategic competencies and capabilities also must be interpreted as situated within local contexts (Novalia et al., 2020).

In order to provide a better understanding of the chapters that follow, this chapter provides a background and description of the context in Chile and its mainstream food system, with an emphasis on horticultural (fruits and vegetables) food systems. It aims to give an understanding about the institutions underlying Chile's current mainstream horticultural food systems. It analyzes and summarizes some of its main unsustainable impacts and outcomes, as well as the geographical, historical and current aspects contributing to the institutionalization of Chile's mainstream food systems. Finally, the chapter aims to give an overview of some of the emerging sustainable food systems, change agents organizations and initiatives within the Chilean context.

To situate readers that are not familiar with Chile, the chapter starts with a general geographical context of Chile in Section 2. Then, Section 3 provides a historical glance into Chile's food systems, including the main XXth century historical events shaping the development of Chile's current mainstream food system. Section 4 provides a description of current mainstream horticultural food systems today. Section 5 identifies these food systems´ main unsustainable impacts. The chapter ends with an identification of (emergent) agency of different human actors that may offer the possibility of sustainable transition of food systems leading towards a possible food system sustainable transformation.

2.2 Physical geographical background

Chile is located in the Southern Cone of South America, and is the world's longest and possibly narrowest country. This implies that continental Chile is more than 4000 km long from north to south. This long territory is often subdivided into five agroclimatic regions: the *Norte Grande* (17ºS–27ºS), the *Norte Chico* (27ºS–33ºS), the *Zona Central* (33ºS–37ºS), *Zona Sur* (37ºS–42ºS) and the *Zona Austral* (>42ºS) (Boza, Muñoz et al., 2019). Chile's national territory is divided into 16 regions for the purpose of government administration, and these regions are in turn divided into provinces and communes (local authorities) (Figure 2-1).

From north to south the country is flanked by the Pacific Ocean and traversed by two *cordilleras –De la Costa* and *De los Andes*–. This implies an abrupted geography from west to east. Nonetheless, because Chile is so narrow, it takes only one hour and twenty minutes (126 km) to drive by car from Valparaíso (at 0 meters above sea level – masl) to 2,750 masl high at the Andes (Googlemaps). Isolated by the Cordillera de Los Andes in the east, the Pacific Ocean in the west, the Atacama Desert in the north, Chile is considered a geographical island (Alaniz, 2019).

Chile´s particular geography gives rise to an enormous variety of climates, soil conditions, and landscapes. Up to 25 different climatic zones can be distinguished (Boza, Muñoz, et al., 2019). Including Mediterranean, considered as critical for human evolution for millennia, partly, due its relevance for global food production (Rick et al., 2020). East-West oriented valleys between the two *Cordilleras* spread within a major depressed central area, hosting large lake basins –some currently drained– and highly productive agricultural lands (Rick et al., 2020) formed by persistent erosion of both *cordilleras*' and rich in minerals sediments. Chile's high diversity of landscapes has been considered by naturalists and scientists as an irreplaceable patrimony of nature (Alaniz, 2019). It also makes the country a privileged territory for diverse food production: from fisheries, seafood, algae, agriculture, to cattle, various mushrooms and fruits from temperate and cold native forests, amongst others (Figure 2-2).

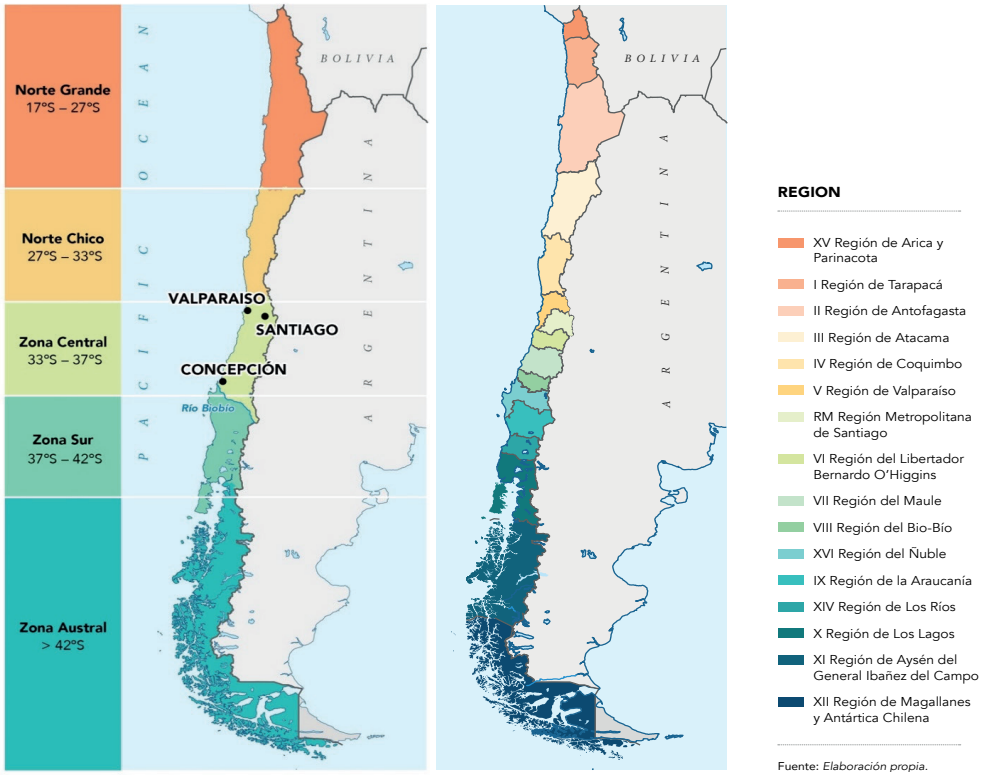

Figure 2-1: Map of Chile

On the left, divided in the country´s five main zones or territories.

On the right, divided in its sixteen administrative Regions

Figure 2-2: Chilean agricultural landscapes from Zona Central and Zona Sur

Above: An orange orchard in Quillota, Valparaíso Region, with the *Cerro La Campana* (*Cordillera de La Costa*) as a background. Credits: Paulina Kanamori.

Below: Lacuy Peninsula, Chiloé Island. Credits: Tobias Hiemstra.

2.3 A historical glance at Chile's current agri-food mainstream system

2.3.1 General historical background

Chile has always been characterized by its agricultural activity. Diverse forms of food systems were practiced in its territory according to the various cultures of its first inhabitants[3], dispersed from north to austral territories. These include hunter-gatherers with incipient forms of agriculture, as practiced by the *Mapuche* and other cultures (Apey Guzmán & López Tapia, 2011; Montalba et al., 2017), as well as complex intercropping, irrigation systems in terraces, and long distance trade relations with places in the territories of today's Bolivia and Peru. The latter were practiced by cultures from Chile's northern and central territory (e.g., *Aymaras, Diaguitas*) under the influence of the *Tiwanaku* and later on *Inca* empires (Apey Guzmán & López Tapia, 2011; Sandor et al., 2020). Domesticated crops from those times include quinoa, tomatoes, potatoes, corn, pumpkins, chili, and a variety of legumes (Apey Guzmán & López Tapia, 2011).

Throughout history, these indigenous food systems have suffered diverse changes. Due to both historical and contemporary drivers of change such as colonial processes, economic and agricultural state policies, land grabbing, displacement, forest degradation, and shifts in land use (Barreau et al., 2019; Monterrubio-Solis et al., 2023), changes such as a loss in food diversity and quality and biocultural homogenization have occurred. Despite these pressures, culturally appropriate and climate-adapted species have been used and maintained by indigenous peoples for centuries and generations (Barreau et al., 2019; Kennedy et al., 2021). Also, agricultural practices such as zero tillage, intercropping, local seed breeding and uses of other local resources (Apey Guzmán & López Tapia, 2011). These are often associated with indigenous agricultural practices and according to some authors, represent a breeding ground for the transition towards more sustainable food systems (Barreau et al., 2019; Montalba et al., 2017).

With its arrival (1540) and thereafter the colonization it produced (until 1810) of what is now known as Latin America, the Spanish Conquista brought on different changes to food systems as practiced by first inhabitants. This included the introduction of new cattle, crop and fruit species. Combined with pre-hispanic ones, these foods would provide the base –until today– of Chile's traditional food: Chile cocina mestiza (Montecino, 2004). This is illustrated in preparations characterized by a mixture of

3 To date, nine *pueblos originarios* or first nations have been acknowledged within the Chilean territory: Aymara, Quechua, Diaguita, Atacameños, Colla, Rapa Nui, Mapuche, Kawashkar, Yamana (Apey Guzmán and López Tapia 2011).

meat or fish, potatoes, whole grains, legumes and vegetables; such as cazuela, caldillo de congrio, charquicán, tomaticán, humitas, pebre, chimicurri, porotos con riendas, amongst others. This traditional diet has been considered healthy and nutritious by different authors (Barreau et al., 2019; Kanter & León, 2020; Kennedy et al., 2021; Montecino, 2004) (Figure 2-3).

Of course, during the period of the so-called *La Colonia* (the colonial period) food production was an essential practice associated with daily human survival; though, some foods were already produced for commercial trade purposes to export to other countries (Memoria Chilena, 2023a). For instance, during *La Colonia* Chile was a relevant wheat provider to the Spanish gold and silver mining exploitations in Perú (Bellisario, 2013).

La Colonia also set the social, administrative, organizational structures for the rural (and urban) space in Chile *Norte Chico* and, mainly, the Central Area up to the BioBio River[4] (Bellisario, 2013), when the Spanish set the control and had the monopoly of the territory´s best quality agricultural lands (Gongora, 1960). This is *el latifundio* –or *sistema de haciendas*– a system defined as a unit of economic, social, and source of (often coercive) power (Mellafe, 1981).

4 After a successful *conquista* of the Northern and Central territories and its inhabitants, including the foundation of Santiago (San Iago) in 1541, the Spanish *conquistadores* had to face the Mapuches´ resistance in the southern territories, marking the beginning of the *Guerra* (war) *de Arauco.* Culminating in 1641 in the *Parlamento* (parliament) *de Quilín*, a treaty between the Mapuches and Spanish *conquistadores* which, among others, recognized the freedom of the Mapuche people and set the BioBio river as the frontier between the Spanish and Mapuche territories.

Figure 2-3: Traditional cooks and food preparations.

Above, on the left: *El Rincón de la Mamita*, opened by La Mamita in 1968, who passed away in 2001. Today her grandsons manage the restaurant where Patricia Fernández and Mariela Bastidas (in the picture) continue cooking after 45 and 20 years, respectively. On their side, a *cazuela.* Independencia, Santiago Chile.

Below, on the left: *Humitas* from *Donde la Tita,* at *La Vega Central*: Santiago´s main food market. *Humitas* consist of a slightly seasoned paste of corn, wrapped in the leaves of corn cob and cooked in boiling water.

Below, on the right: *Chancho en piedra* from *Motemei Cocina Taller*: culinary space in charge of chef Patricio Cáceres aimed at cooking *"cocina a la antigua"* (traditional or old fashion kitchen). *Chancho en piedra* is a sauce originally from Talca (Maule Region), consisting of smashed tomatoes, onions and various spices. Although no longer includes *chancho* (pig) its name is due as traditionally, and many times today, is prepared in a stone mortar.

Credits: pictures by Carolina Vargas @carolinavargasc and texts adapted from Loreto Gática @gaticalomegusta for Finde de La Tercera magazine.

Broadly, the *sistema de haciendas* are rural properties of large extension belonging to a single owner or family, where food productivity depended on the 'work' of peasants; usually poor Spanish descendants, *mestizos*, or *mapuche* captives from war (Mellafe, 1981). These 'servedoms' (not slaves, though in reality not far from it) inhabited small properties (*minifundios*) at the outskirts of *latifundios*, and paid to the latter´s owner for the 'right' of living in and producing food in these small properties. Payment was based on agricultural produce and, usually but not always, with their service.

Since the mid-XVIII century, these peasants started to pay rent for land with their work on a more frequent bases. Gradually, peasant-tenants became working-residents, later on to be known as '*inquilinos*'[5] (Bellisario, 2013). In most, if not all cases, *inquilinos* lived under very poor, precarious conditions (Gongora, 1960). Thereafter, during the first decades of the XIX century, *inquilinos* experienced a transition within the country's food system economy, gradually beginning to play a double role. On the one hand serving in *latifundios*, and on the other hand producing, selling (for their own income) and supplying food for the population on the piece of land assigned to (never owned by) them (Bellisario, 2013).

Over centuries, the *hacienda system* continued to evolve in different ways. Nonetheless, some of its main structures or institutions –for example, extensive land owned by a family and worked by peasant *inquilinos* living in poor conditions– continued to endure until well into the XXth century (Mellafe, 1981) and, more specifically, until the *Reforma Agraria* or agrarian land reform which took place in 1962 (Gongora, 1960; Mellafe, 1981; Olea Peñaloza, 2017). This led to the division of large *haciendas* and the transfer of these lands to peasants, driven primarily by global geopolitics. This was combined with a rising political movement for social justice in Latin America, as I will further explain in the next section.

2.3.2 The XXth century origins of Chile's current mainstream food system

From the 1960s onwards, catalyzed in the middle of the 1970s, Chile's food systems started to experience a process of capitalistic modernization (Berdegué & Rojas, 2014). Transitioning from a system relatively insulated from world market forces and centered on the production of traditional field crops (in the Chilean context, often referred to grains and legumes), to being one of the systems that is most open to international trade and competition in the world today. Fresh and processed fruits and vegetables export are dominating the food sectors´ earnings and economy (Valdes & Foster, 2018). Figure 2-4

5 About the origins and evolution of *inquilinos* in Chile see '*Origenes de los inquilinos de Chile central*' (Gongora 1960).

provides a timeline about the main historical events that have influence the structure of Chile's current mainstream food systems.

Previous authors have identified three main related historical events and periods which have contributed to this transition. These are: 1) XXth century global green revolution politics (San Martín, 2017); 2) Chile's *Reforma Agraria* (1962–1973) (Bellisario, 2007, 2013); 3) policies following Chile´s coup d'état in 1973 and during the dictatorship period (1973– 1989) and the subsequent return to democracy (1990 – today) (Altieri & Rojas, 1999; Bauer & Catalán, 2017; Melo et al., 2021; Murray, 1997; Robles & Kay, 2018; Sarabia & Peris, 2021; Valdes & Foster, 2018). These are further elaborated below.

The politics of green revolution

The 'Green Revolution' is the term applied to technologies and innovations in crop production made in the 1960s, that significantly raised the yields of grain crops, mainly wheat and rice (Briggs, 2009). These technologies include breeding of high-yielding varieties, application of chemical fertilizers and pesticides, irrigation and mechanization, among others. In relation to each other, these technologies were seen as a 'package of practices' to be adopted as a whole and to supersede 'traditional' farming technologies, based on the premise of raising agricultural productivity and technical solutions to food shortages and famine (Briggs, 2009).

The Green revolution term can be seen as referring to the greenness of crops. Although, it has also been argued that Green Revolution was part of a broader Western political project against the socialist Red Revolution at the height of the Cold War (Briggs, 2009; San Martín, 2017). The political consequences of the Green Revolution were seen, particularly by the United States, to be very important as a solution to food shortages and famine in Asia –at first, later on also to be spread to Latin America–, and therefore a bulwark to the spread of socialism in these continents at the height of the Cold War. Traditional agriculture would be transformed and food shortages alleviated by the adoption of new and imported technology (Briggs, 2009) from the U.S..

Particularly, Chile had envisioned the United States as a model for its agricultural industries already since the early XXth century (San Martín, 2017). Nonetheless, it was during the 1960s and under the framework of the 'Alliance for Progress' –financed by USAID and Rockefeller and Ford Foundations (Bauer & Catalán, 2017)–, that the U.S. created a bilateral cooperation aid network with Chile. This was composed of Chilean and U.S. scientists and public agencies (mainly from UC Davis) for the *transfer* of Green Revolution knowledge and expertise from U.S. to Chile (San Martín, 2017).

The 'Alliance for Progress' was an initiative backed by U.S. President John Kennedy in 1961 for development aid from the U.S. to Latin American countries. This was part of the supposed wider mission of the U.S. to speed up Latin American modernization, though also –and probably mainly– to prevent communism in the continent. It was based on creating collaborations to expand agricultural sciences and implementing programs to increase fertilizer consumption, among others (Bauer & Catalán, 2017; San Martín, 2017).

After the Chilean military coup (1973), this network of cooperation was dismantled by the USAID, Rockefeller and Ford Foundations (Bauer & Catalán, 2017; San Martín, 2017). Yet, it would prove key in contributing with highly trained Chilean agricultural scientists, which would turn out to be essential agents in the country´s fruit export boom (from the end-1970s onwards) (Bauer & Catalán, 2017) and overall development of Chile's agricultural sciences and technologies under the paradigm of green revolution from the 1960s onwards (San Martín, 2017).

Reforma Agraria: the agrarian reform

In the early 1960s, the agrarian reform was set-up in Chile. At first it was part of a process of the productive transformation of the agricultural sector. Thereafter, it also became an issue of social justice, with peasants´ families whose lives had being characterized by poverty, precarity and lack of emancipation, being the subjects of *Reforma Agraria* (Olea Peñaloza, 2017).

The first land reform was introduced in 1962 by Jorge Alessandri's right wing conservative government (1958-1964). This was under explicit pressure from the Kennedy administration, as part of the U.S. mission 'Alliance for Progress' (San Martín, 2017). As indicated in the above section, because the U.S. 'Alliance for Progress' envisioned agrarian reforms as moderate alternatives for political strategy to prevent the spread of communism and more radical political change in Latin America, such as Fidel Castro's revolution in Cuba (Bauer & Catalán, 2017; San Martín, 2017). The aim was to tackle the social unrest caused by excessive land concentration by *hacendados* (hacienda owners). For Alessandri, the *Reforma Agraria* was probably an effort for the latter, while simultaneously provoking a move away from the unproductive *hacienda* system by encouraging capitalism through transforming the old agrarian structure into one of headlong capitalist development (Bellisario, 2007; San Martín, 2017).

From the 1930s onwards, Chile's agricultural system had evolved into a system that increasingly failed to supply enough food to the newly expanding urban population (Bellisario, 2007, 2013; Kay, 2002). For instance, between 1930 and 1964, agricultural

output grew at an annual average rate of 1.8 per cent, while the population increased by 2.2 per cent and agricultural demand rose by over 3 per cent yearly (Kay, 2002). Therefore, in the 1950s, 1960s and 1970s, the focus of public food policies was on and succeeded in preventing (especially child) undernutrition and micronutrient deficiency (Rodriguez-Osiac et al., 2021).

Previous authors identify the historical and remaining *sistema de haciendas* as the main factor contributing to this period of agricultural system failure and food shortage. Broadly, for two main reasons. One was *hacendados* reluctance to improve and invest in more productive farming practices and technologies. Commonly, to increase productivity, they relied on recruiting more *inquilinos* (Bellisario, 2007). The other reason, and related to the latter, was excessive concentration of the country´s best agricultural lands by *hacendados* (Bellisario, 2013).

By the end of the 1950s, Chile´s agricultural land distribution was characterized by a small number of large properties (*latifundios and fundos* (large agricultural properties, though not as *latifundios*)) concentrating 80% of the (agricultural) land. Whereas less than 10% of agricultural land –often of worse quality– corresponded to a landscape of very small, atomized, fragmented properties (*minifundios*) inhabited (never legally owned by them) by peasant *inquilinos*. There, peasants produced for their own needs, while also being relevant –and quite productive– for feeding the domestic population (Bellisario, 2007; Gongora, 1960; Robles & Kay, 2018). This unequal land distribution caused most of the country´s productive agricultural land to remain under-used or uncultivated by its owners (*hacendados*) (Bellisario, 2007, 2013; Olea Peñaloza, 2017).

Alessandri´s successor, Eduardo Frei Montalva (Christian Democrat, 1964-1970) continued the model of encouraging capitalism through the transformation of the old agrarian structure into one of headlong capitalist development based on green revolution practices and technologies. His vision was to create a two-tier agricultural system: an agrarian revitalized capitalist structure formed by large farmers (agribusiness) and small family peasant farmers (Bellisario, 2007).

His administration viewed state-led projects, insertion into global markets, and the increase of local production as central to economic and social development (Bauer & Catalán, 2017), through facilitating access to mechanization and fertilizers for both *hacendados* and peasants. For instance, his government drastically transformed fertilizer access by allowing the Chilean state-run bank (*Banco del Estado*) to start imports of fertilizers, and accentuated subsidies to reduce their prices and increase their consumption by farmers and peasants (San Martín, 2017). In 1967, Frei Montalva passed a strong Agrarian Reform Law, aimed at reallocating under-used productive

agricultural land from *latifundios* to peasants, to manage these lands under a system of agrarian cooperatives (Letelier et al., 2021) or individually (Bellisario, 2007). The intention of Frei Montalva's agrarian reform was to eliminate unproductive *latifundios*, to contribute to raise peasants´ income, as well as food production and supply for the country. Around 1.400 properties were expropriated, including a total of 3.565.961 hectares and 25% of the country´s irrigated land (Olea Peñaloza, 2017). Chile became a leading example of the 'Alliance for Progress' (San Martín, 2017).

Nevertheless, Chilean society and politics continued to become more and more polarized in the later 1960s. In a context of growing political ferment over the need for economic reforms and social justice (Bauer & Catalán, 2017), the Socialist Salvador Allende was elected President in 1970 and governed a leftwing coalition called Popular Unity (*Unidad Popular*, UP). Using the Law promulgated by his predecessor (Frei), Allende's government accelerated the agrarian reform, under the discourse *'expropiar todos los latifundios'* (Memoria Chilena, 2023b) 6.401.315 hectares were expropriated in this period (Olea Peñaloza, 2017)–, until Allende's government was overthrown by the military coup in 1973. The military coup of 1973 meant a turning-point in Chilean history that changed and pervades in every sphere of society until today, including food systems.

Military coup and the following dictatorship period (1973 – 1989)

Many authors agree that the roots of Chile's present mainstream food system can be found in a series of major reforms to national economic policy since the mid-1970s (Melo et al., 2021), more precisely after the military coup in 1973. This happened when the military *Junta* under the rule of Augusto Pinochet undertook a series of macro-economic policies, which set the basis for the country's current export based agri-food system (Altieri & Rojas, 1999; Bauer & Catalán, 2017; Kay, 2002; Melo et al., 2021; Murray, 1997; Robles & Kay, 2018; Sarabia & Peris, 2021; Valdes & Foster, 2018).

Before the coup, Chile was a relatively closed economy where agriculture (including forestry) contributed less than 5 per cent to the value of total exports (Kay, 2002). Since the 1930 onwards, the country followed an import-substitution-industrialization (ISI) process of an inward-looking development strategy geared towards the internal market (Kay, 2002), following the 1960s strongly state-centered dominant theories of development economics, as exemplified by the U.N. Economic Commission for Latin America and the Caribbean (ECLAC) headquartered in Santiago, Chile (Bauer & Catalán, 2017; Bellisario, 2007). For instance, in Chile, these policies included approximately half of total investments to be financed by the state (Bellisario, 2007), a significant part of the productive economy –including the farm sector– to be controlled

and managed by state agencies, with public sector food price intervention to be common (Valdes & Foster, 2018).

During the first phase of the dictatorship, apparently, Pinochet was convinced to continue to follow the inward ISI development strategy that had prevailed in the country (Bauer & Catalán, 2017). This was until a group of Chilean economists, mainly from the economics school of the University of Chicago but also from other U.S. Universities, presented to and managed to convinced Pinochet (who barely knew anything rather than military issues) about a macro-economic development proposal based on liberal market-centered economic theory (Bauer & Catalán, 2017; Robles & Kay, 2018; Torres et al., 2015). Colloquially known in Chile as *'el ladrillo'* (the brick) (Bauer & Catalán, 2017), this lead to a range of neoliberal reforms to be undertaken from 1976, and aimed to reverse the structuralist-informed inward-oriented development policy (Murray, 1997). It implied moving to a development paradigm based on open-trade and a liberalized economy (Bauer & Catalán, 2017; Melo et al., 2021; Murray, 1997; Robles & Kay, 2018; Sarabia & Peris, 2021; Valdes & Foster, 2018).

The new paradigm was developed through private (including foreign) investment in the sectors where the country had comparative advantages to be competitive in international markets. Under this paradigm, Chile presented relevant world comparative advantages for agricultural and other foods trading in global markets. The advantages included Chile's counter-seasonality in relation to the north hemisphere, diverse agri-climatic regions, lower labor costs as compared to more developed countries, and being a geographical island that provides natural protection against invasions from pests and diseases (Boza, Muñoz, et al., 2019; FIA, 2017; INE, 2007; Murray, 1997).

In terms of formal institutions, this was translated into a set of market deregulation policies; including: drastic reductions and, in some instances, elimination of protectionist or price intervention measures; privatization of formerly state-run enterprises; and significant cuts in government spending on the agricultural sector in general. By the period 1980–1983 government subsidies in agriculture were about one-third of the expenditures during 1965–1974 (Valdes & Foster, 2018). Alongside, a *contra-reforma agraria* and the security on land and water rights private property to incentivize private (foreigner) investment (Kay, 2002; Sarabia & Peris, 2021; Valdes & Foster, 2018).

Before 1540	Diverse food systems as practiced by *pueblos originarios*	
1540 – 1810	Colonial period	**1540:** Spanish arrival: Set-up of *Latifundio*
1810 – 1962	*Latifundio* continues until the *Reforma Agraria*	**1960:** Starts the transition towards a capitalistic food system under Green Revolution paradigm 1962: First *Reforma Agraria*, to be continued until 1973
1962 – 1973	*Reforma Agraria* (agrarian reform)	**1962:** Creation of INDAP
1973 – 1990	Military dictatorship	**1973:** Military Coup
		1983: Creation of CET-Colina: Chile's first organic agriculture agroecological demonstrative farm
		1988: Foundation of the coalition of parties for democracy: *La Concertación* National plebiscite of the *SI/NO*
1990 – 2009	Governmental period of *La Concertación*	**1990:** Return to Democracy
		1990: Creation of CONAMA
		1992: Creation of Tierra Viva: Chile's first domestic organic agriculture farmers organization.
		1994: Implementation CET-BioBio's demonstrative agroecological farm (existing today)
		1996: Implementation of MERCOSUR, Chile's first free trade agreement
		1998: Creation of ANAMURI (*Asociación Nacional de Mujeres Rurales e Indígenas*)
		1999: Creation of APLs (Clean Production Agreements; valid today)

1990 – 2009	Governmental period of *La Concertación*	**2005:** Creation of the National Commission of Organic Agriculture (CNAO) (valid today)
		2006: Creation of the Organic Agriculture Law (valid today)
		2007: Acknowledgement in the organic agriculture Law of 'Ecological Farmers Organizations'
		2008: *Tierra Viva* conformed as the first 'Ecological Farmers Organization'
		2009: Creation of *Eco-feria de La Reina* (today, *Eco-Feria del Encuentro*), Santiago
2010	Creation of the Environmental Ministry (former CONAMA)	
	Creation of SIRSD	
2014	Creation of *Eco-Viva*, first organic farmers-market in Valparaíso	
2015	1st International Agroecology Seminar organized by INDAP	
	INDAP creates the Family Farming Agroecology *Mesa* (two sessions in total)	
2016	Creation of the Law on Foods' Nutritional Composition and Advertisement	
2023	23 'Ecological Farmers Organizations' registered across Chile	
	Chile signs The Comprehensive and Progressive Agreement for TransPacific Partnership (CPTPP)	

Figure 2-4: Timeline of Chile's mainstream food system.

Immediately after the coup, the military *Junta* started a process of 'partial' counter-reform (1974 - 1980). 'Partial', because not all expropriated lands were returned to their former owners (Bellisario, 2007). The *Junta* returned some of the expropriated land to former landowners in the form of fully returned lands (26% approx. of the former expropriated lands) or in the form of reserves (7%), assigned individual productive parcels to some of the reformed peasants sectors (41%), auctioned off some of the land into the private market (16%) and, finally, assigned some of the land to public institutions (9%), wherein the *Fuerzas Armadas* (Armed Forces) were specially benefited (Bellisario, 2007; Fuentes Contreras, 2017; Robles & Kay, 2018).

The agrarian counter-reform is a controversial topic amongst different authors. For instance, some authors have noted that because a considerable percentage of expropriated land was maintained by or reassigned to peasants, paradoxically, the Military *Junta* achieved the goals of *Reforma Agraria* as conceived by Frei Montalva (Bellisario, 2007; Robles & Kay, 2018; Valdes & Foster, 2018). Yet, some of these authors contend that possibly this was for political reasons, with the Military *Junta* willing to gain support from peasants. These authors also note that small-scale farmers or peasants that in the former period had participated in land *tomas* (take holds of lands) or were labor unions leaders were excluded from land assignations by the counter-reform process (Robles & Kay, 2018). It is also worth noting that the military dictatorship was a period marked by repression, where labor unions, civic associations, peasants leaders in the UP period, and opposition parties were weakened or destroyed, their leaders killed, exiled or disappeared (Carruthers, 2010). Furthermore, were seems to be consensus about different authors with respect to the counter-reform is that its mission was to pave the way for a dynamic land market based on its complete liberalization and secure property rights (Fuentes Contreras, 2017).

Since the return to democracy

With the return to democracy in 1990, the private market driven, export-based agricultural model was continued and even accentuated by *La Concertación*, the center-left political coalition that fought to tear down Pinochet and governed thereafter, between 1990 and 2010 (Cid, 2014; Kay, 2002). *La Concertación* employed during this time a 'growth with equity' discourse (Kay, 2002). It is also the period when environmental policies start to emerge (Kay, 2002; Martínez et al., 2017).

The export-based agricultural model supported by *La Concertación* is galvanized in the motto '*Chile Potencia Alimentaria*' (Chile World Agrifood Leader), which was a governmental slogan promoted in 2006 to position Chile internationally as a global food producer (Cid, 2011, 2014; Sarabia & Peris, 2021), furthering its competitiveness

and integration into world markets (Robles & Kay, 2018). It was accompanied by a policy plan aimed at configuring a solid and profitable food export sector.

To strengthen the Chilean agri-food system's competitiveness in a world trade market, public investment was made in subsidies for farmers and peasants for forestry plantations, irrigation, and fertilization (Melo et al., 2021), as well as in public infrastructure such as highways, water-dams and irrigation infrastructure (though management was often given to private companies through concessions). The privatization and deregulation of highways, ports, airlines and telecommunications, according to some authors, raised these sectors' efficiency and effectiveness, soon to become particularly important for the fruit export sector (Valdes & Foster, 2018).

Also, there was high (nontraditional) technology (foreign) investment promotion through agencies such as CORFO (the Chilean Development Corporation since 1939, an autonomous independent development public agency) and *Fundación Chile*. From 2000 onwards CORFO increased governmental funding for Research and Development (R&D), launching Chile's high technology foreign investment promotion program (Nelson, 2007). This program included attracting foreign investment for research and development programs (R&D) and International Centers of Excellence –including, those dedicated to agricultural and the food export sectors' innovation– to locate to Chile (Klerkx & Guimón, 2017).

An additional approach to governmental expenditure for R&D, was to focus on creating institutions that used existing scientific and technical knowledge to create new enterprises. Chile has been doing this, especially since the return to democracy, through *Fundación Chile*. A private-public partnership established in1976, *Fundación Chile* aimed to combine scientific and technological R&D and apply it in the Chilean economy. This has contributed to scouting appropriate technologies worldwide for their introduction and adaptation to the Chilean context, including, new plant varieties and other use of food technology, quality control and certification of export fruit, and environmental technology to improve productivity and add value of technologies developed outside Chile. This partly contributed for agriculture, forestry and fishing being some of the most competitive sectors of the Chilean economy, and the development of many companies in the food sectors (Bell & Juma, 2007).

In order to reduce custom duties on Chile's exports, a series of free trade agreements were initiated and consolidated, while reducing to minimal levels protection to farmers within Chile (Robles & Kay, 2018). By the end of the nineties, Chile had become one of the most open economies in the world, and its agricultural sector was well adapted to

foreign market trends and opportunities (Sarabia & Peris, 2021), generating (including forestry) about 30 per cent of the value of total exports (Kay, 2002).

With respect to the peasant or agrarian debate in relation to this outward oriented export model, *La Concertación* coalition faced three possible positions (Berdegué & Rojas, 2014). One was that family farming had little viability in the long term, so public policies should be oriented to promote their transition towards other economic activities, and to mitigate and reduce the social costs of such transition. Another was to provide special protection to family farming, for instance, through price intervention and subsidies, under the assumption that would it be too difficult for them to survive in an open, liberal economy. A third position, somehow a mix amongst the other two, and the one that prevailed, was that many segments within family farming had good possibilities to be competitive within this new economic context, and that public policies should be oriented to propel those segments productive capacity and competitiveness in domestic and export markets (Berdegué & Rojas, 2014). For those that could have difficulties in surviving in the new context, it promoted the transition of non-viable farmers (Cid, 2014) to other economic sectors (e.g., as workers of the food industry), mitigating and reducing the social costs of the transition (Berdegué & Rojas, 2014).

Consequently, since the early nineties, through the Ministry of Agriculture agency responsible for peasants and small-scale farmers development INDAP (*Instituto de Desarrollo Agropecuario* – Institute for Agriculture and Livestock Development), policies have been oriented towards the transformation of peasant agriculture into productive competitive farms based on green revolution practices (e.g., monoculture, pesticides use) (Cid, 2014). Whereas, INDAP gauges farm viability in terms of producers' integration into agro-industrial commodity chains (Cid & Latta, 2015), which was known in Chile as the peasants' 'reconversion' debate (Kay, 2002).

The period of *La Concertación* (1990 – 2010) also marked the emergence of environmental policies. For instance, including the creation of CONAMA in 1990 (*Corporación Nacional del Medio Ambiente* – National Corporation of The Environment), which became the Environmental Ministry in 2010 (Martínez et al., 2017). Also, advancements in more stringent regulations regarding pesticides use and monitoring, the creation of a program (SIRDS – *Sistema de Recuperación de Suelos Degradados* – System for the recovery of eroded soils, 2010) for soils' recovery and sustainable management –including, subsidies to farmers and peasants for synthetic fertilizers–, and of *Acuerdos de Producción Limpia* (APLs)– Clean Production Agreements.

The creation of the soils' recovery and sustainable management program (SIRDS), resulted from tensions between the government and farmers growing traditional crops

(e.g., legumes, grains) when the MERCOSUR[6] agreement was signed. The agreement would imply strong competition from traditional crops imports from neighbor countries; in particular from Argentina, Paraguay and Brazil. Thus, the SIRDS program was created to provide them with an economic compensation (Valdes & Foster, 2018).

Clean Production Agreements are voluntary agreements, existing until today, arose between a business association representing a (food) productive sector and the corresponding public agency. The objective is to commit producers to a set of sustainable goals and actions within a set time frame (Melo et al., 2021). Since 1999, a total of 44 agreements have been signed by the agri-food sector, involving 4,793 member companies (Melo et al., 2021; ODEPA, 2019b). This also is the period of the creation of Chile's National Organic Agriculture Law (SAG, 2019) in 2006 and its implementation since then, which is further explained in Section 2.6 of this chapter.

Legislation on the marketing and use of plant protection products (PPPs) is laid down by Decree Law No. 3557 of 1980 (so, dictatorship period). In 1999 (Resolution No. 581), the Ministry of Health established the pesticide maximum residue levels (MRLs) in food, later on replaced and updated by Resolutions 33/10 and 762 of 2011 of the Ministry of Health. These levels are adopted from Codex Alimentarius, based on the USA and Europe (Coria & Elgueta, 2022). There are two agencies in charge of pesticides control and monitoring: The Ministry of Agriculture and The Ministry of Health.

The Agriculture and Livestock Service (SAG)—from the Ministry of Agriculture—is the competent authority for authorization, importation, manufacture, distribution, sale, and use of pesticides, herbicides and fungicides, and control of their marketing and use. SAG also controls management and disposal of these substances at the farm level. Also, the Ministry of Agriculture monitors pesticide residues in food through the Chilean Agency for Safety and Food Quality (*Agencia Chilena para la Calidad e Inocuidad Alimentaria* – ACHIPIA), in charge of the Information Network and Food Alerts program (*Red de Información y Alertas Alimentarias* – RIAL), which started in 2011. The Ministry of Health is the competent authority, through the National Institute of Public Health (*Instituto de Salud Pública* – ISP), for checking compliance with MRLs for fruits and vegetables sold on the domestic market, including retailers and local street markets (Coria & Elgueta, 2022).

6 MERCOSUR (*Mercado Común del Sur* – Common South Market) is a process of regional integration founded in 1991 by Argentina, Brazil, Paraguay and Uruguay. Mercosur is the first international free trade agreement joint by Chile, in 1996.

The Ministry of Health also enacted health and environmental conditions for workers, and regulated the aerial application of pesticides in urban areas and the monitoring of pesticide use by agricultural workers (Regulation D.S 594, 2001). Whereas, in 2004, regulated occupational exposure to pesticide and created a protocol for national notification of acute pesticide poisoning reports (Law 16.674) (Coria & Elgueta, 2022). Yet, as previous authors have noted, each ministry has its own surveillance system to monitor the agricultural use of pesticides and levels of residues in food; thus, there is no unified, coordinated national surveillance system (Coria & Elgueta, 2022; Zúñiga-Venegas et al., 2021). Whereas, there is a high contrast on the quality and effectiveness in the monitoring of pesticides between the agricultural export and domestic sectors, being much less effective in the latter (Coria & Elgueta, 2022).

Yet, it has been argued that sustainability policies from these years were driven by Chile's integration into the globalization process, very aligned to the opening of the country's economy and export based development model, rather than, by a genuine intention to foster more sustainable (food) systems (Martínez et al., 2017). Thus it was driven by the aim to position Chile as 'more green' or 'sustainable' to increase its competitiveness in global markets, and to comply with the quality, environmental, and labor standards imposed by foreigner countries markets (Martínez et al., 2017). These two reasons seem to have underlined the creation of Chile's Organic Agriculture Law, as deeper analyzed in Chapter 3 of this thesis. While, they might also explain why the control of pesticides in the export sector is effective, as compared to fruits and vegetables destined for the domestic sector.

2.4 Current structure of Chile's horticultural systems

Chile's open trade policy, implemented during the last few decades, has greatly transformed conditions for Chilean farmers and their production systems (Echeverría et al., 2012). It has given rise to the emergence of a new entrepreneurial class of medium-sized and large commercial horticultural farmers, that have very little in common with the former *latifundio*. Many of these farmers would start to form part of a rapidly developing agro-industrial and export-oriented sector, alongside the maintenance of the *parcelero* (owners of medium to small scale farms) peasant sector (Kay, 2002).

Today, the territorial distribution of Chile's horticultural production results from a combination of agroclimatic determinants (including the possibility for irrigation) (Boza, Cortés, et al., 2019), agricultural investment and production decisions driven by incentives determined in domestic and international markets (Jensen, 2021; Valdes & Foster, 2018), and different farmers' conditions to supply and compete either in the

domestic or export markets, or to transit from the former to the latter (Echeverría et al., 2012). These conditions include farm size, the capacity to implement economies of scale, education level, the possibility of access to various financial resources, managerial and technological skills (Echeverría et al., 2012). Nonetheless, according to these authors, particularly the territorial distribution of vegetable production does not depend on agroclimatic factors, but on the proximity to cities (Schwartz et al., 2013).

These determinants have led to today's Chile's horticultural food systems having a dual structure, of a minority of medium and large export companies and a majority of micro and small farmers oriented towards domestic food supply (Boza et al., 2015; Núñez & Torres, 2014). This duality is also linked to geographical location, with export-oriented farmers located mainly in central Chile, and domestic oriented farmers often in the south (Echeverría et al., 2012). Nonetheless, other authors emphasize that there is diversity within these two broad categories (Challies & Murray, 2011; Gaitán-Cremaschi et al., 2020), and their boundary is not clear-cut. The conceptual and policy dichotomy between 'peasant family agriculture' and 'business farmers' is less and less consistent with a reality dominated by various forms of organization of agriculture production, as well as of 'family farming', with no clear-cut distinctions amongst them (Berdegué & López, 2017). In what follows I describe these two main categories.

2.4.1 Fruit export sector

The clear export orientation of Chilean fruit growing is expressed in the fact that about 80% of the country's fruit production is exported, both as fresh and processed fruit. This export is to more than 100 countries, including the main world markets and covering a significant portion of fresh fruit imports made by the United States, the European Union and Japan (EU & CONICYT, 2007; ODEPA, 2019b).

This fruit export sector is diversified, with more than 75 species being cultivated (ODEPA, 2019b) and including about 6,000 farmers (Klerkx & Guimón, 2017) distributed mainly between the *Norte Chico* and Southern Area, though concentrated in Chile's central areas (Boza, Muñoz, et al., 2019) with 81,2% concentrated between the Valparaiso and Maule Regions (Boza et al., 2020).

The institutional and public policy environment has enabled farmers and/or entrepreneurs of different sizes to expand the sector's activity (Melo et al., 2021), most of whom correspond to medium and large export farmers or companies (Núñez & Torres, 2014). Nonetheless, there are cases of smallholder grower participation associated to wine or raspberry production whom, through cooperatives, have managed to strengthen their volume capacity, comply with required safety and quality standards, gain and retain

foreigner market access (Challies & Murray, 2011; Letelier et al., 2021). In general, whether large, medium, or small scale, many exporters (58% by 2012) belong to farmers' associations, where they likely benefit from provided technical and market information (Echeverría et al., 2012).

It is a sector characterized by a high degree of intensification and productive efficiency (Sarabia & Peris, 2021), intensive and sophisticated use of technologies –including irrigation systems–, industrial modes of production and economies of scale (Valdes & Foster, 2018) under the green revolution practice paradigm (San Martín, 2017), including intensive application of chemical pesticides (Coria & Elgueta, 2022; Muñoz-Quezada et al., 2016; Zúñiga-Venegas et al., 2021), and synthetic fertilizers (Melo et al., 2021; San Martín, 2017). There are also extensive monocultures (Sarabia & Peris, 2021), while all regions exhibit a high concentration of a few fruit species that are grown within their territories (Boza et al., 2020), thus showing little (bio)diversity. Furthermore, the sector needs to meet the demands of international markets; such as international standards of food safety, best practices, labor conditions, and environmental practices, as well as Chile's domestic governmental standards (Klerkx & Guimón, 2017).

Exporting producers have close relations with agribusiness firms that export fruit (Echeverría et al., 2012). Links between fruit exporting farmers and distribution companies are crucial in the international marketing of Chilean fruit exports. Distribution companies provide the facilities necessary for preparation, packing and cold storage, and obtain economies of scale in transportation and price bargaining (Murray, 1999). Food production and processing companies make an effort to export the highest value goods when they can, leaving less –and the lower qualities– for national consumption. The supply from small-scale farmers, especially through traditional markets, compensates for the lack of some exportable products (Boza, Muñoz, et al., 2019). Furthermore, these distribution companies are almost fully responsible for research and development in the sector, and also can act effectively as banks, providing farmers with credits. Securing the supply of fruits is made through contractual agreements which involve credit provision (Murray, 1999).

2.4.2 Vegetable domestic sector

Vegetable production is one of Chile's main agricultural activities and is the source of work for 34,000 farmers. Vegetables are produced all over Chile. 90% of production takes place between the Coquimbo and BioBio Regions, with 85% of it concentrated in the Metropolitan, O'Higgins and Maule Regions, and 30% only in the Metropolitan Region (ODEPA, 2019b) This concentration is due to the proximity of these Regions to

the capital city Santiago, which concentrates a third of the country's population (Boza, Cortés, et al., 2019).

Previous studies (Gaitán-Cremaschi et al., 2020) identified five co-existent vegetable food systems, thus confirming the heterogeneity within the broad category of the vegetable domestic sector, and that the dichotomy between 'peasant family agriculture' and 'business farmers' is not clear-cut, with fluid forms of organization of agriculture production, as well as of 'family farming' (Berdegué & López, 2017). These five co-existent domestic vegetable food systems are: two that can be characterized as mainstream ones: a 'small, conventional/traditional system', and a 'large, conventional food system'. These cover almost 100% of the total volume of plant products marketed nationally (Boza, Cortés, et al., 2019; Gaitán-Cremaschi et al., 2020).

The other three systems that, according to the authors, offer possibilities for food system sustainable transitions are an 'agroecological system', a 'small organic' one and a 'large organic system' (Gaitán-Cremaschi et al., 2020). The latter, considered by the authors as hybrid, applies organic farm practices through an input-substitution model that follows the same principles that are adhered to in conventional farming. For example, curative measures that rely on external inputs of organic fertilizers and pesticides without challenging production in monocultures. Here I explain the two mainstream ones.

The 'small, conventional/traditional system' is characterized by small-sized farms (less than 12 hectares) that rely on high use of family labor; thus, family farming, according to the conceptualization provided by Berdegué & López (2017). Yet, most of these farmers or peasants are smallholders with less than five hectares (Núñez & Torres, 2014; ODEPA, 2019b). This 'small, conventional/traditional system' makes up the majority of the country's vegetable food system production (Sarabia & Peris, 2021); being extremely relevant in the supply of fresh vegetable for the domestic population (Berdegué & Rojas, 2014; Rivas, 2013). Farms in this category commonly comply with very low to high tax formality arrangements, very low to medium level of organization of marketing activities and limited access to market information (Boza, Mora, et al., 2018).

The 'large, conventional food system' are large scale (over 12 has) farms. In many cases, these are part of consolidated companies with a clear economic focus, which is reflected in high levels of organization for marketing activities and access to market information (Gaitán-Cremaschi et al., 2020). This also applies to the domestic 'large organic system'.

Both systems, 'small, conventional/traditional system' and 'large, conventional food system', are characterized by a conventional approach to farming (Gaitán-Cremaschi et al., 2020). This typically involves use of synthetic fertilizers, synthetic pesticides, mono-cropping and intensive tillage. However, in some cases, especially in the southern regions of Chile such as BioBio, La Araucanía, and Los Ríos, conventional farming is combined with traditional and indigenous farm management practices (e.g. zero tillage, intercropping and use of local resources), which enable reductions in pesticide use and the replacement of mono-cropping by more diversified systems (Gaitán-Cremaschi et al., 2020). Synthetic inputs in the 'small, conventional/traditional system' varies from low to high, but depending on factors such as technical advice from public extensionists, training, labor availability, scale of operations, farm structure, climate and economic resources. In many cases, farmers do not apply a large amount of chemical pesticides due to a lack of economic resources to do so (Gaitán-Cremaschi et al., 2020). In both systems, 'small, conventional/traditional system' and 'large, conventional food system', pesticide intensity varies from low to high. Control on chemical substances (pesticides, herbicides, fungicides) by SAG is limited, due to the existence of many and geographically highly dispersed farms (Gaitán-Cremaschi et al., 2020). Whereas, INDAP plays an important role in subsidizing 'small, conventional/traditional system' with nitrogen or other synthetic fertilizers, as well as high-tech hybrid seeds (Martínez et al., 2017).

There are two main fruit and vegetable distribution systems at the domestic level: the traditional food distribution system and supermarkets (Rivas, 2012, 2013), which together commercialize almost 100% of total volume of vegetables in Chile (Gaitán-Cremaschi et al., 2020). Therein, wholesale markets have a share of 80% –most of which passes through the wholesale market Lo Valledor, located in the capital city Santiago– (Rivas, 2013; Gaitán-Cremaschi et al., 2020). Supermarkets commercialize the remaining 20% of volume (Faiguenbaum et al., 2002). In the eyes of many consumers, *ferias libres* (street markets associated to the traditional food distribution system) continue to hold an important advantage in terms of price, quality and a range of price-to-quality ratios (Faiguenbaum et al., 2002). Working-class consumers by far prefer the *ferias libres* for reasons of cost and quality of products. Medium and high-income consumers prefer them also because of quality of service, with a perception of supermarkets fruits and vegetables not being 'fresh', for being refrigerated and kept in storage for longer periods, as compared to those from *ferias libres* (Faiguenbaum et al., 2002).

The traditional food distribution channel

Most farmers from both the 'small, conventional/traditional system' and 'large, conventional food system' commercialize their produce through traditional food system distribution. This is an extensive value chain that involves many intermediaries, such as farmer centered intermediaries, wholesale market focused intermediaries, and *ferias libres*. There are more than 900 *ferias libres* in the country, that involve around 84,000 *feriantes* (mostly intermediaries/resellers, and to a much lesser extent farmers doing direct sales). Among these intermediaries/resellers there is wide diversity in terms of management, efficiency and quality of the service (Rivas, 2013). To a much lesser extent, farmers sell their produce directly to small shops, *ferias libres*, restaurants (Rivas, 2012).

Given their role in stocking vegetable products, intermediaries and wholesale markets are the main players in price setting (Boitano, 2011). In this distribution channel, as well as in the supermarket channel, power is highly asymmetrical. Intermediaries, especially those that buy vegetables at the farm and those active at wholesale markets, have a better bargaining position than farmers and small retailers, because they are better informed regarding prices and traded volumes, and have the logistics to store and transport the products (Schwartz et al., 2013). Power asymmetry, lack of transparency of market information and lack of knowledge about the way the different value chain actors operate, lead to relatively very low levels of trust along the chain (Gaitán-Cremaschi et al., 2020). Also, to a very low share by farmers of the final price of commercialized fruits and vegetables (Rivas, 2012).

In this traditional horticultural distribution channel, there are no traceability requirements regarding pesticide use and pesticide residues on food, being pesticides control through the value chain of food distribution almost non-existent (Rivas, 2013; Schwartz et al., 2013; Gaitán-Cremaschi et al., 2020). Both the Ministry of Health and the Ministry of Agriculture play a role in monitoring pesticides residues in food. Yet, samples are taken in the sale spots. Thus, they are able to account for whether fruits of vegetables comply or not with set-up standards of maximum residue levels (MRLs), but they are unable to trace back who is complying or not with an adequate use of these substances. The result is that vegetables with high and low, or even no synthetic pesticides use and residues get mixed at market outlets, with probable cross contamination amongst them. This hampers the necessary traceability to provide food safety to consumers (Schwartz et al., 2013). Only recently the *ferias libres association (ASOF),* have begun a process of improvement in commercial practices, including pesticides traceability (Rivas, 2013).

The retail distribution channel

The other main distribution channel is through the retail or supermarkets. This is a quite concentrated sector in terms of power. There are around 100 supermarket chains in Chile; though together, the four big chains control 52% of the sector, which are fully owned and controlled by Chilean capital (in all cases, holdings closely tied to a single family) (Faiguenbaum et al., 2002). Supermarkets purchase their fruit and vegetables from medium and large-scale farmers from the large, conventional food system group. Also, and increasingly, they procure from supply firms (medium-sized and large farmers often also own supply firms) (Rivas, 2013). These new suppliers are firms which can consistently deliver large quantities of standard-quality produce. To achieve this, they have had to implement rather basic technical innovations to meet the packaging and labelling standards of supermarkets (Faiguenbaum et al., 2002).

Sales to supermarkets are regulated by formal commercial agreements on price, volume, frequency of delivery and quality. The terms in these agreements include fixed monthly or annual prices, delay in payments (30–90 days waiting period before payment), fee charged by the supermarket to the producer for the benefit of having market access known as 'rapel', shelf placement charges, fees for special promotions and discount for produce that deteriorates before it is sold (Faiguenbaum et al., 2002). This set-up imposes a large entry barrier to many suppliers, mainly because of reasons of scale. Hence, only a few large farmers manage to sell directly to the supermarkets; with hundreds of small farmers who used to supply one or two supermarkets being displaced. Despite all these harsh conditions, these farmers prefer supermarkets as, after all the charges and discounts, the net price tends to be equal to or slightly better than that offered by wholesalers, while giving them some stability with respect to the demand for their supply (Faiguenbaum et al., 2002).

Product standards are specified but in the case of fruit and vegetables refer almost exclusively to appearance and packaging. According to a previous study, there are no standards whatsoever related to sanitary condition, chemical residues, or traceability being the latter arbitrary, dependent on each supermarket firm (Faiguenbaum et al., 2002). This might have change in recent years, as previous authors indicating that under the current situation, when MRLs (maximum residues levels) are violated, super-markets and food processing companies will not purchase those products. In contrast, MRLs of products sold in *ferias libres* in Chile are not verified, where fruits and vegetables exceeding MRLs can still be sold (Coria & Elgueta, 2022).

2.5 In summary: Chilean agricultural and food policy outcomes

2.5.1 Successful outcomes

Chilean agricultural and food policies from the last decades have been recognized internationally as a policy success story (Agosin & Bravo-Ortega, 2009; Bell & Juma, 2007; Lebdioui, 2019). Considered by many analysts as one of the most successful cases of non-traditional agro-export (NTAE) growth (Murray, 1999; Robles & Kay, 2018).

This success is attributed to various outcomes of Chile's current mainstream food system. These include increased levels in productivity and development both in terms of quantity and quality (INE, 2007). For instance, between 1976 to 2007 horticultural production volumes have enormously increased[7] for different fruits, crops and vegetables (either for export or domestic supply), while over the same period the overall food cultivated area decreased significantly. In other words, Chile now produces more food in less land as compared to the past. This has been attributed to the intensification in the use of technologies, including irrigation (INE, 2007).

Policies also laid the groundwork for the subsequent and rapid expansion of Chile's agricultural productive land –specially the export fruit sector, at times referred as the Chilean 'fruit boom'–. This today is an important contributor to the country's economy and employment. In 2019 Chile was the sixth largest exporter worldwide of fruits (Boza, Muñoz, et al., 2019), and has gained recognition as a world class fruit and vegetable supplier (EU & CONICYT, 2007), with forestry, livestock and agricultural products growing more than 8.6% annually in the period 1990–2018 (Boza, Muñoz, et al., 2019). Today, Chile's food sector is the second –after mining– most important one for the country's economy, with an estimated contribution to GDP of 4,7% (Bellisario, 2013; Melo et al., 2021; ODEPA 2019b; Sarabia & Peris, 2021). When the sector's forward and backward productive linkages are added, its contribution to national GDP doubles, contributing to 8.6% of GDP and 24.9% of the national total employment (Bellisario, 2013; Melo et al., 2021; Sarabia & Peris, 2021; Valdes & Foster 2018).

The food sector has also been associated with poverty alleviation in rural areas, significantly contributing to increases in rural households' incomes and bringing economic activity to otherwise economically depressed areas (Berdegué & Rojas, 2014; Martínez et al., 2017;

7 For instance, Chilean agricultural exports have increased from US$ 97 million in 1974 to more than US$ 12,500 million in 2008 (Echeverría et al. 2012), and grain crops productivity from 10% to 50% between the decade of 2005 to 2015 (Martínez et al. 2017)

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Melo et al., 2021; Valdes & Foster, 2018;). Between 2006 and 2013, rural households under extreme poverty and poverty due to low incomes decreased from 23,5% to 8,3%, and from 49,1% to 24,4%, respectively (Martínez et al., 2017). Twenty-three percent of rural households income is associated to agricultural production from family farming activity, 4% to middle-scale agriculture, and 73% from salaried employees in agriculture or other food system companies (Berdegué & López, 2017). Importantly, these authors refer to family farming activity not in terms of farm scale (e.g., small) or peasant identity but in terms of whether most working labor in the farm activity comes from family members, at times including middle scale farms with an entrepreneurial or business character (Berdegué & López, 2017).

In relation to food security, the country has the lowest indexes from Latin America, though this remains a challenge for the country (Jensen, 2021), as I further explain in sub-section 2.5.2. Nonetheless, the positive food system outcomes described here have usually been considered a story of success of sustained development of Chile's food sector, that contrasts with the relative unproductiveness and precarity of its agriculture over recent decades (Bellisario, 2013).

2.5.2 ¿Chilean agri-food system policies a story of success? Chile's mainstream food system's unsustainable outcomes

Chile's story of success in terms of the outcomes of its agriculture and food policies has been challenged also. To a great extent, this is due to Chile's mainstream food system's intensive use of natural resources (Melo et al., 2021) and its exiguous interest for sustainability (Muñoz-Saez & Renwick, 2022). The little concern there is for sustainability is driven mainly by international consumer demand (Muñoz-Saez and Renwick 2022), with several reports and scholars documenting the negative environmental and social impacts of current food systems (Table 2-1 and Table 2-2). Here, I elaborate further on these.

Environmental impacts

Environmental impacts include climate change, water pollution and depletion, various forms of soil degradation, and biodiversity loss (Table 2-1). Chile's mainstream food system is a main contributor to climate change, while also being highly vulnerable to it. For instance, high-income citizens' food consumption carbon and water footprints are above the world averages. Though the latter, also big in low-high income residents in the southern area due to high meat consumption (Gormaz et al., 2022). Whereas, the country suffers intensifying scarcity of water resources –even depletion, in some cases– (Fundacion Chile, 2018).

Table 2-1: Chile's mainstream food system unsustainable environmental outcomes

Impacts	Authors
Soil degradation Intense use of fertilizers and chemical inputs (pollution), as well as intense, unsustainable farming practices	Elgueta et al., 2017; San Martín, 2017; Melo et al., 2021
Water depletion. Besides increased scarcity of water resources due to the effects of climate change, overuse of water resources beyond its availability in watersheds.	Bauer, 1998; Bolados et al., 2018; Fundación Chile, 2018; Melo et al., 2021; Sarabia & Peris, 2021; Coria & Elgueta, 2022
Water pollution Due to agricultural inputs –synthetic or natural (manure) –	Elgueta et al., 2017; San Martin, 2017 Sarabia & Peris 2021; Melo et al., 2021; Coria & Elgueta 2022
Biodiversity loss Extensive monocultures with little respect for the conservation of native flora habitat (e.g., water courses)	Torres et al., 2015; Montalva 2017; Melo et al., 2021
Contribution to climate change Green houses gas emissions associated to different activities of food production	Ponce et al., 2014; Gormaz et al., 2022

There is also high use of chemical pesticides (Coria & Elgueta, 2022), with Chile having one of the steadiest increases in N fertilizer consumption per hectare (t/ha) in the Americas (San Martín, 2017). Whereas, in 2015 six more times of pesticides where used than in 1990, while the share of total land devoted to agriculture has remained quite stable during the same period (Coria & Elgueta, 2022). Large amounts of pesticides and fertilizers used in food production are associated with increased levels of water and soil pollution (Coria & Elgueta, 2022; Elgueta et al., 2017).

Large extensions of –mainly fruit or vineyards– monocultures with intense use of water, pesticides and fertilizers have also led to a reduction in native forests and biodiversity (Montalva, 2017). The agricultural sector requires approximately 70% of fresh water in Chile, being the main water consuming sector. According to the OECD (2008), by 2050 more than 40% of the world's population will be living in areas with severe water stress, therefore, the water crisis is a growing and structural problem also in Chile (Sarabia & Peris, 2021).

Social impacts

Social impacts relate to food insecurity, social inequality and injustice. While having the lowest food insecurity indexes as compared to other Latin American countries, food safety remains a challenge (Jensen, 2021). This is partly due to the intense use of pesticides, alongside inefficient and ineffective regulations for the surveillance on these substances use (Gaitán-Cremaschi et al., 2019; Melo et al., 2021; Zúñiga-Venegas et al., 2021) (Table 2-2).

Previous studies have shown evidence of high exposure of the population to pesticides through food intake (Corral et al., 2017; Muñoz-Quezada et al., 2012) and its relation with neurologic, cognitive, reproductive and carcinogenic effects on their health (González, 2019; Zúñiga-Venegas et al., 2021). The RIAL (*Red de Información de Alerta Alimentarias* – Information Network and Food Alerts, in charge of the Ministry of Agriculture) has account for recurrent presence of pesticide residues in fresh vegetables, suggesting that Chilean consumers are regularly exposed to the acute and chronic toxic effects of pesticides (RIAL, 2017, 2018). Annually 17.63% of the national farmers are poisoned by pesticides; could be much higher than official records because workers do not inform the authorities due to ignorance or fear of losing their jobs (Coria & Elgueta, 2022). Furthermore, the current surveillance system focuses on acute pesticide poisonings, while little is known about the chronic effects of exposure to pesticides through agricultural applications or consumption of contaminated food by the general population (Coria & Elgueta, 2022).

When it comes to the unequal distribution of resources, an emblematic case has been that of the Petorca Province, in the Valparaiso Region, Chile's central area. Where, the current water code from 1981 –which conceives water as an economic, private good to be distributed through the market– has meant high concentration of water resources by the avocado export sector. This leads to severe water scarcity both for human consumption and for local small-scale farmers, now unable to continue their traditional farming activity (Bolados et al., 2018; Fundacion Chile, 2018).

There is also food and nutrition insecurity due to the loss of traditional, relatively healthy (Kanter & León, 2020; Kennedy et al., 2021), diets. Via global commodity chains and supermarkets (Cid & Latta, 2015), Mexico and Chile are the Latin American countries where sales of ultra-processed foods have increased the most (Boza, Muñoz, et al., 2019). In Chile, only 15% of the population eats the recommended serving per day of fruits and vegetables (400 g or 5 pieces), and the country ranks first among the OECD nations in overweight and obesity prevalence (Cambeses et al., 2022). Unhealthy diets, overweight, and obesity are the leading risks factors of disability and

death today in Chile (Mialon et al., 2020). Paradoxically, in a country with priveleged geographical conditions for varied horticultural production, a relatevely healthy and nutritious traditional food culture (Kanter & León, 2020; Kennedy et al., 2021) and last decades significant increases in horticultural productivity. Yet, the consumption of fresh vegetables and fruits has clearly fallen (Boza, Muñoz, et al., 2019).

Table 2-2: Chile's mainstream food system unsustainable social outcomes

Impacts	Authors
Food insecurity	
Health problems through food intake associated with high levels of pesticide residues in vegetables and fruits	Muñoz-Quezada et al., 2012; Zolezzi, 2012; Muñoz-Quezada et al., 2016; Corral et al., 2017; Gonzáles, 2019; Daniel Gaitán-Cremaschi et al., 2020; Melo et al., 2021; Zúñiga-Venegas et al., 2021; Coria & Elgueta, 2022.
Health problems associated with overweight and overconsumption of ultra-processed foods environments, loss of traditional diets, and decline in fruits and vegetables consumption.	Azar et al., 2015; Boza, Muñoz, et al. 2019; Boza & Kanter, 2020; Cambeses et al., 2022; Mialon et al., 2020; Jensen, 2021; Kennedy et al., 2021; Sarabia & Peris, 2021; Franco et al., 2022.
Inequity and injustice	
Low-income citizens are the most affected by food insecurity	Kanter et al., 2019; Pinheiro et al., 2022
Large-scale acquisition and concentration of land and waters	Bauer, 2004; Torres et al., 2015; Bolados et al., 2018; Fundación Chile, 2018; Barreau et al., 2019; Melo et al., 2021; Sarabia & Peris, 2021; Torres et al., 2015.
Unbalanced power relations in food distribution and value chain	Faiguenbaum et al., 2002; Rivas 2012, 2013
Precarious labor conditions in the food sector	Murray, 2006; Cid & Latta, 2015; Robles & Kay, 2018; CADEM, 2020; Sarabia & Peris, 2021.
Health issues associated to the exposure of farm workers and rural inhabitants to pesticides.	Corral et al., 2017; Zúñiga-Venegas et al., 2021; Gormaz et al., 2022; Pinheiro et al., 2022

There are also social impacts related to unequal distribution of the mainstream food system both benefits and negative outcomes. For instance, research in rural areas in Chile has indicated that farmers exposed to pesticides have cognitive deficits (Corral et al., 2017) and that pesticides may affect the intellectual capacity of children from rural areas living near agricultural activity (Muñoz-Quezada et al., 2016). Furthermore,

when it comes to food and nutrition insecurity, Chile's domestic food diets do not meet nutritional recommendations in any socio-economic category. Nevertheless, the higher the socio-economic status, the higher the nutritional quality index (Cambeses et al., 2022). Whereas, at the lower the socio-economic level there is greater probability of being obese (Azar et al., 2015). Through an extensive system of *ferias libres* for domestic fruit and vegetable distribution, Chile offers good physical and economic access to these products; however, in general, citizens do not perceive fruits and vegetables as essential foods for human health (Rivas, 2013). Whereas, people living under economic restrictions, and exposed to an environment saturated with cheap, ultra-processed foods (Kanter et al., 2019), are more prone and tend to replace fruits and vegetables for the latter (Rivas, 2012).

Certainly, the series of policy towards a liberalized, global open economy were particularly advantageous for producers and rural residents in farming zones favorable to certain exportable products (such as fruits and wine grapes), while other sectors were not so favored. Specially, livestock and crops (grains, legumes) by competition from cheaper imports (Kay, 2002; Valdes & Foster, 2018). Exposed to international competition, many farmers or peasants abandoned these crops, either switching to more profitable domestic (Berdegué & López, 2018) or export-oriented production, or leaving farming altogether (Valdes & Foster, 2018).

Households' path out of poverty in rural areas has been associated with either of two factors. The first covers peasants that have been able to remain competitive and continue to produce food, often through specialized units (monocropping) of vegetables for the domestic market (Berdegué & López, 2017; Berdegué & Rojas, 2014). The other, relates to income increases from labor in the food or other sectors (Berdegué & Rojas, 2014; Berdegué & López, 2017), sometimes in combination with farming vegetables for domestic market. Some authors perceive peasants leaving farming and integrating into labor work as positive, because it allows them to significantly increase their income as compared to their past related farming activity (Valdes & Foster, 2018). Other authors are concerned with the proletarization of peasants, for instance in terms of what the conversion of peasants to workers may imply for the loss of an essential part of Chilean culture and identity (Berdegué & López, 2018), or precarious labor conditions (e.g., low wages, temporary work) that remain underpinning the Chilean food exports boom (CADEM, 2020; Murray, 1997, 2006; Robles & Kay, 2018).

Finally, power asymmetry associated to food distribution –both within the traditional food system distribution system and that of supermarkets– results in unfair conditions for farmers. The high power of wholesale markets– specially Lo Valledor – has been criticized for a lack of transparency in price formation, with scant farmers information

about final prices in commercial spots, resulting in farmers having a very low share of the final price, price bargaining or negotiation power (Rivas, 2012). Yet, if able to sell directly to final consumers (including restaurants, hotels, and so for), farmers' incomes would increase considerably (Rivas, 2012). An alternative that has developed to increase the bargaining power and market access of small farmers is through farmers associations, which have been pushed recurrently by INDAP. Though, in many cases farmers do not perceive them as a priority, and when they accept to join them, their objective is access to credits or subsidies, but not a real conviction or intention to work together (Boza, Cortés et al., 2018). In regard to the retail (supermarkets), negotiation is difficult for suppliers, including horticultural and any other type of suppliers. Supermarkets chains exert their excessive power over suppliers, for instance, imposing them subjective and discriminatory purchasing criteria, while making unilateral and ex post changes on contractual purchasing agreements (Rivas 2012, 2013).

2.6 Emergent change agents offering possibilities for transitioning towards more sustainable food systems

Concerns about Chile's mainstream food systems impacts have prompted action from different social actors enabling sustainable alternative food systems to the country's mainstream one. These include some efforts from the public sector, though mostly from multiple and diverse non-public sector agents, including farmers and peasants organizations, NGOs, entrepreneurs, scientists. In what follows, I describe some of these multiple actors' actions.

2.6.1 Recent actions from the public sector

According to different authors (Jensen, 2021; Kanter et al., 2019; Mialon et al., 2020; Sarabia & Peris 2021), the most recent remarkable and comprehensive public sector action for sustainable food system transitions is the 'Law on foods' nutritional composition and advertisement' (Law Nº20.606, 2016). This Law aims to target the population's current high food insecurity associated with overweight and overconsumption of ultra-processed, unhealthy foods. Among other actions, it includes a labelling system informing about foods that exceed acceptable levels of sodium, saturated fats, sugars and calories; restrictions in these products' advertisement and forbidding their sale in schools (Jensen, 2021).

Passing Law Nº20.606 was a contested process due to strong resistance of the food industry and some politicians, with the argument about its potential negative effects over the economy and employment (Mialon et al., 2020). This reflects the contentious relations between the food industry's –and overall food sector´s – economic interests and public health. The effectiveness of this Law remains to be seen. It is worth noting that, besides this Law no other comprehensive[8] actions have been taken by the public sector to address other dimensions (e.g., excessive pesticides use) of food and nutrition insecurity.

Other public sector attempts to build more sustainable food systems are the APLs (*Acuerdos de Producción Limpia* – Clean Production Agreements) since 1999 (explained above, in *Since the return to democracy*) and the Protocol for Sustainable Agriculture (2016) (ODEPA, 2016). The latter provides a series of principles and guidelines for sustainable agriculture, including labor conditions, energy and water resources management, among others. Yet, both of these policies have been questioned for being voluntary, something that seems ineffective to provide good incentives or (coercive) institutions for changing the practices of those involved in food production (Melo et al., 2021). Other authors also question the ambiguity of the 'sustainable agriculture' term applied by the public sector in their policy actions (Martínez et al., 2017).

Since 2006, Chile has a National System for the Certification of Organic Products (SAG, 2019), commonly referred to as the Organic Agriculture Law. This law came about after a cooperative policy making process amongst the public, organic private and civil society sectors, but mainly pushed and driven by the latter two. This Law has been considered as the country's most comprehensive policy in terms of food systems sustainability (Martínez et al., 2017). Partly, for its explicit goal towards promoting food systems managed under agroecological farm principles, and partly for addressing food systems' energy, biodiversity, and traditional knowledge dimensions (Martínez et al., 2017).

Broadly, this Law provides guidelines about compulsory and forbidden practices within organic, biological or ecological food farming, food manufacturing and distribution. To verify that these practices are being effectively implemented, it sets the rules for two types of certification systems, both inspected by SAG, the Ministry of Agriculture's agency responsible for phytosanitary monitoring and control, among other tasks for ensuring correct implementation of this Law. The control is outsourced to private certification

8 Public sector actions targeted to address excessive pesticides used in agriculture and food distribution are scattered initiatives, far from being comprehensive policy plans. For instance, in 2015 the Ministry of Agriculture Agency FIA funded a project for implementing a system of domestic horticultural products pesticides traceability in some mainstream food distribution channels (Rivas 2012)

companies, and there is also a peer review among organized farmers. These are referred to in the Law as '*Organizaciones de Agricultores Ecológicos*' (OAEs - Ecological Farmers Organizations), with the aim to provide access to organic certification to farmers that otherwise could not afford it. Nevertheless, since its implementation organic agriculture production and commercialization remains marginal in relation to conventional agriculture, representing less than 1% of the total cultivated area (FIA 2017). So far, there have been no studies addressing the Law's outcomes and its potential for food systems transformation, and this analysis is presented in Chapter 3 of this thesis.

2.6.2 Diverse, non-public sector, change agents for food systems transformations

Multiple, diverse non-public sector initiatives have emerged in Chile to counterbalance Chile's mainstream food system's negative and unsustainable outcomes.

According to previous authors, the first alternative to conventional high external input food systems in Chile with the aim of enhancing sustainability can be traced back to the eighties. Specifically, it can be linked to the actions of pioneering individual academics (Altieri, 2016) and a national NGO (CET – *Centro de Educación y Tecnología* – Center for Education and Technology) based in Colina, Metropolitan Region (Montalba et al., 2017). These were visionary academics critical of Chile's neoliberal and rural development model, who through courses and the writing of influential books inspired an emerging generation of technicians and professionals (Montalba et al., 2017). In Colina, CET implemented the first productive demonstration farm open to the public managed under organic or agroecological principles. Simultaneously, CET worked with urban and rural communities on issues such as self-sufficiency, recycling, and conservation of natural resources (Montalba et al., 2017).

Since the early nineties, new NGOs, peasants and farmers organizations emerged. From CET Colina, new CETs in different territories were born. Simultaneously, a cadre of diverse farmers (e.g., export, domestic; small-medium to large scale) committed to alternative approaches (e.g., organic, biodynamic agriculture, agroecology, permaculture) started to implement ecological farm practices (Cid-Aguayo, 2011; Montalba et al., 2017).

In Chile, export-oriented large-scale organic farmers or companies have been categorized by previous authors as practicing an organic-by-substitution as opposed to transformative approach (Altieri, 2016). Other scholars agree that some of these farmers' practices cannot be considered radically transformative and thus as change agents, since they were linked to global food distribution depending on economies of scale mode

of production (Cid-Aguayo, 2011). Yet, they have found that most of these organic pioneers, and thereafter many of the farmers they mobilized as well as some certification companies (also engaged in global food distribution), were driven by sustainability values and criticism towards the mainstream food system (Cid-Aguayo, 2011). For instance, some large organic (winery, fruits) companies have sought to transcend the input-substitution approach, characteristic of the export-oriented organic production in Chile, by making efforts to incorporate an agroecological approach into their farms´ design and management (Montalba et al., 2017).

There is thus not a clear-cut boundary between large-scale, (export) market-oriented organic conventionalized (e.g., input by substitution) farmers and non-conventionalized ones (e.g., based on ecological principles). Hence, to dismiss the whole organic export sector as conventionalized and as minimally organic producers is a gross oversimplification states Cid-Aguayo (2011). The same author argues that more thinking needs to be done on how authentic environmental concerns are combined with private organic enterprises farming practices, and how this export-oriented sector interacts with more sustainable transformative food systems from Chile –for example, agroecological and small-domestic organic ones–. This is important to enact policies that support each of these three systems focused on organic farming, as well as to identify the possibility of complementarities and synergies amongst them (Gaitán-Cremaschi et al., 2020).

At the local level, in 1992 Tierra Viva (which continues to exist) was founded. Being Chile's first organization of domestic market-oriented, small-medium scale organic farmers. Tierra Viva was, and still is, innovative in terms of sustainability transitions, for various reasons beyond the implementation of ecological farming practices. These innovative practices include a peer review system among organization members to verify the implementation of ecological practices. This system was implemented since the organization's early creation, with the objective of strengthening consumer trust, but also to stimulate learning in ecological farm practices amongst members. Also, they created the first organic shop (in Santiago, now disappeared) managed by a farmers organization. There, Tierra Viva and other organic farmers could sell their produced directly to consumers (without intermediaries) and set their own prices to provide counterweight to the unequal power relations in food distribution amongst different actors described above, that remain mainstream today. Tierra Viva also played a key role in making the country's National System for the Certification of Organic Products more inclusive (e.g., more affordable) to small scale, domestic market-oriented farmers.

In the first decade of the 2000s, some of the above farmers (both export-oriented and domestic market-oriented) as well as other private actors (e.g., certification companies, or individuals from the National Institute for Agricultural and Livestock Research (INIA);

CET members) were key in driving the creation of organic agriculture policy. They did this by lobbying the government, providing knowledge and negotiating with the Ministry of Agriculture through the policy making process. Together with committed public sector individuals (from the Ministry of Agriculture agencies ODEPA and SAG, mainly), this first resulted in the *Norma Chilena de Agricultura Orgánica*, 2000, and thereafter in The National System for the Certification of Organic Products (Law Nº20.089, 2006). As a an organization of farmers oriented to the domestic market, and inspired by the Eco Viva Brazilian network experience and Organic Law making process therein (Niederle et al., 2020), Tierra Viva was important for driving the formalization of this law (in 2007) of 'Ecological Farmers Organizations'. These are participatory, peer review certification systems' amongst domestic market-oriented farmers, as an alternative to third party certification by companies, and thus, affordable for small farmers.

Finally, in 1998, ANAMURI (the National Association of Rural and Indigenous Women by its Spanish acronym: *Asociación Nacional de Mujeres Rurales Indígenas*) was formed by a group of women peasants in Buin, a rural county within the Metropolitan Region. ANAMURI began its work with temporary women agricultural employees, as a response to the growth of a female agricultural proletariat, as well as a response to existing male-dominated peasant organizations (Cid-Aguayo, 2011; Cid-Aguayo & Hinrichs, 2015; Cid & Latta, 2015).

Mapping different present day change agents

Nowadays, there is a presence of promising alternative vegetable food systems initiatives in Chile in line with ecological farming (Rossing et al., 2020). At times, these are supported by alternative food networks such as short circuit farmer's markets and consumer cooperatives (Blanco et al., 2017; Cid & Latta, 2015; Letelier et al., 2021; Saravia Ramos, 2020). Whereas 'Ecological Farmers Organizations' have grown in member numbers from one in 2007 (Tierra Viva) to twenty-three in 2022, distributed across Chile. Chile is now the country, after Brazil, with the second highest number of these organizations in Latin America. With Brazil and Chile inspiring other countries from the continent to adopt this policy (Hruschka et al., 2021), and recently, also Europe, which have finally formally institutionalized this peer review, participatory certification system for domestic farmers (Eguillor, 2022).

Though the initial CET Colina disappeared, apparently due to a highway that cut the farm in two and the aging and retirement of the first pioneers, other CETs (BioBio, SUR, Chiloé) continue. They have remained relevant through all these years, and still are today, in spreading ecological farm practices to a variety of actors (e.g., farmers, public extensionists, students), and lift peasant culture and identity (Montalba et al.,

2017). Other organizations dedicated to the generation and distribution of knowledge (mainly, in ecological farming practices) have also emerged in different territories, hence the number of change agents has diversified. For example, amongst many others, these include the *Red de Soberanía Alimentaria de la VI^ta Región* (O'Higgins Region), *Centro Agroecológico Longaví* (CAEL, Maule Región), *Centro Los Maitenes* (Calbuco, Los Lagos Region). Often, these organizations work on varied knowledge-related activities with individuals or small-medium scales farmers, peasants and/or indigenous communities, in an effort to support them to improve their livelihoods, and contributing to make possible their existence and transition towards sustainable and just food systems.

While multiple and diverse, these organizations seem to share discourses based on nature protection, farming systems resilience, farmers autonomy from mainstream food systems, food sovereignty, reinvention and revalorization of peasant identities (including diets) and rural life (Cid-Aguayo, 2011; Cid-Aguayo & Hinrichs, 2015; Cid & Latta, 2015). Being highlighted by previous authors for pursuing others forms of economy, based on solidarity rather than mainstream food systems' capitalistic and neoliberal values, which have led to power asymmetry and unfair conditions for farmers in food distribution, or contentious economic interests from the food industry in relation to public health (Blanco et al., 2017; Cid & Latta, 2015; Letelier et al., 2021; Saravia Ramos, 2020). Incorporating evidence-based ecological principles (e.g., diversification) would help farmers to maintain biodiversity, boost ecosystem services, decrease reliance on external inputs, foster climate resilience and mitigate climate change, without reducing yields (Muñoz-Saez & Renwick, 2022).

These multiple and diverse change agents' organizations may be relevant in seeding more sustainable alternatives in relation to Chile's mainstream food systems. They thus seem key change agents on whose work –alongside policy institutions that support them– the possibility of sustainable food system transitions in Chile may rely. Nevertheless, despite their potential and actual efforts to create sustainable food systems, these organizations and the practices they promote typically have few links to or effect on the mainstream food system, and are marginalized from public policy institutions that support them (Gaitán-Cremaschi et al., 2020; Hruschka et al., 2021). Hence, while there is presence of numerous change agents and varied promising alternative vegetable food systems in Chile, these remain highly marginalized and disempowered by mainstream food system institutions (Rossing et al., 2020). Figures 2-5 and 2-6 illustrate some change agents examples within Chile's transitions-in-the-making towards more sustainable food systems.

Figure 2-5: Some change agents in Chile's sustainable food system-transitions-in-the-making.

On the left: Don Enrique Jorquera, member of 'Agricultores Orgánicos Valle de Limache' OAE, Valparaíso Region. Don Enrique has been key in preserving the Limache valley traditional tomatoes seeds; including *tomate Limachino* which, while not as aesthetical compared to other varieties (e.g., *Rosado*, which he also preserves), this little, very red, round variety is famous for its intense flavor. Don Enrique was skeptical about INDAP extensionists advising him to apply pesticides and so on. So, he opted to continue farming through ecological methods, as he learnt from his father and grandfather. In the picture, he shows me the calendar that guides his practices.

On the right: Jaime Aranguiz, a traditional seeds' keeper, folklorist, agroecological peasant, environmental activist and educator in Paine. A rural county in the Metropolitan Region severely affected by corn monocultures threatening the genetics of traditional corn seeds. For instance, due to its smooth consistency, conserving the traditional corn variety *maíz choclero* is crucial to make the softest, creamy *humitas*. Jaime's mother was acknowledged by INDAP in 2017 as one of three outstanding agroecology family farms from all Chile. She learned about ecological practices from her mother, a woman who Jaime says was very clever and wise.

Figure 2-6: Some change agents in Chile's sustainable food system-transitions-in-the-making.

Above on the left: Part of the *Cabildo Campesino* of Quillota, December 2019, Valparaiso Region (picture by the author).

Above on the right: in her *chupalla* (straw hat), Natalia Cuevas from Yumbel, Ñuble Region. Natalia has been supported by Cet BioBio in agroecological farm practices and the distribution of her products in the local *feria*. Today, she manages and outstandingly beautiful farm. In the picture she teaches visitors about her practices (Credits: Cet BioBio).

Below: farmers from different 'Ecological Farmers Organizations' and other practitioners from the Valparaiso Region, after one session of the course they self-organized for learning on how to produce culturally, contextually appropriated seeds under agroecological-organic practices (Credits: Felipe Martínez Alfaro).

CHAPTER 3

3

(Un) intended lock-in: Chile's organic agriculture law and the possibility of transformation towards more sustainable food systems

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ABSTRACT

Food systems transformations require coherent policies and improved understandings of the drivers and institutional dynamics that shape (un)sustainable food systems outcomes. In this paper, we introduce the Chilean National Organic Agriculture Law as a case of a policy process seeking to institutionalize a recognized pathway towards more sustainable food systems. Drawing from institutional theory we make visible multiple, and at times competing, logics (i.e., values, assumptions and practices) of different actors implicated in organic agriculture in Chile. More specifically, our findings identify five main institutional transformative logics underpinning the interests and actions of organic actors. However, we find that the Law was not motivated by these logics and did not advance them. Rather, the Law was designed to support a market niche targeted to elite consumers and to reinforce agricultural exports. As a result, the Law constrains rather than enables the practice of organic agriculture and access to organic food by consumers, especially at the domestic level. We note that attention to institutional logics in the analysis of food systems, and specifically food system transformation, is relevant to more comprehensive assessments of the transformational potential of food systems policies. We conclude that there is a need to further consider and make visible the way in which different drivers (i.e., laws) are constituted through and by diverse, and often competing, institutional logics.

3.1 Introduction

There is a global consensus around the need for sustainable food system transformations (HLPE 2020; Webb et al. 2020). Food system transformations imply a change of mental modes, social practices, and the development of new values, alongside a destabilization of the assumptions, models, methods, and practices of current mainstream food systems (Duncan et al., 2022). *Sustainable food system transformations* are marked by a normative component based on sustainability values (Béné, 2022). Such sustainable transformations demand coherent policies and legal frameworks. However, the literature on food systems suggests many policies and laws targeting sustainable food systems come to undermine their transformative potential (Baker et al., 2021; Béné et al., 2019; Slater et al., 2022), for example, through competing proposals for transformation pathways (Lajoie-O'Malley et al., 2020; Zurek et al., 2021).

Organic agriculture has been put forward as one pathway for balancing multiple sustainable development goals (Eyhorn et al., 2019; Reganold & Wachter, 2016) with proven environmental (Cespedes-Leon et al., 2017; Seufert & Ramankutty, 2017) and social benefits (MacRae et al., 2007; Prihtanti et al., 2014).

Because 'policy matters', we need 'to take seriously the sort of politics and policies required to enable organic agriculture to be what is imagined' (Guthman, 2005, p. 313; Tomlinson, 2008) and advance our understanding of whether existing public policies favour sustainable transformations, or whether they act as disincentives (Arcuri, 2015; Bendjebbar & Fouilleux, 2022). Towards this end, this paper responds to calls to unpack and further understand the underlying forces, trends and processes that drive food system change to formulate more effective sustainable food system policy (Duncan et al., 2022; Fanzo et al., 2020; HLPE, 2020). We do this by examining the diverse logics relating to the Organic Agriculture Law of Chile to understand what these logics are, how these logics relate to institutional logics underpinning the motivations of different organic agriculture field actors and how the difference between the two relate to the effects of the Law in terms of hindering or supporting sustainable food systems transformation.

Here it is important to note that organic agriculture is not a monolithic category: it includes a range of practices from multifunctional, small-scale, biodiverse farms to globally standardised and business-oriented industries targeting export with reliance on input substitution-based methods (Darnhofer et al., 2010; Migliorini & Wezel, 2017; Niederle et al., 2020; Poméon et al., 2018). In this paper, we define organic agriculture as a farming approach based on processes that preserve biodiversity and sustainably use natural resources, such as: appropriate soil tillage and conservation techniques; crop rotation with leguminous; intercropping and functional biodiversity, for example, for

pest management (Eyhorn et al., 2019; Migliorini & Wezel 2017). Furthermore, we understand organic agriculture to be based on food values of health, ecology, fairness and care (De Wit & Verhoog, 2007), for instance, striving for fairness in producer-consumer relationships (Darnhofer et al., 2019). Despite relevant critiques and concerns, organic agriculture has been developed as an alternative form of food production with ambitions to change mainstream food systems (Michelsen, 2001a; Niederle et al., 2020; Tovey, 1997).

Starting in the early nineties, organic agriculture began to receive policy support at the national and global level (Dabbert et al., 2014; Demiryürek et al., 2008; Michelsen, 2001b; Nikol & Jansen, 2021). This can be considered a significant contribution towards advancing a transition pathway given that policy has been identified as a critical driver for steering sustainable food systems (Candel & Pereira, 2017; HLPE, 2020; IPES-Food, 2015). For instance, Denmark and Brazil have been cited as positive examples of successful organic public policies (Lamine, Schmitt, Palm, Derbez, & Petersen, 2021; Lynggaard, 2001; UNCTAD, 2008), partly for contributing to expanding organic food consumption through market development instruments (UNCTAD, 2008). Nevertheless, organic policies can have adverse impacts that undermine organic agriculture´s transformative potential by restricting its transformative values and political aspects (Arcuri, 2015; Bendjebbar & Fouilleux, 2022; Guthman, 2005; Kaltoft, 2001; Tomlinson, 2008; Tovey, 1997).

Across diverse contexts, studies have shown how organic public policies have reflected a move away from movements´ politics towards a focus on commercial values (Fouilleux & Loconto, 2017; Haedicke, 2016; Lehtimäki & Virtanen, 2020; Nikol & Jansen, 2021). Previous studies from the Global South and North have shown that a main motivation for governments to support organic policies has been the development of export organic agriculture as means of economic growth (Campbell & Liepins, 2001; Darnhofer et al., 2019; Demiryürek et al., 2008; Gao et al., 2017; Nikol & Jansen, 2021). Consequently, many national and international organic policy debates have been reduced to the institutionalization and harmonization of national certification systems. One consequence of this has been a shift away from addressing issues such as securing the livelihoods of resource-poor farmers and domestic food security (Bendjebbar & Fouilleux, 2022; Fouilleux & Loconto, 2017; Haedicke, 2016). Further, farmers who do opt for organic production face the high costs and bureaucratic requirements associated with certification (Veldstra et al., 2014). This leads organic farmers to rely on premium prices (Klonsky & Greene, 2005). As a result, the dominant way that organic agriculture has been enacted in policy (Constance et al., 2008; Tomlinson, 2008) risks that organic agriculture becomes a niche-market with premium prices, available by

choice to predominantly middle-upper class consumers (Adasme-Berríos et al., 2015; FIA, 2017; Nikol & Jansen, 2021).

In this paper, we interrogate these politics and tensions through an analysis of the Chilean National System for the Certification of Organic Agricultural Products (from now on, The Law[9]). We have selected the case because, first, as noted above, organic agriculture has been acknowledged as a promising transformative pathway (Eyhorn et al., 2019), but it is not without critique. Second, the case provides an example of a public policy process to institutionalize organic agricultural at the national level as a potentially transformative food system pathway (Bendjebbar & Fouilleux, 2022; Lehtimäki & Virtanen, 2020). This has been little studied in the context of Latin America. Furthermore, while there is research about organic agriculture in Chile (Cespedes-Leon et al., 2017; Millaleo et al., 2006), this has not received much attention from the social sciences (B. Cid-Aguayo, 2011) and food system transformation perspectives. Third, Chile has been identified as a predominantly export-orientated organic agriculture country (Hruschka et al., 2021). Thus, the case provides insights about current trends in the rapidly internationalizing organic global policy debate (Schwindenhammer, 2017) and the impact of policy on the capacity of organic agriculture to advance food system transformation, particularly in the context of countries from the Global South.

To support our analysis, we use concepts of 'organizational fields' and 'institutional logics' from institutional theory. Institutional theory has been widely used to examine how processes of institutionalization unfold, analyzing the (de)institutionalization of mainstream economic and social dynamics and the power of transformative institutions; including within organic agriculture policy-making processes at the global level (Fouilleux & Loconto, 2017; Schwindenhammer, 2017) and national contexts (Bendjebbar & Fouilleux, 2022; Legun, 2011; Lehtimäki & Virtanen, 2020; Michelsen, 2001a). Some previous studies on organic agriculture have used 'organizational fields' to examine the actions and interactions of different actors in either the reproduction or transformation of institutional arrangements (Haedicke, 2016; Lynggaard, 2001; Michelsen, 2001b; Schwindenhammer, 2017).

The concept of 'institutional logics' allows us to examine different actors' positions within organizational fields (Osei-Amponsah et al., 2018; Reay & Hinings, 2009) in relation to multiple understandings of the purpose of organic agriculture (Haedicke,

9 We use the term 'The Law' as is the common name used by people in Chile to refer to the country´s 'National System for the Certification of Organic Agricultural Products'. This System is constituted by three interrelated components: i) The Law Nº 20.089, which describes the System´s scope of action, procedures and sanctions; ii) Supreme Decree Nº2 about technical norms regulating organic food production and manufacture; iii) Supreme Decree Nº3 about technical norms that regulate the System´s functioning.

2016). We opt for an institutional logics approach to more finely grasp actors´ values and actions, and their implications for sustainable food systems, though we acknowledge other approaches (e.g. political economy, discourse analysis) could have also been useful to examine the underlying politics in the formal institutionalization of a sustainable food system pathway (Béné, 2022; Clapp et al., 2018; IPES-Food, 2015; Maughan et al., 2020).

In the next section, we explain our theoretical framework. Thereafter, we explain our data gathering and analysis methods. We then present our findings, and we discuss these findings in relation to other studies. Finally, we provide our conclusions. Our analysis of the implementation of the organic Law in Chile highlights the need to further consider and make visible the way in which different drivers (i.e., laws) are constituted through and by diverse and often competing institutional logics. We argue that attention to institutional logics in the analysis of food systems and specifically food system transformation is key to more comprehensive assessments in the transformational potential of food.

3.2 Theoretical framework

In this paper we apply institutional theory concepts of 'organizational fields' and 'institutional logics' to analyze the implications of the Chilean Organic Agriculture Law for sustainable food systems. Here, we explain these concepts and how they were applied.

3.2.1 Organizational fields and institutional logics

Institutional theory is concerned with advancing knowledge about the stability (i.e. reproduction) and change (i.e., disruption) of institutions (Barley & Tolbert, 1997). By institutions, we understand all of the 'rules of the game' that structure (e.g., enable, constrain) human interaction and activity (North 1990, p. 3). Institutions can be formal or informal, overt or implicit (Darnhofer, 2015). Informal institutions are cultural and social norms (e.g., value systems). Formal institutions are explicit rules (e.g., constitutions, laws, property rights) designed and enforced, for instance, by governments (Conti et al., 2021). In this work, we focus on a formal institution.

We understand organizational fields as 'those organizations that in the aggregate, constitute a recognized area of institutional life: key suppliers, resource and product consumers, regulatory agencies, and other organizations that produce similar services or products' (DiMaggio & Powell, 1983). The classical organizational field approach assumes that field-level dynamics lead to similar structures as field actors pursue 'a common

meaning system' (DiMaggio & Powell, 1983). Recent studies have demonstrated that organizational fields do not only emerge around organizations with similar orientations but usually around agents with competing interests and values (Schwindenhammer, 2017).

'Institutional logics' (in short, logics) help us to capture the multiple visions, interests, normative understandings and practices within an organizational field (Haedicke, 2016). Here we follow earlier definitions of 'institutional logics' as the 'socially constructed, historical [observable] patterns of cultural symbols and material practices, assumptions, values and rules by which individuals produce and reproduce their material subsistence, organize time and space, and provide meaning to their daily activity and social reality' (Thornton et al., 2012). In other words, logics are 'frames of reference' that guide actors' practices; for instance, helping them to give their actions comprehensible and legitimate meanings, make sense of their world, construct their actions and identities, steer attention towards specific problems and solutions, define goals, set the rules of the game, allocate power and status. Logics are simultaneously embodied through both symbolic representations (e.g., language) and concretely experienced through material practices (Thornton et al., 2012). Institutional logics differ from other approaches (e.g., discourse analysis, policy framing) in that it also allows to examine actors´ practices in consideration of food systems transformations.

The 'institutional logics' approach promotes the idea of 'embedded agency': institutions and institutional logics both shape and are shaped by individuals and organizations (Osei-Amponsah et al., 2018; Thornton et al., 2012). Logics shape and influence (e.g., enable, constrain) the cognition (e.g., belief systems) and behavior (e.g., practices) of individuals and organizations (Thornton et al., 2012). However, they are not simply passively adopted: actors draw from, construct and enact logics according to their values, needs or goals (Haedicke, 2016). Actors also have the capacity to (re)shape and resist prevailing institutional logics, and introduce alternate logics through new practices (Hayes & Rajão, 2011). Hence, logics are not static or deterministic within organizational fields; they are instantiated, enacted, (re)shaped, and challenged by actors in organizational fields (Berg Johansen & Boch Waldorff, 2015; Thornton et al., 2012).

Organizational fields can thus also be understood as the practical space where different actors display and play-out their respective logics. In organizatoinal fields multiple logics often co-exist. The relations between different actors´ logics can be complementary, contradictory, competitive, conflicting and/or resistant. Contradictory or competing logics can make organizational fields arenas of political struggle (Hayes & Rajão, 2011). For example, institutional logics has been applied in previous food system studies as an heuristic to show actors´ negotiations about local food systems´ meaning and structure

(Mars & Schau, 2017), or how value-based conflicts about food safety consumption affects non-compliance practices of formal food safety rule (Mercado et al., 2018). Within sustainability transition studies, institutional logics has proven a valuable approach to study the confrontation between actors seeking and resisting change (Smink et al., 2015).

3.2.2 Application of the analytical concepts

We consider the Chilean mainstream food system as highly institutionalized –both formally and informally– and the Chilean Organic Agriculture Law as a process of formally institutionalizing a potentially transformative food system pathway in public policy. We see the organic sector as an organizational field as it is composed of varied organizational field actors (e.g., suppliers, consumers, regulatory agencies) with its own recognizable institutions –for instance, practices, rules (e.g., standards, the Law)– to which all field actors are subject whether they agree or not with them.

Previous organic agriculture studies have applied institutional logics as a fine-grained approach for mapping and examining the relations between different actors´ understandings and practices within the organic field (Haedicke, 2016). Other food studies have applied it as a framework to structure and compare different actors' food safety logics and their implications for food safety regulation (Mercado et al., 2018). We apply institutional logics as an heuristic to identify and characterize the values, assumptions, and practices informing an interest in organic production by Chilean field actors. We then look at the logics embedded in, and advanced by, the Law. We compare the logics of field actors and the Law to analyze what interests and values were advanced by institutionalization, and what logics within the organic field are not captured by the Law. We reflect on these dynamics to consider how this form of institutionalization shapes the possibility of food system transformation.

3.3 Methods

3.3.1 Data gathering

Because logics are historically contingent patterns that can change over time (Thornton et al., 2012), our analysis focuses on contemporary logics within the organic agriculture field as identified at the time of data gathering. Yet, our analysis deals with the period from the Law policy-making until ongoing events and dynamics as articulated by research participants. We consider that a retrospective analysis of the policy-making process is important for a thorough understanding about current logics, from where and why they have developed.

Qualitative data was gathered between August 2018 and March 2020 in Chile using a combination of methods including secondary data review (including, FIA, 2017; ODEPA, 2011, 2019a, 2021; SAG, 2019), purposive semi-structured interviews (54 in total), and observation. We first conducted interviews with field actors as identified in our secondary data review. Through snowball sampling (Miles & Huberman, 1994), these first interviews allowed us to identify other relevant field actors. Interviewees involved a diversity of field actors including domestic farmers from OAEs (*Organizaciones de Agricultores Ecológicos* – Ecological Farmers Organizations), domestic farmers-markets developers, export farmers, extensionists, representatives from certifying companies, scientists and NGOs, and public sector servants from different Ministry of Agriculture agencies (Table 3-1).

Interviews were intended to capture different field actors´ organic agriculture values, beliefs, motivations and practices (i.e., logics). Actors –from public, private, NGOs and SOCLA-Chile (*Sociedad Científica Latinoamericana de Agroecología*-Chile) scientists– that participated in lawmaking were asked to reconstruct the process and asked about what led to its creation. They were also asked about cooperation, contestation and negotiation and the issues on which these dynamics were centered. Further, they were asked to evaluate the Law: whether it has supported organic agriculture and made changes to the mainstream food system; whether it has negative aspects or effects; and, whether it could be improved. In general, interviewees were asked about the main problems they perceive within mainstream food systems and how these problems can be addressed through organic agriculture, and where appropriate, they were asked to describe their own organic practices. All interviews were transcribed (in Spanish), coded and analyzed using Atlas.ti. To allow interviewees to speak freely, they were guaranteed full anonymity, as also stipulated in the informed consent form interviewees signed. To avoid traceability, which is quite easy in the small network of organic agriculture actors in Chile, we also refrain therefore from referring to the organizations or sectors interviewees belong to.

To reveal actors´ practices, interviews were complemented with observation in interviewees working space (farms, farmers-markets, NGOs demonstrative farms) and in CNAO (5 meetings in total). The latter also allowed us to understand ongoing political issues around organic agriculture in Chile and the Law´s implementation (Wooten & Hoffman, 2016).

3.3.3 Data analysis

Like other institutional logics studies (Osei-Amponsah et al., 2018; Reay & Hinings, 2009), and in acknowledgement that different methods exist (Reay & Jones, 2016), here we have used an interpretivist analysis to identify institutional logics. This means that patterns associated with logics are informed by the literature on organic production but emerge from inductive data analysis and interpretation. Empirical data was analyzed through a combination of deductive and inductive coding. Data was first analyzed through deductive codes derived from the application of logics constructs, such as values, assumptions (or beliefs), and practices. At the same time, we remained open to other codes; for instance: goals, visions, motivations, barriers, complementarities or contestations. Subsequently, coded text excerpts were revised by the main author to identify and categorize patterns from which, out of interpretative inductive analysis, main field logics were derived; each of them with an implicit or explicit belief system (e.g., values, assumptions) and associated practices (see Table 3-2 and 3-3). By 'pattern' we mean a set of symbols and beliefs expressed in discourse (verbal, written), (in)formal norms observable in behavior and activity (i.e., practices) that are recognizable and associated with an institutional logic or logics (Reay & Jones, 2016). Further analysis of identified logics allowed us to examine their relations (e.g., synergies, competition, contradictions) and what these imply for the possibility of sustainable food systems.

Findings were presented by the main author in three group discussions for feedback and verification. One with thirty farmers from different OAEs, another with two officers from the Ministry of Agriculture, and one with five members of the SOCLA-Chile scientific group. In our Findings we illustrate each logic through the empirical gathered data, including quotes from interviewees (Reay & Jones, 2016).

Table 3-1: Different type of organic field actors interviewed

Organic agriculture field actors interviewed	
Private sector	18 domestic farmers in total; among which: 10 are members from OAEs; these are farmers organizations officially acknowledged by the Law for farmers to obtain organic certification through group inspection among member farmers. 10 participate in farmers-markets 3 none-farmers domestic organic farmers-markets developers Organic export sector: 4 farmers, 2 private extensionists, and 2 representatives from certifying companies
Public sector	12 representatives from different agencies from the Ministry of Agriculture: ODEPA – *Oficina de Estudios y Políticas Agrarias*; responsible for statistics, agricultural policy making, and official coordinator of the *Comisión Nacional de Agricultura Orgánica* (CNAO – National Commission of Organic Agriculture) SAG – *Servicio Agrícola y Ganadero*; responsible for the country´s phytosanitary control and for implementing the Organic Law INDAP – *Instituto de Desarrollo Agropecuario*; responsible for peasants and small-scale farmers development INIA – *Instituto de Investigación Agropecuaria;* private institute with public sector support for agricultural and livestock research PRODESAL (*Programa de Desarrollo Local* – agreement between and co-financed by INDAP and the respective municipality to provide public extension to smallholder farmers)
Third sector	5 interviewees representatives from national NGOs; including *Red por la Soberanía Alimentaria de la Sexta Región*, (CAEL), CET-BioBio 8 academics and members of SOCLA-Chile (Sociedad Científica Lationoaméricana de Agroecología-Chile)

3.4 Findings

In what follows, we first describe organic agriculture logics displayed by field actors. Then, we describe the relations between these logics. Second, we describe the logics incorporated in and supported by the Law. We thereafter analyze the effects of the Law and its logics in relation to field actors´ logics and to sustainable food systems.

3.4.1 Different field actors´ organic agriculture logics

We identify five organic agriculture logics as commonly displayed by different actors working for organic agriculture including national NGOs, both domestic and export farmers, certification companies, researchers, and public officers sympathetic with

organic agriculture. These logics are: a human health logic, environmental logic, two market logics (export and domestic), a control logic, and a rural development logic. Table 3-2 illustrates organic agriculture field actors´ logics.

Human health logic

The human health logic contains values of human health protection, and the provision of nutritious and secure food. For example, a health logic might be expressed by concern that food intake does not generate health risks or exposure to dangerous substances for those working on agriculture (Interview 3, 5, 6, 7, 8, 9, 15, 16, 30, 31, 33, 41, 43, 48, 51, 52, 53). The health logic in organics operates under the assumption that there are risks associated to high use of pesticides in Chile´s horticultural food systems, specially at the domestic level. While Chilean conventional exports comply with safety standards for pesticides residues– as required by importer countries or international standards (e.g., ISO 65)–, at the local level the application of these chemicals remain risky for people´s health (Corral et al., 2017; González, 2019; Muñoz-Quezada et al., 2012). As indicated by a farmer from an OAE, *"the spirit that this thing should have is that the production of food is to nourish the population, even if it is for export, not to make people sick*" (Interview 8).

Environmental logic

The environmental logic values nature protection and environmental stewardship. Those orienting to the environmental logic recognize the impacts that the mainstream agriculture practices have on the environment, such as the historical effects of monocultures on soil erosion, native deforestation and biodiversity loss (Interview 1, 26, 33, 42). Also, high pesticide use and related environmental pollution are recognized (Interview 2, 4, 5, 6, 8, 33, 40, 42, 45, 51, 52, 53). Under an environmental logic, organic practices oppose mainstream practices aimed at maximizing agricultural production through artificial inputs or the clearing of native flora for extensive monocropping. Instead, organic agriculture practices relate to principles of ecology (Interview 1, 2, 24, 26, 27, 30, 33, 36, 40, 45) or holism (Interview 34). Ecological practices entail working with and encouraging agri-ecological systems relations (Interview 26, 33) for food production to achieve adequate levels of production based on farm-derived and local resources; such as recycling on-farm nutrients, managing diseases and pests through the health of soils and enhanced biodiversity. Based on these ecological practices, organic agriculture is proposed to confront harmful industrialized food landscapes through food production that harmoniously coexists with natural ecosystems.

Market logic: export and domestic

There is a market logic wherein we distinguish both an export and a domestic market sub-logics. The former is held primarily by export field actors such as certifying companies, private extensionists and export farmers. According to interviewees and as observed by previous studies (Cid-Aguayo, 2011), many of these export field actors are driven by the environmental and human health logics, rather than for business (Interview 1, 34, 40, 41, 43), and have also been supporting the domestic market logic, either as organic domestic consumers (Interview 40, 41), as farmers that both export and supply the domestic market (Interview 31, 40, Observation in farmers-markets), or through support for the development of domestic farmers-markets (Interview 6, 31, 40).

The domestic market logic relates to values of justice in response to mainstream domestic market actors´ relations and dynamics. These relations are shaped by a highly concentrated supermarket and wholesale sector, which disempowers farmers who cannot negotiate fair prices and conditions (Interview 6, 7, 30, 32, 31, 40, 41, 48, 53). The following quote illustrates the farmer-supermarket dynamics:

"[Supermarkets] *asphyxiate farmers until they don´t have more air, because they ask them incredible conditions, reducing their prices until farmers say "no, you know, I can´t breathe anymore", and when farmers are above to decide to die, supermarkets tell them "oh, I led you breath now*" [interviewee inhales profoundly], *and then they squeeze them again, until the poor farmers* …" (Interview 41).

Farmers and NGOs enacting the domestic market logic criticize the Ministry of Agriculture´s policies aimed at connecting medium and small-scale farmers to large retailers and export market. These policies are motivated by the assumption that these markets may provide higher revenues to farmers, contributing to higher incomes and rural development, as confirmed by public servants (Interview 21, 22). Organic domestic farmers maintain that their interest has almost never been to supply supermarkets or to export, mainly because they do not align with the skills of producers and volume capability (e.g., number of hectares) (Interview 5, 6, 8, 30, 31, 53). These farmers advocate for place-based markets that allow them to set fair prices, reduce costs in food transport, sell directly to consumers and build relations of trust with them (Interview 5, 6, 8, 10, 31, 32, 51, 53). They advocate for minimal intermediaries only when necessary, so to avoid farmers receiving a too small share of the final price. In practice, some farmers´ organizations have created their own farmers-markets where they set their own rules, prices, and sell directly to consumers. Some NGOs have supported local actors (e.g., municipalities, farmers) in developing or accessing local, place-based markets (Interview 1).

Control logic

Within the market logic we distinguish a control logic that was already practiced by different field actor groups when the Law was discussed. This logic differs in practice in the domestic and export markets. Out of self-motivation, members of some domestic farmers organizations inspected each other's organic practices. These kinds of processes are often part of what is referred to as participatory guarantee systems (PGS). The peer inspections were implemented to avoid potential cheating on organic practices, encourage consumers´ trust, and to share knowledge among members (Interview 5, 6, 8, 9, 10, 31). In the export context, when the Law was discussed, foreigner certification companies already came to Chile to audit and certify farmers.

The underlying values that underpin the control logic are trust, transparency, and credibility. The control logic operates under the assumption that farmers may sell conventional products as organic, either because they lack knowledge about organic practices (Interview 2, 5, 6, 9, 50) or to get higher prices (Interview 5, 6, 15, 40, 53) and this would undermine those values.

Rural development logic

A rural-development logic is shared by diverse actors from the field including domestic farmers, some export farmers and public officers. It has been developed in practice mainly by NGOs like CAEL (*Centro Agroecológico Longaví*) and CET-BioBio (*Centro de Educación y Tecnología*-BioBio). In this logic, organic agriculture (at times agroecology) is a means to achieve broader goals related to rural poverty alleviation and the improvement of small-scale farmers' livelihoods. The assumption is that farmers may improve their earnings and quality of life by implementing ecological farm practices; not because they may sell organic products at higher prices, but by disrupting their dependence on farm external inputs (Interview 1, 18, 26, 31, 30, 33, 36, 40, 42, 45, 51), providing them with secure working conditions, protecting and enhancing their living-place, and, if applied at the landscape-scale, improving their overall surrounding physical environment (Interview 1, 18, 26, 33). This logic contests the Ministry of Agriculture´s policies, which some interviewees identify as responsible for disrupting (indigenous) farmers ecological practices from the past, making them dependent on inputs like pesticides, fertilizers, and seeds and the corporations that develop and sell them (Interview 1, 5, 10, 26, 30, 31, 51, 53).

Food systems transformative relations amongst field actors´ organic agriculture logics

From the above, we see that all logics –perhaps, with exception of the export market and control logics– share a transformative agenda for organic agriculture. Organic agriculture emerges as both a criticism and solution to the problems of mainstream food systems. To varying degrees, all actors display the environmental, human health and rural development logics; reflecting what could be considered organic agriculture's core values.

Each of these logics aim to disrupt one or several mainstream food system institutions. Yet, these logics are not exclusive from but coalesce into each other with respect of mainstream institutions to be transformed, and sustainable food system transformation overall. For instance, implementing ecological practices may allow farmers to reduce their production costs, work under safe conditions, enhance their living place, and supply citizens with secure food. Thus, the environmental logic is expected to support both the rural development and human health logics.

The human health and domestic market logics are expected to reinforce each other in the need to improve current pesticide standards and the delivery of secure food to citizens. The domestic market and rural development logics may target big corporations´ (e.g., agri-chemical companies, wholesale markets) power concentration in the mainstream food system. The domestic market sub-logic thus also is expected to support the environmental and human health logics. More direct farmer-consumer relations may improve effectiveness in pesticides traceability. The control logic may not be considered as transformative on its own, it may support other transformative logics by, for instance, contributing to assure that organic practices have effectively been implemented, encouraging farmers learning in organic practices (environmental and rural development logics), or strengthening trust in organic markets (market logic). While each of these logics respectively challenge mainstream food system institutions, together they create synergies for the construction of sustainable food systems.

Table 3-2: Institutional logics enacted by different organic agriculture field actors.

Different field actors organic agriculture logics	
Human health logic	
Values	Protection of consumers and agricultural workers; provision of secure food
Assumptions	Health risks associated to high use of pesticides in Chile´s food systems
Practices	Ecological practices provide healthy food free of pesticides
Environmental logic	
Values	Nature protection, environmental stewardship
Assumptions	Varied environmental impacts of Chile´s mainstream food systems
Practices	Ecological practices confront harmful industrialized food landscapes through food production practices that harmoniously coexist with nature
Market logic	
Values	Justice. Against asymmetric power relations in food distribution
Assumptions	Place-based markets with minimum intermediaries may allow farmers to receive higher and fair prices, while reducing costs in food transport
Practices	Export field actors embedded in global food distribution; though some have supported domestic market development Domestic farmers organizations create farmers-markets where they set their own rules, prices, and sell directly to consumers. NGOs support local actors in developing place-based markets
Control logic	
Values	Trust, transparency, credibility. Encourage farmers learning in organic agriculture practices
Assumptions	Mainstream farmers or food processors may claim their produce as organic; either because: - Farmers lack knowledge about organic farming practices - Opportunism driven by premium prices
Practices	When the Law was discussed, already: - Out of self-motivation, some domestic farmers organizations inspected each other's organic practices - Export farmers have always (before and after the Law) being subject to private companies certification, as required by foreigner markets
Rural development logic	
Values	Contribute to poverty alleviation and improving livelihoods in rural areas
Assumptions	Implementing ecological practices may allow farmers to reduce their production costs, work under safe conditions, enhance their living place
Practices	NGOs working on knowledge activities for small-scale farmers to implement ecological practices

3.4.2 Institutional logics of the Law

The Law has incorporated four logics: a market export logic, a control logic, an environmental logic, and a business logic. It can be noticed that the Law only aligns to three of the logics identified within the organic organizational field (export, control, environmental) while a new logic emerged through the Law (business). Table 3-3 provides a characterization of the logics enacted by the Law and we explain them in this *section.*

Market export logic

We distinguish the export market logic according to one of the main goals that provoked its creation, as well as what has been the focus of different government actions since its implementation (Table 3-3). Many interviewees –including public and private actors (e.g., export and domestic farmers, certification companies) – suggested that what triggered the need for a Law were changes in EU´s organic regulation (Interview 12, 14, 15, 40, 41, 42, 43, 44, 45, 53). These changes compelled countries wanting to export organic products to have a legal, national organic agriculture system with state involvement to safeguard its correct implementation (Interview 12, 15, 14, 42). Specifically, the EU requires a tripartite standards governance system that links standard-setting, certification, and accreditation activities, which are inseparable from the market for certified organic products (Fouilleux and Loconto 2017).

To ensure Chilean organic exports could access as many markets as possible and advance equivalence agreements (Interview 12, 13, 34, 54), the definition of organic practices has been based on reviewing and adapting (Interview 2, 12, 40, 41, 42, 43, 54) foreign standards, or even adopting a "*copy paste*" approach (Interview 2, 12, 42). The most stringent interpretation of foreign standards has been included in the Chilean system (Interviews 2, 12, 34, 40, 41). As mentioned by different interviewees as an example, the EU´s organic agriculture guidelines forbid fertilization with natural saltpeter (an abundant mineral in Chile) and the US organic policy still allows it. In order to ensure the entrance of its organic products in both EU and US, Chile opted to forbid saltpeter. The same pattern applies to all standards from the many diverse countries to which Chile exports organic agricultural products; Chile complies with the standard that will allow it to enter another country´s markets as organic. In line with Chile's export agricultural policies (Sarabia & Peris, 2021), organic agriculture appeared as an opportunity for Chilean agricultural exports. As a result, the market export logic of organic agriculture has been central to public sector support and attention (Interview 12, 40, 41, 42, 43, 54).

Table 3-3: Institutional Logics incorporated and supported by the Chilean Organic Agriculture Law

Provokers of the Law: Export and business logics	
Export logic	
Values	Positioning Chile within global organic food trade market to support the country´s economic development
Assumptions	Chile´s geographical conditions (e.g., counter-season in relation to north hemisphere; isolation, that protects from foreigners pests and diseases) provide the country with comparative advantages for agricultural exports (FIA 2017)
Practices	To ensure Chilean organic exports in as much countries as possible, organic practices definition based on foreigner organic agriculture Laws Ministry of Agriculture agencies actions focused on consolidating export markets; for example: - Monetary support to farmers or industries for the opening of foreigner organic markets - Raising statistics about organic export markets, and signing equivalence agreements with the EU, Brazil, Switzerland, Australia (currently in process with US, South-Korea, Japan). - There are no statistics about organic agriculture at the domestic level, nor any other public sector actions targeted to support the domestic organic market
Business logic	
Values	Profitability
Assumptions	Organic products can access better prices than mainstream ones due to certain consumers' willingness to pay more for them
Practices	Ministry of Agriculture agencies actions focused on consolidating profitable markets; though, no public actions have been taken to support the organic domestic market as compared to the export one
Control and Environmental logics: Induced and shaped by the export and business logics	
Control logic	
Values	- Promote values of credibility, transparency, legitimacy, trust. - Against values of fraud and opportunism - Protect organic farmers from unfair competition from mainstream farmers claiming their produce as organic
Assumptions	Mainstream farmers or food processors may claim their produce as organic; because: - Farmers can lack knowledge about organic practices - Opportunism driven by organic premium prices - Thus, need to protect the proper use of the terms organic, biological or ecological agriculture

Table 3-3: ***Continued***

Practices	- All farmers and food processors willing to sell products as organic (or as ecological or biological) must follow the Law´s certification process; otherwise they should be sanctioned by SAG (the Ministry of Agriculture agency responsible for safeguarding) the Law´s correct implementation - For farmers, this include every year: to elaborate a production plan (e.g., how many hectares they will plant, what crops, their yields); fill-in records of all their practices through the growing season - Farmers´ effective implementation of organic practices are inspected by both SAG and certification bodies - Certification bodies inspect farmers at least once a year; this includes farm site observation, gathering and uploading into SAG's organic website farmers´ fill-in records - SAG inspects every year both farmers and certification bodies; provides accreditation to certification bodies; approves or denying inputs for organic agriculture - Unfulfillment to the Law by farmers, food manufacturers, or certification bodies are sanctioned (including monetary fines or suspension from the system) - SAG dispenses to organic farmers or food processors a one year certificate for them to be able to prove they do organic practices, as well as the official national organic seal to label their produced. The seal is aimed for consumers to identify organic products
Environmental logic	
Values	Organic products officially defined in the Law as 'those coming from holistic' agricultural systems which 'encourage and improve the health of agroecosystems and, in particular, biodiversity, biological cycles and soil´s biological activity' (Law 20.089 Article 2, SAG 2019).
Assumptions	Organic farming practices may encourage and improve the health of agroecosystems; in particular, biodiversity, biological cycles and soil´s biological activity
Practices	- The Law defines compulsory, allowed and forbidden practices in organic farming and food manufacturing, and - Regulates a tripartite certification system to ensure that farmers and food manufacturers effectively implement or avoid the practices defined in the Law

Table 3-3. Institutional Logics incorporated and supported by the Chilean Organic Agriculture Law. According to the goals that triggered the Law´s creation, we identify the export and business logics as drivers of the Law, which induce the control and environmental logics: necessary to ensure Chilean organic exports in profitable niche markets. It can be said that the control and environmental logics are at the service of the logics driving the Law.

Control logic

As required by the EU, the Law sets the rules for a tripartite mechanism of organic farmers and certification body practices (Table 3-3). The Law acknowledges two certification bodies: certification companies and OAEs. To date, there are 23 OAEs distributed across the country (Eguillor, 2022).

In OAEs, farmers organize themselves to inspect each other´s practices and obtain organic certification, while also being inspected by SAG, to whom they pay only once in their lifetime for their subscription and accreditation. Through OAEs farmers are allowed to sell at the domestic level and export to Brazil, since both countries signed an equivalence agreement. The acknowledgement of OAEs in the Law resulted from action by domestic farmers against the organic export logic endorsed by the public sector. They contested that if approved, the Law would oblige them to go through a certification process they could not afford, and they questioned why they should follow policies imposed by foreigner countries whose markets they had no interest in accessing (Interview 4, 6, 8, 12, 40, 54).

The aim of the control logic is to protect the proper use of the term 'organic agriculture' and its equivalents –according to the Law: ecological, biological agriculture, or the 'combination of these terms', e.g., 'agro-ecology'–. This has been adopted mainly to provide a guarantee to consumers (Interview 5, 7, 8, 9, 14, 15, 18) and to strengthen consumers' trust and perceptions of organic agriculture´s legitimacy (Interview 5, 6, 8, 9, 14, 15). Nonetheless, from the above sub-section (about the Law´s export market logic) we note that the main goal for the formal institutionalization of the control logic has been to support organic exports.

Environmental logic

The Law defines organic products and agriculture as "those coming from holistic" agricultural systems which "encourage and improve the health of agroecosystems and, in particular, biodiversity, biological cycles and soil´s biological activity" (Law 20.089 Article 2, SAG 2019). The acknowledgement of organic agriculture by the Law as an holistic system resulted from the "battle" (Interview 34) of private field actors –including certifying companies and export and domestic farmers– against some public-sector actors willing to give prominence to input-substitution approaches, as indicated by some interviewees that participated in the lawmaking process (Interview 34, 54). This resulted in a Law that not only defines forbidden and allowed practices, but also makes some practices compulsory; such as the recycling of nutrients through composting, rotations

and enhancing biodiversity through cover crops. This was identified as important to diminish organic "input-by-substitution" approaches (Interviews 34).

Business logic

We distinguish this logic based on another goal that triggered the Law's creation, as well as the way the public sector has being supporting organic agriculture. As indicated by an organic private extensionist who participated in the law-making process, "*what drove this* [the Law´s creation] *was the spirit of conquering niche markets"* (Interview 34). Here, we note a business logic which conceives organic agriculture as a *"market niche"* (Interview 11, 14, 19, 20, 22) where products can access *"premium prices"* (Interview 34, 41, 43). For instance, a public extensionist engaged in supporting domestic organic farmers groups signaled to do so in an attempt *"to help farmers to add* [economic] *value to their production"* (Interview 11). Compared to mainstream production, organic agriculture may provide higher economic returns to farmers due to premium prices, under the assumption that organic products have certain qualities (e.g., without pesticides, environmentally sound) appreciated by certain consumers willing or able to pay more for them.

3.4.3 Effects of the Law and its logics on food systems transformation

Some interviewees recognized ways that the Law contributed to organic agriculture. Some indicated that it has contributed to the reputation and access of Chilean organic agriculture in foreign markets (Interview 34, 41, 54). At the national level, it has contributed structure and order to the organic field through a common understanding about organic farming practices (Interview 2, 5, 6, 8, 9, 15, 54). Other interviewees perceive that the existence of a public organic agriculture law has legitimized organic agriculture as a viable form of agriculture in contrast to past and present prejudices that view it as *"hippy farming"*, unproductive or non-profitable (Interview 1, 34, 54). Others celebrate the acknowledgment of OAEs for farmers that otherwise cannot afford certification (Interview 1, 2, 9, 12, 14, 15).

Besides the above mentioned, interviewees did not identify other contributions from the Law, and described some key shortcomings. Most organic actors contest the lack of support for both domestic and export-oriented organic farmers and for the focus on export markets to the neglect of domestic market development (Table 3-3). There remains a need for policies aimed at domestic market development (e.g., public purchases, access to physical space in every district for organic farmers-markets, informing the population about organic food human health benefits alongside health risks associated to mainstream food consumption) (Observation CNAO). Moreover,

besides allowing farmers some control over what can be called organic, the Law does not include any other actions that would help expand the practice of organic agriculture to more farmers and consumers. There also remains a policy need to support learning in organic practices, as well as in organizational skills to create and maintain OAEs. There is currently no provision for organic projects with exclusive public funding or bonus scores in public tenders in a way that would acknowledge organic agriculture´s social and environmental benefits in comparison to mainstream production. Today, organic agriculture actors seeking public funding compete equally with mainstream producers (Interview 24). We further explain these findings in the following sub-sections.

Problems of the control and business logics for organic agriculture to be practiced by more farmers and consumers

Despite the growth in terms of hectares under organic management since the Law's implementation, the number of hectares destined for export has stagnated in the last years (Interview 12; Observation CNAO). Interviewees explained that this is because organic agriculture for exports is constrained to crops that can access premium prices (i.e., apples, blueberries, wines, wild collection) (Interview 12, 34, 41, 43). As one public officer explained: *"…We have noticed that a barrier for more farmers making organic agriculture is that Chilean export fruit price is too good. So, fruit exporters are not interested in switching into organic" (Interview 12).*

This was echoed by a certifying company interviewee who said:

"If an agricultural product has an excellent value in the conventional market, it is not interesting for farmers to make the effort to convert their produce into organic. But, if what they produce suffers a lowering in its price because it is too massive, it is very interesting for people to say, "how can I have again an interesting price?", "converting into organic". That is a classic situation that we see. When a product is very well paid, nobody asks "how can I convert my production into organic?". Even an entrepreneur with conviction made the exercise and told me, "for earning one cent more, making the whole effort is not convenient to me". But, when do they come back? When they realize they won´t earn one cent but 30% more if selling organic" (Interview 41)

These quotes illustrate that at the export level the main or only incentive for farmers to transition to organic agriculture is to access premium prices (i.e., business logic) that pay off the extra investment of certification. Even farmers with conviction may not switch to organic if they will not receive the economic incentive because farmers face additional work when practicing organic compared to mainstream agriculture (DeLind, 2000). In our case, additional work and costs mainly relate to certification, which affects domestic

farmers more than export ones. As confirmed by previous studies, export farmers or industries pay personnel to make the certification, whereas OAEs must deal with certification tasks and costs by themselves (Hruschka et al., 2021). Despite OAEs pay to SAG only once for their registration, every year thereafter they must incur in extra-costs (e.g., gas for moving between member´ fields, some organizations pay members doing the inspections for their time) that seem to be overlooked by public officers.

Our findings point to interdependence between the control –enforced by law– and business logics. On the one hand, the control logic reinforces the business logic, as it is unlikely most farmers will assume certification extra work and costs if they are unable to access premium prices. On the other hand, the chance to access premium prices may create the incentive for farmers, food manufacturers and commercialization spots to act opportunistically and cut corners or even fraudulently label produce as organic, thus, the need of a control system. The control and business logics interdependence in theory has positive aspects, but in practice can be problematic.

Control strengthens the field´s legitimacy and may encourage farmers' learning (Interview 1, 2, 5, 6, 9, 34). Economic incentives also seem an effective incentive to encourage more farmers to implement organic agriculture, reducing ecological impacts. Thus, the business logic supports the environmental logic, and perhaps the rural development logic in aligning to efforts to raise the income of farmers. Yet, these logics only operate if farmers access premium prices, which at the export sector is limited to few crops, and at the domestic level to a few wealthy districts and supermarkets. In supermarkets, retailing organics can reproduce unfair conditions for farmers, contradicting their motivations for market fairness through organic agriculture (as indicated above, in field actors organic agriculture (market) logics). Furthermore, raising farmers´ income through premium prices represents a deviation from the rural development logic as described by organic field actors, aimed at improving farmer livelihoods by reducing production costs through ecological practices. The control-business logics' interdependence undermines the rural development logic when raising –rather than lowering– farmers´ costs through certification processes, particularly at the domestic level where they are less likely to receive economic compensation for this extra investment.

The business logic –reinforced by the control logic– is problematic in so far has contributed to shape organic agriculture as a market-niche and sustainable or healthy lifestyle *option* targeted to medium-upper class environmentally concerned citizens (FIA, 2017; McDonnell & Yáñez, 2008). It contrasts with the human health logic: to ensure secure food to the broader population, denoting a market-incentive-based policy making the market rather than a sense of public sector obligation the main driver of food systems sustainability outcomes. Furthermore, at the domestic level, prices are a major

barrier for more citizens to consume organic produce (Interview 15, 18); being 25% to 100% higher than mainstream products (FIA 2017). Supermarkets supply organic products due to marketing studies indicating that organic products attract citizens with high purchasing power (Interview 41), and most distribution points are gourmet shops located in wealthy districts (FIA, 2017, Interview 41). "*Today organic is completely stigmatized, and it is very difficult to get rid of the elite stigma"* (Interview 5). The benefits of legitimacy and no longer seeing organics as a 'hippy' form of production has been displaced by an assumption that organics is inaccessible. As pointed out by SAG, export and domestic farmers interviewees there is a need to change the business logic towards making organic food equal in prices or even cheaper than mainstream ones (Interview 5, 15, 18, 30, 31, 40).

The Law's logics are largely reproducing the mainstream food system

Some interviewees agree that organic for export is an advancement towards more sustainable food systems through the switch to nonpolluting substances (Interview 1, 26). However, some domestic farmers, public officers (Interview 24, 26, 27, 33, 30) and export field actors (Interviews 40, 41, 43) criticize organic production oriented for export because it enables large extensions of organic mono-cropping with little biodiversity; poor labor conditions (Interview 16, 26, 40, 33); or concentrations in water rights among large producers, marginalizing small-scale farmers (Interviews 26, 33). Different interviewees also criticize that organic for exports has been the sole focus of public policy. The following quotes illustrate how issues raised by the domestic market, rural development, and human health logics have remained unchallenged by the Law:

"*When the Law was discussed, some groups contested that, ethically why should we produce clean products to feed the Europeans that pay more. Why not produce at a local scale, for the local market, for healthy nutrition for the local population, etc."* (Interview 54)

"*The* [monetary] *support from PROCHILE [a Ministry of Agriculture Agency] constrained our actions because funding was aimed only for activities related to exports. That produced that we could not freely deliver resources nor time to other activities, for instance, for peasants family agriculture"* (Interview 40)

Furthermore, the Law is counterproductive to the human health, rural development, and domestic market logics, and fails to meaningfully or extensively enact an environmental logic. It has institutionalized a system that sanctions organic farmers, more-so than conventional ones. Conventional farmers are inspected –and eventually fined– by public agencies (SAG, Ministry of health), but these control mechanisms are proven to be weak and ineffective (Interview 6, 12; González, 2019; Zúñiga-Venegas et al., 2021).

Organic actors point out to the paradox that farmers implementing environmentally sound practices are more controlled and must acquire more additional certification costs than conventional ones. Something some of them consider unfair (Interview 4, 7, 10, 41) and others frame as "*the world up-side down*" (Interview 5, 6, 9, 33). This indicates that while a whole public sector effort (including the government, parliament) has been mobilized to set-up an organic law, this has been done in a way that does not disrupt mainstream food system institutions.

One example interviewees cited to illustrate the maintenance of mainstream production through the Law related to the regulation of spray drift. All organic farmers face chemical drift pollution from their conventional neighbors (Interview 5, 6, 40, 41, 43, 54). There is no article in the Law protecting them from it, so that organic farmers assume drift costs and consequences. In setting stringent control to organic than mainstream farmers, the Law doesn´t create the conditions for fair competition between organic and mainstream agriculture. As indicated by a public servant:

"*there is almost no control over conventional agriculture. If you can arrive to the market with produced with not allowed residues, for me that is grave. And, it is also like organic agriculture cannot compete against an agriculture that it is allowed to do everything and has no limits" (Interview 24).*

Organic agriculture's incapacity to compete with mainstream agriculture is accentuated by the fact that organic policy officers have been mandated to support organic agriculture without criticizing the mainstream food system. For instance, they must avoid making claims about the health benefits of organic food (Interview 12, 14, 19, 21) despite food safety concerns domestically due to pesticide use (Coria & Elgueta, 2022) and this being a core aspect of an organic human health logic. These concerns are widespread: in a meeting of the National Commission of Horticulture, a policy officer suggested that they could not support a '5 a day' movement advocating for citizens to consume five or more fruits a day, as such policy could imply ***human health*** risks due to high levels of pesticides at the domestic level (Observation National Commission of Horticulture). Yet, organic policy officers are unable to use these unsafe pesticide levels to advocate for organics to challenge mainstream production. This illustrates how the public sector faces barriers to acknowledging problems in dominant conventional food industries, and this is echoed in the Law: it is crafted to support only those logics that would fail to confront or challenge those industries.

Resistance to the Law by organic agriculture and agroecology fields actors

We found resistance to the Law among domestic field actors including farmers, some NGOs and market developers. Their resistance took two forms.

First, some domestic organic farmers or market-developers resist being compelled to follow certification as stipulated by the Law (Interview 10, 27, 30, 48, 53). Some would only seek certification in cases where there is a market that offers good conditions and prices, so they might at least recover their investment in certification. The issue is, on the one hand, that with the exception of wealthy districts, there is almost no premium price in the domestic market (Interview 5, 10, 44, 48, 53). On the other hand, these actors are not driven by a business logic, but by others (i.e., human health, environment, rural development, domestic market). They display the control logic, and believe control is needed, particularly in the absence of direct farmers-consumers relations. Yet, they consider that the effort required by the current certification system might not be necessary for the markets they participate in and pursue; these are place-based markets, where consumers and farmers know each other and control is based on trust, peer-review among farmers organizations (at the margins of SAG) and by making farms open-access to consumers. While they do not resist the Law certification process *per se*, they advocate for more reflexivity about the type of market relations appropriate for mandating a singular certification system, particularly in the context of alternative market relations where other forms of control could be more appropriate (Interview 6, 26, 30, 48, 53).

Second, some interviewees perceived that the Law has reduced organic agriculture to a checklist of environmental farm practices aligned with business and export logics, and leaving issues like extensive organic monocropping with little biodiversity and related social issues unchallenged (Interview 1, 5, 6, 10, 27, 30, 33, 48, 53). This criticism was shared by public sector actors (Interview 15, 16), export field actors (certification companies, farmers) (Interview 34, 40, 42, 43), domestic farmers from both OAEs and those that resist current certification (Interview 5, 6, 10, 27, 30, 33, 48, 53). As a result, some actors do not identify anymore with organic agriculture but with other transformative pathways such as agroecology or regenerative agriculture (Interview 1, 27, 30, 33, 48, 53). In their view, agroecology does entail a political project that challenges power relations in the mainstream food system. Export organic field actors continue to advocate for organic agriculture but consider that there is a need for an 'Organic 3.0' agenda, as proposed by IFOAM (IFOAM, 2017; Migliorini & Wezel, 2017) (Interview 34, 40, 41, 43). Political challenges to business-as-usual are central to most organic field actors, and yet, they have not been reflected in the Law.

3.5 Discussion

In this paper we analysed the case of the Chilean Organic Agriculture Law using institutional fields and institutional logics to examine how policies and institutions can function as drivers or inhibitors of food system transformation. In what follows, we reflect on our main findings. First, we reflect on the implications of the case for policy intended for food system transformations. Second, we reflect on the utility of institutional logics as an analytical tool.

Our case shows the policy-making process and implementation of Chile's organic agriculture law. While done with good intentions from the public sector –to indeed support organic agriculture´s development– the public sector has selected logics coherent with Chile's mainstream food system policies, compatible with productivist export oriented industrial agriculture paradigms (Sarabia & Peris, 2021). Transformative logics that imply changes within this mainstream food system have been excluded. This has happened by not formally institutionalizing confrontational logics in further policy actions, and limiting the Law to a strict mechanism of organic farm and food manufacturing practices. Exclusion has also happened by silencing the relations between organic transformative logics and the mainstream food system. For instance, public officers working in and sympathetic with organic agriculture are mandated to support organic, but only in manners that avoid criticism to the mainstream food system. This resonates with Tomlinson (2008), who explains how in the UK organic policies support the institutionalization of organics, but in ways that avoid critique and any comparison between organic agriculture and the mainstream food system. Furthermore, and in line with previous studies, it indicates that despite organic´s formal institutionalization, the intention has not been to transform the mainstream food system (Martínez et al., 2017). As a result, the Law has had the opposite effect: to contain organic agriculture and prevent transformation.

Our findings demonstrate how public policy can undermine the content of organic agriculture and its transformative potential when it excludes its social, political and normative values (or logics); contributing to its depoliticization. This is aligned with the findings of other organic agriculture scholars (Arcuri, 2015; Bendjebbar & Fouilleux 2022; Lehtimäki & Virtanen 2020; Michelsen 2001a; Tomlinson, 2008; Tovey, 1997) and food systems transformation studies, beyond organic agriculture (Béné, 2022; Duncan & Claeys, 2018; Schiller et al., 2019). In Chile, depoliticization has resulted in the creation of an organic agriculture policy that, paradoxically, generates more obstacles for sustainable and beneficial food production than mainstream production partly due to controls that are more stringent for organic producers. For instance, the costs, bureaucratic requirements, burdensome record keeping is onerous for organic

certification (Barrett et al., 2001; Guthman, 2004; Veldstra et al., 2014). This has meant that in Chile organic agriculture is only possible for a few farmers with high levels of conviction or farmers who produce a crop that receives a premium price. Moreover, when the public sector prevents the circulaion of information about problems with high pesticide use or the health benefits of organic production, it is less likely that citizens will be willing to pay more for organic food. Consequently, with the current Law organic agriculture cannot compete with the mainstream food system and keeps actors stuck in existing production and consumption patterns (Conti et al., 2021), being unable to drive the transformation the Chilean food system requires (Muñoz-Saez & Renwick, 2022).

3.5.1 Implications of the case for policies intended for food system transformation

In view of our findings in relation to previous organic and food system transformation studies, our study has two implications for transformative policies that drive sustainable food systems.

First, transformative food system policies will be those that purposively aim to the sustainable transformation of mainstream food system. This requires a focus beyond policies supporting or formally institutionalizing transformative pathways, as seen in our case as well as in previous organic agriculture and other transformative pathways studies (Michelsen, 2001a; Mier y Terán Giménez Cacho et al., 2018; Nicholls & Altieri, 2018; Schiller et al., 2019).Such policies are needed, but transformation also requires active work in disrupting mainstream food systems and engaging with them directly. Transformation requires policies that disrupt the values, practices, relations, assumptions (i.e., logics, institutional) driving unsustainable food systems outcomes, and contributing to mainstream systems' lock-in (Béné, 2022; Kuokkanen et al., 2017). Hence, policy mixes are required between policies aiming for the 'creation' of sustainable institutions and for 'destabilizing' (Kivimaa & Kern, 2016; Rogge & Reichardt, 2016) unsustainable ones (Bendjebbar & Fouilleux, 2022; Eyhorn et al., 2019; Leeuwis et al., 2021).

Second, while the state is the only one able to institutionalize transformative food systems in public policies (Bendjebbar & Fouilleux, 2022), commited non-public field actors can be critical in supporting and advancing transformative food policies (Arcuri, 2015; Campbell & Liepins, 2001; Conti et al., 2021; Haedicke, 2016; Niederle et al., 2020). Committed actors to food system transformation are key in resisting the public sector´s tendency to depoliticize food systems transformative pathways and policy debates. Their challenge is to develop organizational capacity to generate strong

coalition discourses (Leeuwis et al., 2021) able to re-politicize sustainable food systems policy debates (Niederle et al., 2020) and to apply pressure to governments (Eyhorn et al., 2019). The challenge for the public sector is to balance the contradictions and trade-offs between supporting both mainstream and transformative food-systems, as well as to acknowledge transformations´ inherent political dimension. Hence, it is necessary to meaningfully include committed social movements and private sector actors into the policy debate to contest mainstream food systems (Arcuri, 2015; Bendjebbar & Fouilleux 2022; Campbell & Liepins 2001). It is necessary to foster a continuous and recursive policy making process of contestation, cooperation and negotiation among social movements, the private and public sector (Campbell & Liepins, 2001) and make space for their competing logics.

3.5.2 Utility of institutional logics as an analytical tool

Institutional logics provides us with a useful approach to unpack and further analyze some of the underlying forces, trends and processes involved in food systems change and inertia, particularly related to the politics of formal institutionalization. Institutional logics allowed us to capture the understandings, motivations and actions tied to organic agriculture by different field actors, and to analyze how these related to those embedded in the Law. This helped us to further analyze two things: First, how different logics may affect mainstream food system transformation or reproduction; Second, the power relations between different actors created through unequal representation of logics in the Law. For example, the public sector captured and locked-in a transformative pathway, making visible the way in which different drivers (i.e., laws) are constituted through and by diverse and often competing institutional logics that exist in unequal conditions of power.

A number of sustainable food systems frameworks have highlighted the importance of unpacking and further understanding the processes involved in food systems drivers, as ultimately these drive (un)sustainable food-systems outcomes (HLPE, 2020; IPES-Food, 2015). Institutional logics is an approach that can aid and deepen these analyses, not only by offering a way to consider processes and drivers at play in the politics of formal institutionalization, but also by complementing other approaches (e.g., political economy, policy framing) by providing an analytical tool to make visible often contested and competing values, interests and practices in sustainable food systems politics and policymaking. We have shown how important it is to explore the logics that inform these drivers, for instance, to demystify the particular claims made by some actors (e.g., public sector) in relation to advancing transformative food system pathways (e.g., organic agriculture) by formal institutions. As in our case, it cannot be assumed that the existence of an organic agriculture Law –supposedly Chile's most comprehensive

policy in terms of food system sustainability (Martínez et al., 2017)–, is putting us in the right direction towards sustainable food systems. Institutional logics can provide more comprehensive understanding and assessments in the transformational potential of food systems policies.

3.6 Conclusion: Policies as drivers of sustainable food systems transformations

The urgent need for sustainable food systems transformations demands coherent policies and legal frameworks. However, the literature on food systems suggests many policies targeting sustainable food systems may undermine their transformative potential. Through the case study of the Chilean National System for the Certification of Organic Agricultural Products and the use of institutional theory concepts –namely: institutional fields and institutional logics– this paper examines the politics of a (supposedly) sustainable food system policy, and their implications for the role of policy as a driver of sustainable food systems transformation.

Our case shows an organic agriculture policy that ultimately serves to perpetuate the mainstream food system, inhibiting, even obstructing, food system transformation. We find there is no a real intention towards food system transformation, with the public sector still committed to mainstream modes of food production and circulation (Duncan & Pascucci, 2017). Despite being recommended as a potential sustainable food system transformation pathway and its increasing institutionalization in different national contexts in last decades, considerably less public financial support is put towards organic than to mainstream food systems worldwide (Reganold & Wachter, 2016; Vanloqueren & Baret, 2009). Furthermore, transforming mainstream food systems implies trade-offs for the public sector; including uncertainty (Duncan et al., 2022), and sunk costs from (past) investments in mainstream food systems chosen by governments (Conti et al., 2021; Kuokkanen et al., 2017). In addition, overtly acknowledging the benefits of organic agriculture in relation to the mainstream food system the public sector supports, implies making public serious political issues associated with high pesticides use in horticulture. To avoid these challenges, governments may formally institutionalize transformative pathways, but in ways that fail to challenge the mainstream system, keeping transformative food system pathways marginalized, at bay, or locked-out (Béné, 2022; Kuokkanen et al,. 2017).

Previous food system studies have identified different mechanisms to lock-in mainstream systems (Conti et al., 2021; Kuokkanen et al., 2017). One is through the depoliticization and neutralization of transformative pathways, as shown in our case and

observed by previous food system organic agriculture studies. This can occur through selecting ('cherry picking' (Béné, 2022)) these pathways' aspects that are coherent with the mainstream food system policy agenda. Political aspects that imply a disruption of dominant mainstream systems are ignored or hidden. This has also been conceptualized as transformative pathways' co-optation (Campbell, 2001; Wezel, Goris, et al., 2018) appropriation or capture (Pel, 2016; Schiller et al., 2019) by actors that resist food systems transformations; including the public sector. Consequently, policies concerning transformative food system pathways are made under mainstream food systems logics contributing to their reproduction and incremental changes.

Transformations are inherently political, and can only be accomplished by understanding and addressing the power relations that underlie attempts at change (Scoones et al., 2015). As our research indicates, institutional logics are one way to further understand how transformation is motivated and mobilized, but ultimately placated and subsumed in the service of powerful economic interests.

CHAPTER 4

4

Change agency roles in the Chilean agroecology food system sustainability transition

ABSTRACT

Different actors (e.g., farmers, civil society, policy makers, business), so-called change agents, are critical to support food systems sustainability transitions. However, sustainability transition studies have been criticized for a lack of more actor-based sensitive conceptualizations and analyses of agency, including, the plurality of change agents and their (inter)actions. Towards this end, this paper introduces the case of the Chilean agroecology transition-in-the-making where, drawing on an analytical framework of different transformative roles in sustainability transitions and through a systematic analysis of interviews, some change agent organizations were identified including farmers, NGOs, and from the public sector.

These change agents were both distinct in their activities and in the composition of the roles they played, but the majority did engage in activities that aligned to multiple kinds of roles aimed at food system transformation. As a result, there were several roles that were played by multiple organizations, albeit in ways that differed. Furthermore, we found that while different change agents –in this case, albeit incidentally– were complementary, there were also antagonistic interactions amongst them. We conclude that one particular change agent category cannot be associated with a particular transformative role, as change agents may play multiple (changing) roles, at times simultaneously. Furthermore, research on collective change agency should consider the fluidity with which change agents may adopt and combine roles in ways that generate complementary and antagonistic relations, shaping how they forge cooperative relations in ways that advance or hinder food system transitions. Fluid role approaches can help to add social complexity in the analysis of dynamic cooperative alliances and conflict involved in food system sustainability transitions collective change agency.

4.1 Introduction

The urgent need for food systems transformation is irrefutable (Foran et al., 2014; Webb et al., 2020). Such transformations require 'sustainability transitions,' understood as processes of fundamental social and technical change, and this has been amply recognized in the agri-food sociology literature (Duncan et al., 2022; Rossi et al., 2019). Such transitions can occur when a dominant socio-technical system (the regime or mainstream food system) is reconfigured into a sustainable one (Avelino et al., 2016). These transitions are supported by the actions of different actors, so-called change agents (e.g., civil society, policy makers, business). These change agents rarely operate alone, but rather advance change through relationships, networks and processes of cooperation (Köhler et al., 2019; Renting et al., 2012; Rossi, 2020).

Nonetheless, the scientific field of sustainability transition has been criticized for its lack of more actor-based sensitive analysis and attention to agency (Fischer & Newig, 2016; Kortetmäki & Huttunen, 2022; Rauschmayer et al., 2015). Such critique applies to all main transition frameworks (de Haan & Rotmans, 2018); including food systems transitions frameworks (El Bilali, 2019a; Stahlbrand, 2016). These critiques can reflect, for instance, oversimplified conceptualizations of agents as proponents and opponents of sustainability transitions as incumbents and challengers (Brown et al., 2013) or rough separation between niche, regime incumbents (Fischer & Newig, 2016; de Haan & Rotmans, 2018; Smith et al., 2010), intermediaries or hybrid actors (Huttunen et al., 2021). These transition frameworks often suggest that regime actors –usually associated with governments and incumbent firms (Geels, 2011, 2014), or in food system studies with the public sector, industries or corporations (El Bilali 2019a)– resist fundamental change against niche actors developing sustainable socio-technical innovations, who wish to change the regime with intermediaries or hybrid actors (who belong to both the regime and niche, or intermediate relations between niche and regime actors) acting as change agents (Huttunen et al., 2021). Change agents are thus distinguished from incumbent actors representing the vested interests of the prevailing regime and who can direct their agency to prevent or resist transition of the status quo (Koistinen et al., 2018).

Rather than clear-cut distinctions, in terms of actors networks cooperating for and supporting a certain social or socio-technical sustainable innovation or pathway, the niche and regime boundary is fluid and dynamic (Diaz et al., 2013). For instance, previous studies, including food systems (Diaz et al., 2013; Kivimaa, 2014; Runhaar et al., 2020), have shown that incumbents and regime actors can support transitions (Roebke et al., 2022). Whereas, other studies indicate that in order to advance sustainable innovations, at some point, change agents may need to bring in supporters

from the dominant regime (Diaz et al., 2013; Elzen et al., 2012; Gonzales de Molina et al., 2019; Hargreaves et al., 2013; Ingram, 2015; Rossi et al., 2019; Smink et al., 2015). In this line, previous scholars have argued that the transformation of dominant socio-technical regimes should not be seen in terms of a shift from one socio-technical system to another (that is, from promising niches to regimes); but rather, as a continuously negotiated accomplishment of heterogeneous actors with different motivations and frames of references (Garud & Gehman, 2012; Jørgensen, 2012).

Despite increasing recognition that transition pathways are dynamic and include more fluid characterizations of roles played by actors, frameworks often attribute relatively static roles to actors as representatives of certain interests. In other words, while there is recognition that there is diversity within broad categories like incumbent whereby these actors can sometimes support transitions, there is less research on the ways that actors may move between roles in different situations—in some cases the incumbent may not be simply supporting change from the incumbent position, but actually playing the role of a new entrant. As a result, approaches may downplay the complexity related to human behavior and the different roles people engage in their daily lives, and fail to have sufficient conceptual tools to understand (change) agency (de Haan & Rotmans, 2018; Hassink et al., 2018; Jørgensen, 2012; Wittmayer et al., 2017) and to approach the interactions between agents as drivers of change (de Haan & Rotmans, 2018; Diaz et al., 2013; Hargreaves et al., 2013; Pesch, 2015).

Further conceptual development thus is needed to examine agency in transitions (including agri-food systems ones) that specify relevant functions of different actors and role categories (Kortetmäki & Huttunen, 2022), and of agencies emerging from the adoption of multiple roles by actors in different contexts. Doing so can enable a more systematic inclusion of varying values, identities, motivations and purposes of agents (Huttunen et al., 2021). Beyond in generic transition studies, this is also relevant for the agri-food transitions literature which has started to explore the relevance of change agency in order to advance processes of sustainable food systems transitions (Anderson & Maughan, 2021; Fernandez-Wulff, 2019; Michel, 2020; Pigford et al., 2018).

This paper sheds light on the relevant functions of different change agents, their role categories, and how their adoption of multiple roles, some of which may become more salient within a particular context, can generate their relational agency. We discuss the relevance for understanding a transition-in-the-making by highlighting complementary actions and roles, as well as those that come into conflict. We highlight the ways that different actors may adopt the same role in relation to a particular issue, particularly when they are orienting to different values in their actions, and in doing so, generate antagonisms. Taking this approach allows us to add social complexity to analyses of

alliances and conflict in transitions. We do so by providing an empirical account of the actions and roles played by identified change agents in Chile's agroecology transition-in-the-making. We frame transitions towards agroecology 'transition-in-the-making' as this offers possibilities to grasp change agents' actions and interactions (Genus & Coles, 2008; Jørgensen, 2012), while recognizing that there is ongoing uncertainty as to whether their actions will lead to a complete transition (e.g. agroecology as Chile's regime or mainstream food system). This approach also accounts for the emergence of (new) framings, practices, or actors' networks that challenge the mainstream food system (Elzen et al., 2011).

To unravel who are the different change agents in the Chilean agroecology transition –their actions, roles– and the relations amongst them we use a framework developed by de Haan and Rotmans (2018) for transformative change agency roles, in combination with other studies about agency in transitions which have identified relevant actions change agents can make in order to advance these processes. According to previous transition scholars, roles can be defined as 'a set of recognizable activities and attitudes used by an actor to address recurring situations' (Mossberg et al., 2018; Wittmayer et al., 2017). Previous transition scholars indicate that the concept of 'roles' –as performed by the actors through a process of transition– can help to address the lack of a suitable conceptualization of actors (Wittmayer et al., 2017) and their dynamic interactions (Mossberg et al., 2018; Perez et al., 2015; Story et al., 2011). In addition, a role-based typology can be used as an illustrative tool to facilitate a more generic analysis of actors in transition processes (Mossberg et al., 2018).

This framework provides a typology of different, complementary transformative roles that can be played by different types of change agents (e.g., civil society, policy makers, business), together with a typology of the alliances (initiatives, networks, and movements) they form in their pursuit of systemic transformative change. The authors consider these change agency roles and alliances as necessary for sustainability transitions to happen (de Haan & Rotmans, 2018). These actor roles are not bound to a particular system (incumbent or emerging) nor to niche or regime categories. We build on this framework by addressing the following research questions:

> *What actions are taken by relevant change agent organizations within the Chilean agroecology-transition-in-the making to advance this transition, and how do these relate to transformative roles?*
>
> *When and why do change agents perform the same roles, and what does this imply for their relations (e.g., complementary, antagonistic)?*

What does a more fluid analysis of roles and their strategic adoption tell us about collective change agency for food systems transitions?

The paper is structured as follows. First, we explain and justify the case selection. We then introduce our theoretical framework, drawing on theories from transition studies on change agency. Building on the theoretical framework, we identify and analyze specific change agent organizations put forward by Chilean agroecology change agents (e.g., farmers and peasants, NGOs, third sector (i.e., scientists), and the public sector). We do not examine consumer initiatives as these remain under-developed in the Chilean landscape (Gaitán-Cremaschi et al., 2020). We map these with a view towards contributing to a more comprehensive understanding of the different change agents in the case of Chile's agroecological transition, and to progress discussions on change agent roles in food transitions. The findings are followed by a discussion and conclusions.

4.2 Case study

4.2.1 Case selection: Agroecology in Chile

While agroecology has been part of the sustainable agriculture movement for decades (Gliessman, 2017; Nicholls & Altieri, 2018), it has recently been highlighted as a prominent path towards food systems sustainability in particular to address or counter the impacts of dominant food systems (HLPE, 2019; IPES-Food, 2016; Salazar et al., 2020). Agroecology also represents an important case for studying collective change agency. The need of multi-actor collaborations to advance agroecology transitions has been well established in the literature (Anderson et al., 2021; Dale, 2020; FAO, 2018; Gonzales de Molina et al., 2019; Mier y Terán Giménez Cacho et al., 2018; Nicholls & Altieri, 2018; Oteros-Rozas et al., 2019; Renting et al., 2012). This body of work stresses the importance of fostering an agroecological movement which engages many diverse actors (Rosset & Martínez-Torres, 2012). Further, there are calls for proponents of agroecology to join forces and work with the many actors engaged in developing sustainable food systems (Wezel, Goette, et al., 2018). For example, in Ecuador, the articulation between organizations, academia, and public actors helped agroecology grow in conceptual depth, national reach, and political influence (Intriago et al., 2017). In Brazil, from the mid-2000s onwards, the strong involvement of civil society organizations secured space for agroecology in family agriculture public policies (Petersen et al., 2013), and the construction of the Policy of Agroecology and Organic Production (PNAPO). Here the involvement of social movements and representatives of civil society organizations was key to the structuring of governance mechanisms

capable of streamlining the incorporation of agroecology (principles and guidelines) into a diverse set of policy instruments (Lamine et al., 2021).

At the same time, we note that political agroecology research has tended to emphasize peasants as key change agents for agroecology transitions (Gonzales de Molina et al., 2019), while possibly overlooking the contribution of other societal actors; such as scientists, NGOs or the public sector. There is also a gap in understanding of how diverse change agents interact, relate and complement each other's actions and roles through agroecology transition processes, and how transition is influenced by fluidity in the roles among change agents.

Chile has been selected as a site for inquiry because since the 1980s the negative social and environmental impacts resulting from Chile's mainstream food system (Coria & Elgueta, 2022; OECD, 2008) has prompted action from diverse change agents. These agents have supported a transition towards alternative food systems based on agroecological approaches (B. Cid-Aguayo, 2011; Cid & Latta, 2015; Montalba et al., 2017), leading to many promising agroecological vegetable food systems in Chile today (Gaitán-Cremaschi et al., 2020; Hruschka et al., 2021; Salazar et al., 2020). As a result, the case site is both highly relevant in its need for transformation, while also being in a period of transition where change agents are mobilizing and their activities and roles are highly visible.

4.3 Theoretical framework

Our theoretical framework builds on de Haan & Rotmans (2018) framework in complementation with other studies focused on change agency in sustainability transitions. We apply the framework to identify and characterize different change agents in the Chilean agroecological transition-in-the-making in terms of their actions, roles and alliances. In what follows we elaborate on our understanding of change agents. Then, we describe four types of change agents, their transformative roles, and their alliances.

4.3.1 Change agents in sustainability transitions

The literature on agency in transitions use the terms of 'actors', 'agents' (Hassink et al., 2018; Werbeloff et al., 2016), and 'change agents' (de Haan & Rotmans, 2018; Koistinen & Teerikangas, 2021) somewhat interchangeably. We understand by agency as actors' capacity to take action and make a difference over the course of events (Giddens, 1984).

'Change agents' refer to those actors that purposively take action to, and play a significant role in, 'initiating, managing or implementing change' to advance sustainability transitions (Bos et al. 2013; Gugerell & Penker, 2020; van Poeck et al., 2017). These actions can be oriented to supporting the creation of sustainable food systems or disrupting processes underpinning mainstream food systems in order to drive and advance sustainable transitions. Change agents can be individuals or collective actors (e.g. organizations, networks, movements) including a diversity of societal actors; such as research or scientist institutions (Bulten et al., 2021; Wittmayer & Schäpke, 2014), public sector and policy making agencies (Gliedt et al., 2018; Kivimaa, 2014), firms (Späth et al., 2016), farmers, NGOs or other civil society or grassroots organizations; for instance, consumers (Seyfang & Longhurst, 2013; Spaargaren & Oosterveer, 2010).

4.2.2 Change agents' transformative actions, roles and alliances

Different conceptualizations exist to denote actors and change agents roles in sustainability (van Poeck et al., 2017) and transitions studies (Avelino & Wittmayer, 2016; Hauck et al., 2020; Wittmayer et al., 2017). As a starting point, we make use of the conceptualization put forward by de Haan & Rotmans (2018).

This framework considers change agents to be value driven, and introduces the concept of 'streams' to explain how shared value-based motivations amongst different change agents can enable them to join forces and set alliances (de Haan & Rotmans, 2018). Streams are defined as societal value sets held by change agents that guide their actions. The integrative theoretical framework distinguishes four meta roles for transformative change:

i. Frontrunners: pioneers in implementing and making known and available to society alternative sustainable solutions from those facilitated and supported by the regime (de Haan & Rotmans, 2018; Hauck et al., 2020). Their work is often associated to initiatives; such as start-ups, businesses, coops, NGOs, but also 'mega' projects such as legislative reform. Connectors or topplers may also be involved in these initiatives (de Haan & Rotmans, 2018).

ii. Connectors: actors that connect in two respects. First, they connect sustainable solutions to systems –be they emerging (e.g., agroecology) or incumbent (the mainstream food system or regime)– by embedding or anchoring them in an institutional context (de Haan & Rotmans, 2018). Second, they facilitate connections between different actors by bringing together several actors and possibly their initiatives on the basis of shared values. In this respect, the connector role can be associated to that of intermediaries, brokers or

partnership managers; who create collaborations amongst different actors (Hargreaves et al., 2013; Kivimaa, Boon, et al., 2019). Thus, actors playing connectors roles are crucial in facilitating the formation of inter-organizational connections and networks (Rohe & Chlebna, 2022). Networks can be formal and informal, and can be understood as the gathering together of various (frontrunners) initiatives (de Haan & Rotmans, 2018) or single organizations.

iii. Topplers: provide coherence to the alliances and nascent or changed systems. Also, they introduce, change and phase out institutions to make way for alternative sustainable solutions. They do so by articulating, advocating, making explicit and externalizing the value sets that would connect actors to a rising stream (i.e., a rising set of sustainable values). According to this model, movements (such as the agroecology movement) are closely related to the actions of topplers. By externalizing a shared set of values a transformative movement can create and amass supporters. Movements need not consist of topplers and supporters exclusively; frontrunners, connectors and, consequentially, initiatives and networks often also form part of movements. It is by mobilizing a critical mass of supporters that topplers may introduce, change and phase out institutions to make way for alternative solutions. Furthermore, what sets movements apart from networks is that most supporters do not have, or need, a direct connection to the transformative actors in the alliance, but rather connect to value sets embodied by the movement on a more abstract level

iv. Supporters: are not change agents themselves, though their support is crucial in the institutionalization process of system innovation. For example, the authors identify supporter with consumers, whose endorsement provides legitimacy to and expresses the societal need for the (new) emerging innovations (de Haan & Rotmans, 2018).

4.3.3 Application of the Theoretical Framework

In our analysis we ascribe these roles to different change agent organizations led by different social actors in the Chilean agroecology-transition-in-the-making. By organizations we refer to a group of people (individuals) who work together for a shared purpose(s) and goal(s). We acknowledge that individual change agents can be relevant to advance transformation processes (Charli-Joseph et al., 2018; Pesch et al., 2017); including different roles (e.g., leadership) they may play within their respective organization(s). Yet, it is unlikely that any individual can bring-up transformative change on her/his own (Farla et al., 2012); the same applies for single organizations. Effective

individual change agents are not lone heroes; their capability must be embedded in teams whose members are able, for instance, to rapidly tap resources, knowledge, and networks of other relevant entities (Mintrom & Rogers, 2022).

Change agent organizations take on these four meta-roles (either one or a combination) and can perform all of these actions, though they might do so in different ways and with differing levels of intensity. For instance, while frontrunners may mobilize resources for their own initiatives, actions related to networking (e.g., facilitating partnerships, the circulation or exchange of knowledge, or trust between different actors and change agents organizations) are strongly linked to the work of connectors. In turn, the capacity to create inspiring visions or discourses that are able to mobilize others are actions more related to the work of topplers.

4.4 Methods

Empirical qualitative data was gathered through fieldwork in Chile's central-south area –namely, from the Valparaiso and Metropolitan Regions, to the BioBio Region– during July 2018 till June 2020. Data was gathered through a combination of methods including semi-structured interviews (56 in total), secondary data review, site observations; for example, in change agents' organizations' farmers-markets, productive-demonstrative farms, and events.

Interviews were first conducted with actors related to agroecology –at times organic agriculture– food systems; including farmers, farmers-market developers, NGOs, academics, policy officers, as identified by previous studies (Cid & Latta, 2015; Montalba et al., 2017). This provided an overview about the history of agroecology's development in Chile, identifying main actors, milestones, and relevant ongoing processes which allowed us to identify and map some of the relevant change agents organizations from the public and non-public sector within Chile's agroecology transitions-in-the-making.

Second, we conducted interviews with members from these public and non-public organizations identified as change agents. In order, to further examine the actions and practices they engage with to advance agroecology food system pathways. During interviews, they were asked about the main challenges they have faced in trying to advance agroecological transitions (at the local, regional and national levels), how they overcame these challenges, who were relevant supporters and detractors of their actions, and their relations (collaborative, competing, contested or conflictual) to other actors. According to their actions, we assigned to these change agents the different transformative roles from our theoretical framework.

All interviews were transcribed (in Spanish), coded and analyzed using Atlas.ti software. A combination of deductive and inductive coding was applied. Deductive codes were derived from our theoretical framework including: 'actions' and 'interactions' (e.g., cooperation, competition). Deductive coding was undertaken simultaneously by being open to emergent observations (i.e., visions, resources). Analysis of 'actions' and 'interactions' codes helped us to understand what transformative meta-roles different change agents were playing, and how they were relating to each other and for what (common) goals.

4.5 Findings

4.5.1 Mapping change agents from the Chilean agroecology transition-in-the-making

Drawing from the definitions outlined above in Section 4.3., through a systematic analysis of our interviews and data we identified a number of change agents; three groups of non-state actors, including three types of farmers organizations, national NGOs, and academics working through SOCLA-Chile (*Sociedad Científica Latinoamericana de Agroecología*; from now on referred as SOCLA); and two public extensionists teams (PRODESALES) and, though for a limited period of time, INDAP (the Ministry of Agriculture Agency responsible for small-scale farmers and peasants development) from the public sector. The three types of farmers organizations include farmers-markets, *Organizaciones de Agricultores Ecológicos* (OAEs – Ecological Farmers Organizations), and FEDAECH (*Federación de Agroecología y Consumo Responsible de Chile* – Chilean Agroecology and Responsible Consumption Federation).

As illustrated in Table 4-1, we found that change agents were both distinct in their activities and the composition of the roles they played, but the majority did engage in activities that aligned to multiple kinds of change agency roles. As a result, there were several roles that were played by multiple organizations, albeit in ways that differed and were internally consistent within a suite of change agency activities often targeting different sites within the food system. For example, while each organization focuses on changing different parts of the food system, we have categorized all of these change agent organizations as frontrunners, with the exception of FEDAECH. This is because they advance agroecological solutions and practices that differ from those of the mainstream food system. Below, we detail how each of these organizations target different parts of the food system in ways that generate complementarity, even while these organizations play similar roles (Figure 4-1).

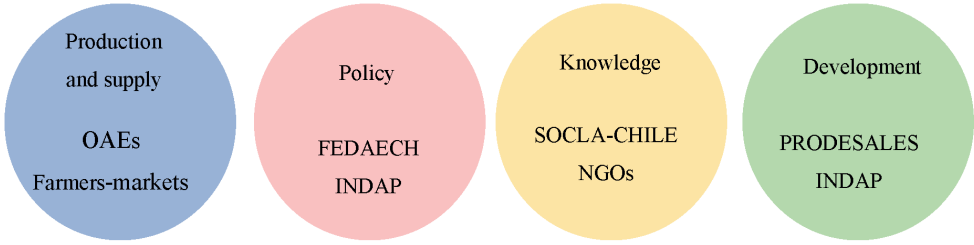


Figure 4-1: Different change agent organizations in the Chilean agroecology-transition-in-the-making and the food system component in which they operate

Farmers organizations target food production and supply. With regards to supply, through farmers-markets organization initiatives they aim to challenge power asymmetry found in mainstream markets, where wholesale markets are the main players in price setting (Boitano, 2011). In mainstream markets, farmers have little bargaining capacity and limited control regarding pesticide use and residues in food (Gaitán-Cremaschi et al., 2020). With few exceptions, in farmers-markets, farmers sell directly to consumers and set their own prices. This is something they reported as important for building food literacy in consumers, long-lasting trust in consumers-farmers relations and ensuring fair revenues for their work. Most farmers-markets result from inter-organizational cooperation amongst OAEs, other domestic farmers groups, or individuals.

OAEs are farmers and peasants participatory certification organizations that allow farmers to access organic certification for the domestic market with fewer barriers to access (e.g. costs of certification). These OAEs are accredited by the Ministry of Agriculture agency SAG, according to the country's 'National system for the control and certification of organic products' (SAG, 2019), which, since its implementation (2006) compels farmers willing to sell their agricultural produce as ecological, biological, ecological or 'the combination of these terms' (e.g., agro-ecological) to follow certification. OAEs's farmers food production practices (e.g., enhanced farm biodiversity through crop diversification, rotations and plant corridors; fertilization through compost and manure, no chemical pesticides use) differ significantly from those of the mainstream system; characterized by (large) monocultures and intensive application of fertilizers (Martínez et al. 2017) and chemical pesticides.

Table 4-1: Change agents, roles, and activities within those roles

Roles Actor group	Frontrunner	Connector	Toppler	Supporter
PRODESALES	**YES:** Providing sustainable, alternative extension from those provided by the mainstream	**YES:** Connecting agroecological practices to public extension services	**NO**	**YES:** Supporting small-scale farmers and peasants to transit to agroecology practices
INDAP	**YES:** Frontrunning an agroecology policy agenda within INDAP	**YES** Connecting agroecology at INDAP´s (a mainstream institution) policy agenda	**NO**	**NO**
SOCLA-Chile	**YES:** Frontrunning agroecology research and scientific knowledge	**YES:** Connecting agroecology within mainstream research institutions	**NO:** though, sporadically, contributing to sense-making and mobilizing practitioners through the congress (once every two years)	**NO**
NGOs	**YES:** Frontrunning demonstrative, educative agroecology productive farms	**YES:** Connecting practices and knowledge to various mainstream actors	**NO**	**YES:** Supporting various actors, with a focus on small-scale farmers to transit to agroecology practices
Farmers-markets	**YES:** Providing alternative to the mainstream forms of food supply that are fair for farmers and free of pesticides for consumers	**NO**	**NO**	**NO**
OAEs	**YES:** Making alternative to the mainstream food system forms of sustainable food production	**NO**	**NO**	**NO**
FEDAECH	**NO** Though it is a network composed of farmers frontrunners organizations	**YES:** Connecting single agroecology farmers organizations Connecting agroecology to the Ministry of Agriculture policy agenda	Possibly; Construction of values through critique of export elite organic agriculture	**YES:** Supporting the political clout of other agents

The Chilean Agroecology and Responsible Consumption Federation (FEDAECH), mainly targets the policy dimension. To the date of data gathering, namely: five OAEs and three farmers-markets conformed to FEDAECH recommendations, which some members envision as an open source of knowledge resources for member and non-member organizations to support them in the implementation of agroecology (Interviews 5, 6, 7, 9, 37, 39). FEDAECH, for example, shares knowledge in farm practices, or experience on how to develop a farmers-market or an OAE. As such, we see FEDAECH as a connector facilitating connections between different frontrunner farmers organizations, as well as a supporter for other frontrunners to implement agroecology initiatives.

This role is consistent with a motivation for the creation of FEDAECH: to mobilize public policies in favor of agroecology. The network aims to accomplish this mobilization through two main actions. First, by mobilizing many organizations engaged with agroecology (e.g., consumers, farmers, scientists, others) to develop political clout in face of public agencies. Two, by participating in the Ministry of Agriculture's official networks related to agroecology or related food system pathways (e.g., organic agriculture) policy making; namely, the National Commission of Organic Agriculture (2006-until today) and INDAP's sporadic (two meetings in total) National Commission of Agroecology while being a change agent.

In the National Commission of Organic Agriculture, FEDAECH has been contesting the Ministry of Agriculture's strong focus on organic agriculture for exports at the expense of organic agriculture or agroecology at the domestic level, and for developing organic agriculture as a premium price market-niche; contending the need for policies targeted to agroecology's development at the domestic level (Interview 6, 7, 9, 10, 37, 39) and to frame this transition as the need for healthy food for the broad population, rather than to an elite (Interview 5, 6, 9, 10, 37, 39). Something that was agreed by members from different NGOs and SOCLA (Interview 1, 32, 45).

We thus also categorize FEDAECH as a connector, by connecting domestic agroecological farmers' needs, visions and ideas for solutions to the respective public institutions (Hruschka et al., 2021) and related mainstream organic agriculture policy agenda. In doing so, we furthermore note FEDAECH attempting to be a toppler by giving coherence to agroecological food systems through the articulation of values (e.g., fair, local, healthy) and their externalization. In order, to attract more supporters to create political clout to pressure public agencies to introduce, change and phase out mainstream institutions to make way for agroecology. Nonetheless, the extent to which FEDAECH contributes to, and has an impact on, the national discourse while representing the Chilean agroecology movement is yet to be observed (Hruschka et al., 2021). Whereas, FEDAEH cannot be categorized as a toppler with the power or

influence to change and phase out mainstream institutions to make way for agroecology, at least at the policy level.

SOCLA-Chile and NGOs such as CET-BioBio and CAEL are focus mainly on knowledge-related activities. For example, CET-BioBio and CAEL are frontrunners developing demonstrative agroecology productive farms (at times, mobilizing public economic resources for this goal) open to varied types of actors –including, public extensionists, professionals, students, small-scale farmers and peasants and, in the case of CET-BioBio also export farmers, where they carry on varied educative activities aimed at exchanging practical knowledge and supporting diverse actors in their transition towards agroecology. These farms have helped expand the practice of agroecology to more farmers and peasants, public or private extensionists, and professional students (Nicholls & Altieri, 2018). NGOs can also be categorized as connectors, by connecting agroecological practices to public extension services, a mainstream institution. Our analysis suggests that the most important role NGOs play as change agents is as supporters for more farmers to implement and transition to agroecology.

SOCLA-Chile is a frontrunner in agroecology research and scientific knowledge within different individual members institutions (Universities, private-public sector research institutions). In this way, SOCLA-Chile can also be categorized as a connector, as they connect the alternative agroecology food system within mainstream research and professional education institutions, where agroecology is often perceived as being *"idealistic"* (e.g., unproductive, not feasible to feed the broad population), *"too hippy"* or *"not scientific"* (Interview 1, 45, 49, 51). Furthermore, some interviewees indicated the lack of professional education on agroecology (and related transition pathways, e.g., organic agriculture) (Interview 1, 7, 9, 10, 11, 29, 45) as a barrier for this transition-in-the-making.

So far, one of SOCLA-Chile main activities is organizing (every two years) national two days agroecology congresses. To promote the exchange and spread of knowledge –both scientific and practical– and to foster connectivity amongst actors interested in agroecology. In its first version (2019), the Congress mobilized around 900 participants from almost every region of the country, including farmers and peasants from both OAEs and FEDAECH, as well as other farmers or peasants organizations, scientists, PRODESALES, university students, NGOs. Although, we cannot assess from our data to what extent and in which respect the congress results in enduring connections amongst participants. We also categorize SOCLA as taking some toppler actions. The congress activity (though sporadically, once every two years) was able to mobilize a considerable amount and varied followers working, interested or engaged with agroecology, that

can also be seen as a space for these followers to discuss and exchange knowledge and meanings about agroecology (sense-making).

From the public sector, two change agent organizations were identified: INDAP and some public extensionists (PRODESALES). These two organizations are intimately related, in so far as INDAP is an agency in the Ministry of Agriculture tasked with the development of small-scale farmers and peasants (Interview 22). Public extensionists teams are generated through an agreement between INDAP and the respective municipality to provide farmers from those territories with extension services. Some interviewees identify INDAP as responsible for disrupting peasants and indigenous farmers ecological practices from the past, making them dependent on corporations' inputs like pesticides, fertilizers, and seeds (Interview 1, 6, 31, 37, 39, 77). Today, most public extensionists provide mainstream extension services, and different interviewees mention the scarce number of public extensionists knowledgeable in agroecology as a barrier for this transition (Interview 1, 7, 9, 10, 11, 29, 45). Within this context, some public sector extension teams have been identified as change agents that played a role as key supporters for small-scale farmers and peasants to implement and transit to agroecology practices. We thus categorized these public extension organizations as connectors, in the sense of connecting the alternative agroecology food system within mainstream public extension service institutions, as well as supporters of small-scale farmers transition towards agroecology farm practices.

During a previous and limited governmental period (2014-2018), INDAP acknowledged agroecology as a promising food system for family farming development following the results of a survey targeted at its users. This survey revealed a considerable number of users were willing to receive agroecology extension services and to be acknowledged as agroecological farmers (Interview 22). Where, around 1.900 (from a total of 157.824 users) declared themselves as agroecological farmers, with 77 of them counting with certification (most of them through an OAE) . This motivated INDAP's national Director of the time to advance on agroecology; illustrating how change agency at the public sector very much depends on the broader political agenda. During this period INDAP took many and varied actions (Table 4-2) (DIPRES, 2018; INDAP, 2017; INDAP et al., 2018).

This was the first time that agroecology officially appeared in the discourse of a Chilean public agency, which had, until then, been limited to 'organic agriculture' (Interview 5), 'biological' and 'ecological farming' (e.g., 'Ecological Farmers Associations' – OAEs; (SAG, 2019)). We categorized INDAP as a connector, connecting the alternative agroecology food systems within mainstream food system public sector extension service programs and policy agenda.

Table 4-2: Actions developed by INDAP while being a change agent (Governmental period 2014-2018)

Action	Objectives and description
Creation of The National Commission for Agroecology	Co-construct guidelines to formally institutionalize agroecology at the Ministry of Agriculture policy level, amongst INDAP central level officers and Chile´s Peasants Federations, represented by their respective Presidents. Also, based on FAO´s agroecology definition. Initially, farmers from OAEs were not convoked. Through their contestation towards INDAP and SAG they finally participated in one (the first) of these meetings. Nevertheless, this Commission only met twice during this governmental period, to be dismantled there after by the new administration.
Publication of INDAP's Toolkit for Agroecology Transitions	Book distributed to all PRODESAL teams from the country and to be download from free from the internet. This was a public sector tender commissioned by INDAP, and allocated by Cet-BioBio as author of the publication (INDAP & CETBioBio, 2016).
Organization of 1st Symposium of Agroecology (6,7 September 2017)	Carried on in FAO´s dependences. Two identified by INDAP as the most outstanding family farming initiatives in agroecology farm at the National level were awarded. One from an OAE and the other not.
Mobilizing public funding	INDAP central level policy officers wrote a proposal to the DIPRES (The Governments Direction of Public Funding, Ministry of Finance), for an INDAP agroecology transition plan; mainly, targeted to increase agroecological extension services. Though, this funding was not allocated by DIPRES (from the same governmental administration while INDAP being a change agent).

4.5.2 Role convergence and contestation

Our interviews showed that change agents working within the Chilean agroecological transition have considerable overlap in the roles they adopt, while also targeting distinct aspects of the food system or performing their roles in ways that align to those sites of change. However, when an issue arose that had implications across those sites of change, these change agents' roles converged, and their differences generated contestations. Below, we detail how the potential institutionalization of agroecological generated conflict among change agents. This example also illustrates how the suite of roles played by organizations can be mobilized in cases where there are diverse interests converging around an issue by change agents who share overlapping roles, as some change agents used their connector role to bolster their frontrunner activities.

Interviewees from all organizations agreed on that INDAP is key change agent in Chile's agroecology transition by supporting small scale farmers and peasants transition to agroecological farm practices and developing (local) markets for them. Nonetheless, when paradoxically, when INDAP took a change agent role and tried to formally institutionalize agroecology at the policy level contestations emerge around the institutionalization of agroecological certification. Specifically, between INDAP, OAEs and farmers markets developers (including from FEDAECH). Also, between INDAP and PRODESALES who have been supporting OEAS.

The tensions reflect differences in opinion about whether agroecology should follow Chile's National System for the Certification of Organic Agriculture Products (Law 20.089, SAG 2019). This Law has been implemented in Chile since 2006, and compels farmers, food manufacturers and markets to follow certification if claiming to produce or sell organic, ecological or biological products; either through private certification done by companies or through an OAE. In the latter, farmers organizations pay among all members once in their lifetime (around 120 US$) to the Ministry of Agriculture for their registration.

INDAP was reluctant to promote agroecology according to the existing organic Law, partly, INDAP interviewees suggested, due to the organization's long-lasting but failing experience with having small-scale farmers maintain and file records (Interview 22, 23, 25). They acknowledged there was a need to find a way for farmers_to identify their produce as agroecological, but, in their view, this would be best pursued outside of Chile's official organic (ecological, biological) agriculture Law.

Most farmers and peasants from OAEs (from and out FEDAECH) advocate for this certification system. In line with INDAP, they agree that the current process is

inappropriate and there is a need to consider changes to improve it, for instance, by lowering the burden on farmers to fill-in and upload records into the Ministry of Agriculture website. Yet, they consider that there are good aspects of certification through OAEs that should be maintained; including, supporting the exchange of knowledge on agroecological farm practice and other forms of support (e.g., moral) amongst members (Interview 6, 5, 36); being able to identify situations where ecological/organic farmers produced have presence of pesticides due to chemical drift from mainstream agriculture neighbors, as experienced by a farmer from FEDAECH (Interview 6); and strengthening both consumers trust and the legitimacy of ecological farming by assuring that farmers are not fraudulently claiming to produce agroecologically due to lack of knowledge or opportunism. For instance, all farmers and peasants organizations interviewed –whether from and OAE or not, or whether advocates or not of certification– had experienced fraud by other farmers and peasants driven by opportunism (Interview 5, 6, 8, 40, 48, 52, 53). These positive aspects of certification through OAEs were agreed by some NGOs and SOCLA members (Interview 3, 45, 32, 12). INDAP officers acknowledged that one of the main motivations for many peasants to claim their produced as agroecological was to receive higher prices (Interview 22, 23), but they did not advocate for the inclusion of agroecological production to be part of the current certification system.

Furthermore, some farmers from FEDAECH perceived that letting agroecology farmers sell products as agroecological without certification implies *"un-loyal market competition"* (Interview 6, 7, 9) , "*unfairness",* or *"inequality"* to farmers from OAEs that have been formally certified as organic. Which was also agreed by some SOCLA members (Interview 3, 45). Nonetheless, within FEDAECH as well as other non-public sector change agents from this studies (SOCLA, NGOs) we found contested visions about whether agroecology should be certified or not, and even whether agroecology allows or not a responsible use of pesticides and fertilizers. For instance, according to some SOCLA members, compared to organic agriculture where the use of chemical pesticides is banned (i.e. the role of certification and Chile's organic agriculture national certification system), in agroecology farmers might use chemical substances sporadically and responsibly. Because, it is more unethical that a farmer losses all her/his harvest than making a conscious pesticide use (Interview 1, 49).

These findings illustrate two change agents playing the roles –among other roles– of connectors, in the sense of willing to connect (or formally institutionalize through public policy) agroecology to the Ministry of Agriculture Policy Agenda: INDAP and FEDAECH. However, they perform these roles with different –at times contested– visions and interests for the operation of the food system market. These conflicts led some farmers from OAEs (some from FEDECH, as well as non FEDAECH members), to ask the SAG, Ministry of Agriculture Agency responsible to implement the country's

National Organic System, to fine INDAP for promoting or allowing farmers to sell agroecology products without certification (Interview 6,10, 11).

In the case of a shared interest in an issue with broad implications for food system transformation, shared roles but conflicting visions led to antagonistic relations of conflict amongst change agents. Yet, when there was a change of government (2018), all INDAP change agent agroecology actions (Table 4-2) were turned down by the new administration and organic agriculture for export became a priority of the Ministry of Agriculture: the historical way organic or ecological agriculture has been institutionalized by the mainstream food system public policy agenda. This change in the governmental policy agenda reduced explicit conflicts between INDAP and OAEs, as including agroecology without certification within the Ministry of Agriculture policy agenda was no longer able to be considered. Nonetheless, from our data we note there remain different visions about whether agroecology should be certified or not, and through what mechanisms, among these change agents (Table 4-3).

Table 4-3: Different change agents inter- and intra-organizations visions about whether agroecology should be certified or not and formally institutionalize at the policy level.

Actor group	Framings about the role of certification in agroecology
FEDAECH	All farmers should get certification, to provide a guarantee to consumers, avoid farmers cheating, fostering farmers deep transition in their practices (Interview 6, 7, 9, 10) Yet, current participatory certification systems (OAEs) can be time consuming for farmers, at times SAG inspectors have little criteria (Interview 6, 7, 9, 10, 11, 38) Other certification systems should also be allowed, for instance, between farmers and consumers and independent from SAG inspection (Interview 11, 38)
SOCLA (including interviewees from CET-BioBio members and some INIA researchers)	Agroecology cannot be certified, for being *"perspective"* that guides farmers practice (Interview 1, 3, 45, 49). Yet, in the absence of farmer-consumer direct relation, farmers willing to claim their produce as agroecological should get certification (Interview 1, 3, 45). Agroecology is a perspective, but for the market dimension farmers should get certification (Interview 27, 78): to give guarantee for consumers; protect the legitimacy of agroecology from farmers claiming to be agroecology when they are not. Not necessarily because of opportunism, but for misunderstandings on agroecological practices (Interview 78). Compared to organic agriculture, where the use of chemical pesticides is banned (i.e. the role of certification), in agroecology farmers might use chemical substances sporadically. It is more unethical that a farmer loss all her/his harvest than making a conscious pesticide use (Interview 1, 49).
Other NGOs	Respects certification, which may contribute to legitimize agroecology. Though, reflexivity is required about for which market relations certification is necessary, and to allow other certification systems (e.g., between farmers and consumers)
INDAP	Reluctant to demand agroecological farmers to certificate, because of INDAP´s long-lasting experience about peasants' difficulty to fill-in records (Interview 21, 22, 24) and the unwillingness of most peasants participating in INDAP´s convoked National Commission of Agroecology to go through the certification process.
Other offices from the Ministry of Agriculture involved with the organic agriculture policy field	SAG: Responsible for safeguarding the correct implementation of Chile´s National System for the Certification of Organic Products, and strong advocates for certification of both organic agriculture and agroecology farmers; equating organic agriculture with ecological, biological, and agroecological. ODEPA: Confused on how to solve the certification contested framings: whether agroecology should be equated with and integrated within the current National Organic Agriculture System. Or should be a parallel and distinct path, without certification.

4.5.3 Multiple Role Adoption by Change Agents

We have identified a number of organizational change agents: INDAP from the public sector that for a period of time played a connector role (connecting the alternative agroecology food systems within mainstream food system public sector) in advancing agroecology; and public extensionists (PRODESALES), that can be key in supporting farmers in their transition towards agroecological farm practices. And three groups of non-state actors, including academics working through SOCLA-Chile; NGOs, and farmers organizations (OAEs, farmers markets) and one network of farmers initiatives (FEDAECH). These organizations play frontrunner roles but also support transitions though supporting and connecting. We note that to date, none of these change agents holds enough power or influence to phase out or change regime institutions, nor have they amassed enough supporters to create an agroecological movement. Nonetheless, they can be categorized as topplers in the sense of articulating, giving meaning to, and making explicit agroecological values (Table 4-1).

In terms of collective change agency we found both complementarity and antagonisms between different change agents organizations –either initiatives or networks (in the case of FEDACH)– their actions, and the interplay of the multiple, overlapping roles they perform.

We found there is complementarity within different change agent organizations, both from the non-public and public sector. While each of them plays simultaneously a combination of roles and overlapping roles between them, they do so through different activities and actions, and they may focus on different parts of the food system. Usually, these are according to the societal function of the organizations individual members, with the exception of FEDAECH, were farmers want to address the policy dimension. For example, farmers organizations institutionalize agroecological food production and supply, scientists promote scientific knowledge within academia and the agroecology community, whereas, in this case, NGOs and public extensionists dedicate their actions to practical knowledge to support more farmers and peasants to implement agroecology practices. As a public sector organization, INDAP is willing to institutionalize agroecology at the policy level. This was also a role played by the frontrunners farmers organizations network FEDAECH (Figure 4-1, Table 4-1).

These different change agent organizations (initiatives, networks) and their roles can be said to be complementary in terms of together advancing agroecology food systems in Chile. Because, respectively, each organization is contributing to target transformative change within a part of the food system, while addressing some of the barriers identified for this transition. Nonetheless, this is an uncoordinated and incidentally strategic

collective change agency. In so far, besides inter farmers organizations cooperation in FEDAECH, there is limited attention paid to more inter-organizational connections. Though there is recognition change agents from different type of organizations are "*dispersed*" (Interview 11, 12), *"uncoordinated", (*Interview 5, 6, 16), or "*isolated*" (Interviews 16, 39), as indicated by OAEs and SOCLA members, and that more cooperation could be forge amongst them.

As noted from section 4.5.2., our case also shows that antagonisms can emerge between change agents playing simultaneously the same role. Or, with respect of how a certain change agent plays a certain role. The latter in our case, when both INDAP and FEDAECH play the role of connectors in the sense of connecting agroecology at the policy level. Whereas, the former can be seen in different change agent organizations disagreement about how INDAP was connecting agroecology at the policy level.

4.6 Discussion

This paper is empirically set in the context of food system transitions, which are processes of fundamental social and technical change, supported by the actions of different actors, so-called change agents (e.g., civil society, policy makers, business). As set out in the introduction, taking the Chilean agroecology-transition-in-the-making as a case, the paper seeks to address the limited conceptual development for understanding (collective) change agency in food system transitions, by specifying the relevant functions of different actors and role categories (Kortetmäki & Huttunen, 2022), and of agencies emerging from the adoption of multiple roles by change agents; in manners, to enable a more systematic inclusion of varying values, identities, motivations and purposes of agents (Huttunen et al., 2021).

In this paper, we set out to answer three questions:

> *What actions are taken by relevant change agent organizations within the Chilean agroecology-transition-in-the making to advance this transition, and how do these relate to transformative roles?*
>
> *When and why do change agents perform the same roles, and what does this imply for their relations (e.g., complementary, antagonistic)?*
>
> *What does a more fluid analysis of roles and their strategic adoption tell us about collective change agency for food systems transitions?*

As becomes clear from section 4.5.1, our case shows multiple and diverse change agents within the Chilean agroecology transitions-in-the-making, including different types of societal actors (farmers, NGOs, scientists, public sector officers). Each of these change agent organizations and networks is composed of same type of societal actors such as farmers, scientists, NGOs; and each organization focuses on changing different parts of the food system; so internally, quite homogeneous in composition. Furthermore, each of them advances this agroecology transition through a combination of different transformative roles, as depicted by our theoretical framework. In what follows, we will first give a summarizing and deepening analysis, after which we will discuss theoretical implications and future research questions.

4.6.1 Summarizing analysis

All change agent organizations played simultaneously the role of frontrunner (with exception of FEDAECH, which was still a network made up of frontrunner farmers initiatives), connector, supporter and to a certain extent toppler. Connectors in the sense of institutionalizing sustainable agroecology solutions or practices within the mainstream food system. Yet, besides FEDAECH, there were less connectors in the sense of facilitating different change agents' organizations intra-organizational or intra-network cooperation. We found that no change agent played topplers position neither in terms of having power to phase out or change mainstream food system institutions to give way to agroecological ones, nor, in having a critical mass of supporters able to create a movement. Yet, all change agents aligned with some actions attributed to topplers by our theoretical framework; specifically, that of articulating and externalizing agroecological values through their respective actions and within their immediate contexts.

In our case there was thus no specific transformative roles associated with particular types of change agent organizations. This is aligned with previous studies indicating that one particular change agent category cannot be associated with a particular actor role (Story et al., 2011; van Poeck et al., 2017). Our research aligned with previous studies that have suggested that actor roles in transitions are erratic, since actors can belong to different role categories (de Haan & Rotmans, 2018; Fischer & Newig, 2016; Hauck et al., 2020; Mossberg et al., 2018). Nonetheless, we note that some change agents may be more easily in a connector, and eventually toppler, position (Mossberg et al., 2018). For instance, in our case, INDAP was able to connect agroecology within the Ministry of Agriculture policy agenda at a time when there was a political alignment with INDAP's Director. Frontrunners farmers' organizations have also been struggling for a long period to connect agroecology with the Ministry policy agenda, and created FEDAECH for that purpose. Yet, it seems more challenging for them –and eventually, for other non-

public sector change agents– to connect their visions to the policy domain. In particular, these organizations face challenges in the need to mobilize supporters in order to have political clout in face of public agencies.

Our case also shows little inter-organization cooperation among different change agents organizations, as well as contestations within and between different organizations. Thus, in our case, different change agents organizations and networks relations can be of independence, co-existence, or lack of cooperation (Avelino & Rotmans, 2009). In our case, this may be related to the overlapping roles of change agents, and their focus on different entry points in the food system for transformation. This lack of cooperation does not imply a lack of collective change agency. Albeit uncoordinated or incidentally strategic, in our case there is collective change agency, insofar as each change agent organization is contributing to advance change within a certain food system component. However, in our case, we note that due to these overlaps, antagonistic relations can emerge between change agents about how agroecology should be institutionalized in public policy, an issue with broad implications across food systems and with relevance for those working in multiple food system domains. It may be that working in different areas of the food system has resulted in organizations playing these fluid and multiple roles, without often coming into contact or being compelled to strategically coordinate. As a result, when there is a broad spanning issue, overlapping roles are mobilized in ways that generate moments of conflict or antagonism.

Our findings resonate with previous agroecology studies indicating the absence of inter-organizational or network cooperation and of a value-based broad network (or movement) amongst change agents engaged within an agroecology transition in Chile (Cid-Aguayo, 2011; Gaitán-Cremaschi et al., 2020; Muñoz et al., 2021; Rossing et al., 2020), as well as from other contexts (Dale, 2020; Isaac et al., 2018; Norder et al., 2016). Hence, what our case and these previous studies indicate is that the sharing of agroecological values by different change agents doesn´t amount as an explanation for change agents to form alliances and join forces, as indicated by our theoretical framework (de Haan & Rotmans, 2018). Furthermore, that even amongst those sharing a broad consensus about the need for an (agroecological) transition, there might be contested visions (Scoones et al., 2015). In our case, about how to formally institutionalize (or connect) agroecology at the policy level. The latter, resonates with previous authors indicating that tensions amongst actors often arise when once loose, fragmented activities as part of movements and networks become institutionalized and 'mainstreamed' (Melissa Leach & Scoones, 2007).

Given this, our findings led us to different reflections about the utility of our theoretical framework for examining and further understanding collective change agency, which we will discuss in the next section on theoretical implications.

4.6.2 The limited applicability of discrete change agent roles in practice

Our theoretical framework allowed us to characterize different change agents in terms of their actions, roles and alliances. This was helpful to have a general overview, analysis and understanding about multiple and diverse change agent organizations in the Chilean agroecology-transition-in-the-making, their actions and how these respectively relate to different entry points for agroecology transitions as carried out by different change agents therein, as well as in relation to each other. Nonetheless, we note two main shortcomings of our framework for examining and further understanding (collective) change agency in sustainable food systems transitions.

We note shortcomings with respect to the conceptualization of these four role categories. First, the framework refers to supporters as not transformative change agents themselves. By contrast, our findings show that supporting roles are relevant to advance transitions. In our case and in line with previous studies, supporting others to implement agroecology food practices, often, through the sharing of knowledge resources, has proven fundamental to supporting the transition (Lamine et al., 2021; McGreevy et al., 2021; Minh et al., 2014). Second, our findings did not validate the clear distinction between frontrunners and connectors; the latter, in the sense of connecting sustainable solutions to the system, contributing to their institutionalization.

Our case shows that frontrunners implementing alternative solutions to those provided by the mainstream system also 'connect' and contribute to institutionalizing sustainable solutions within mainstream food systems. For instance, frontrunner farmers initiatives making available sustainable food to citizens, while institutionalizing sustainable and fair organizational forms for food distribution. Furthermore, transitions are considered institutional change processes (Fuenfschilling & Truffer, 2016) with a normative focus on sustainability values (Darnhofer, 2015), with many studies about agency in transitions using institutional theory concepts (e.g., 'institutional entrepreneurs', 'institutional work') to denote change agents or their actions, respectively (Duygan et al., 2019; Hoogstraaten et al., 2020). From this perspective, not only connectors and topplers, but all change agent role categories should contribute to institutionalizing sustainable food system practices while de-institutionalizing mainstream ones. This seems to be well addressed in the concept of 'institutional work', indicating that to examine and understand how actors change (or not) the status quo, attention must be played on their actions that contribute to create, disrupt or maintain dominant institutions (Duygan et al., 2019).

Our findings also did not validate the clear existence of a toppler role category within the Chilean food transition environment, as it is unlikely any change agents have the power to change or phase out mainstream food system institutions. We found evidence that some change agent organizations may have the potential to play a toppler role within a particular context, highlighting the fluidity of role adoption among change agents. Relatedly, we found that the framework does not make explicit power differentials and the effects on contested relations between different change agents. For instance, among change agents that are more likely to access a toppler positions (e.g., the public sector) as compared to farmers organizations. Topplers may be a more emergent role, played strategically at a moment within transformation, and yet those that have this power may also occupy a position where they are less likely to use it. The framework does not elaborate on the actions and processes change agents need to enact to become topplers, rather than connectors or frontrunners, when they may strategically be in a good position to do so.

4.6.3 Reflections on the fluidity of change agent roles between complementarity and antagonism

Our study thus shows the dynamic and fluid nature of (collective) change agency in sustainable (food) systems transitions. As seen in our case and previous studies, where change agents can play (simultaneously) multiple transformative roles, as the same overlapping roles amongst them, which can change overtime (Mossberg et al., 2018; van Poeck et al., 2017). Nonetheless, while all change agents can play multiple and the same roles, our case shows that some transformative roles might be more easily accessed by some change agents depending, for instance, on their resources, organizational skills (Mossberg et al., 2018; Nasiritousi et al., 2016), or social position. Hence, as previous authors indicate we cannot see change agents as sticked to static roles and interests (Pesch et al., 2017) or as simply fulfilling a specific function in a pseudo-mechanical 'system' (Mossberg et al., 2018) or according to their societal function or position. No specific transformative roles can be associated with particular types of change agents, and actor roles in transitions are erratic, since actors can belong to different role categories (Fischer & Newig, 2016; de Haan & Rotmans, 2018; Hauck et al., 2020; Mossberg et al., 2018).

Change agents can perform these multiple and overlapping roles both in complementary or antagonistic manners (Haxeltine, Avelino, et al., 2016; Haxeltine, Jørgensen, et al., 2016). Research about collective change agency for transitions tends to focus on how change agents build cooperative relations amongst them (de Haan & Rotmans, 2018), while referring to antagonistic interactions (e.g., contestation, competition) between change agents and those actors that resist transitions. Nonetheless, as shown in our case and previous studies, antagonistic relations can also emerge amongst change

agents (Haxeltine, Avelino, et al., 2016; Haxeltine, Jørgensen, et al., 2016; Scoones et al., 2017). In our case, it is precisely (in part) due to these contestations that more cooperative interaction is needed amongst change agents. Because they cannot advance transitions on their own due to their contested framings, specifically in our case with respect to agroecology policy-making and formal policy institutionalization. Hence, research about collective change agency in transitions should address both change agents cooperative and antagonistic interactions (Haxeltine, Avelino, et al., 2016; Haxeltine, Jørgensen, et al., 2016), contributing to further understand what kinds of issues generate complementarities and contestations among change agents in a fluid role environment.

Not doing so, may contribute to disregard the plurality of change agents; for instance, in terms of their interests, goals, priorities, political visions and values, resources and power. And, as previous authors warn, leading to mistaken conceptualizations of change agents' collective agency as monolithic blocks (Nasiritousi et al., 2016) or single political clouts (Hargreaves et al., 2013; Haxeltine, Avelino, et al., 2016; Haxeltine, Jørgensen, et al., 2016). In turn, contributing to overlook the conditions and challenges beyond sharing same values or a same ideology involved in forging more cooperative collective change agency (Saunders, 2007) as well as the importance for (food system) transitions to 'open up' space for discussions where change agents settle emerging tensions, diverging interests and make their contestations explicit, in which the plurality of change agents participate (Leach et al., 2007; Leach & Scoones, 2007; Leeuwis et al., 2021).

Taking fluid approaches such as 'roles' seems useful to address this multi-faceted and dynamic social complexity involved in collective change agency (Mossberg et al., 2018; van Poeck et al., 2017; Wittmayer et al., 2017). Yet, in line with previous authors, we contend that the value of ideal role typologies, and more broadly the 'roles' concept, is not their explanatory power (van Poeck et al., 2017). Their value for further understanding collective change agency in transitions seems rather as heuristics offering conceptual clarification to approach the social complexity of collective change agency (van Poeck et al., 2017). That facilitate a systemic inclusion and examination of heterogeneous change agents involved in transitions, their (changing) relevant functions and roles categories in these processes (Mossberg et al., 2018; van Poeck et al., 2017; Wittmayer et al., 2017). Further analysis can enable to examine their relational agency, for instance identifying where change agents complement each other, when and for what there is potential for furthering synergies and strategic cooperation amongst them, as well as when they are being antagonistic to each other.

Moreover, crucial for agency is that change agents understand the opportunities and constraints implied by their immediate context, being able to expand their agency by positioning themselves wider in space and time (Grin et al., 2011); hopefully, in

synergy to other change agents. As such, role typologies can also help as flexible and makeshift heuristics to inform the practice of change agents in ways that increases their competence to drive transition processes (van Poeck et al., 2017). For instance, in terms of what actions they can take in consideration of their different (and eventually changing) transformative (collective) goals, the opportunities and constrains for agency within their context, as well as in relation to other change agents and actors therein. As such, (ideal) roles (typologies) can be seen as resources from which change agents can draw to initiate, manage or implement transformative change (Wittmayer et al., 2017) to flexibly and reflectively navigate different roles in transition processes (van Poeck et al., 2017; Scoones et al., 2020).

4.6.4 Recommendations for further research

Based on the theoretical implications discussed above, we offer a number of directions for future research.

Further research about (collective) agency in transitions could continue to develop and improve transformative role typologies (Wittmayer et al., 2017). For instance, by identifying and enriching different role categories with further actions and practices, skills (e.g., organizational and mobilizing capacity, conflict resolution) and resources (e.g., knowledge, economic, legitimacy, social position, legitimacy) change agents need to develop in order to play them. Also, the challenges involved in different role categories for when different change agents play them. This development can be based on role categories as the ones identified in our theoretical framework, as well as other role categories considered in previous transition studies. For instance, brokers (Hargreaves et al., 2013; Laurens Klerkx & Aarts, 2013; Mossberg et al., 2018) or policy entrepreneurs –which are not constrained to the public sector– (Mintrom & Rogers, 2022). Also, by exploring roles that emerge in transition processes in particular contexts through inductive –rather than deductive, as in our case – research approaches (Hauck et al., 2020; Mossberg et al., 2018; Wittmayer et al., 2017).

Importantly, further development of transformative role typologies should consider issues of power. Acknowledging that while all change agents may (be willing to) play the same role categories, not all of them have access to them in equal conditions (Nasiritousi et al., 2016). Thus, contributing to address criticisms on the neglect of the role of power and agency in transition studies (Grin et al., 2011; Shove & Walker, 2007; Smith et al., 2010; Stirling, 2011).

Further research could also examine antagonistic dynamics amongst change agents and their roles, and their implications –whether negative or, perhaps, positive– for collective

change agency in advancing (or hindering) transition processes. For instance, previous studies have shown that actors committed to the same transition (i.e., change agents) may compete for leader roles and dominant positions, or seek to brand themselves as the pioneers of these transitions (Mintrom & Rogers, 2022). Furthermore, research could further explore the different competing discourses and 'ideal type' descriptions of roles and their political implications, and/or the negotiation role processes between change agents (Wittmayer et al., 2017).

Finally, research could also examine whether when certain change agents have the capacity to play multiple roles as compared to others leads to unequal power distribution amongst them (Kern, 2015; Nasiritousi et al., 2016), and what this implies for the possibility and importance of including within transition processes marginalized change agents –and eventually, other (marginalized affected) actors as well–. This is relevant in order to advance sustainability food system transitions as truly inclusive (Hinrichs, 2014) and democratic processes (Hassanein, 2013) where the plurality of change agents and their agencies are considered.

4.7 Conclusions

The urgent need for food systems transformation (Foran et al., 2014; Webb et al., 2020) will be supported by the action of different actors, so-called change agents (e.g., civil society, policy makers, business). These change agents seldom are effective by themselves, but collectively advance food system transformation through relationships, networks and processes of cooperation (Köhler et al., 2019; Renting et al., 2012; Rossi et al., 2020; Rossi et al., 2019). However, the scientific field of sustainability transition –including within food systems (El Bilali 2019a; Stahlbrand, 2016) – has been criticized for its lack of actor-based sensitive analysis and oversimplified conceptualizations of agency (Huttunen et al., 2021; Rauschmayer et al., 2015; Smith et al., 2010). Thus, further conceptual development is needed to examine agency in transitions that enable a more systematic plural inclusion of varying values, identities, motivations and purposes of agents (Huttunen et al., 2021) and specify relevant functions of different actors and role categories (Kortetmäki & Huttunen, 2022).

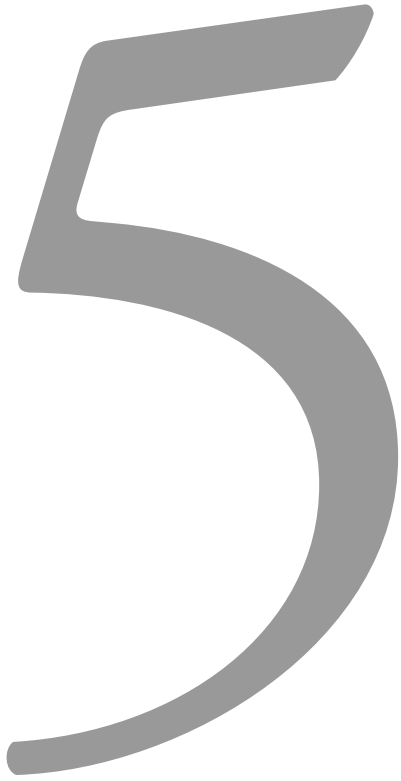
In our case, the mechanisms of collective change agency that underlie the framework were not clearly meaningful; that is, the framework and its model of collective action assumes that change agents create alliances (e.g., initiatives, networks, movements) on the bases of their shared values and in line with diverse and complementary roles. In doing so, it neglects the diversity of change agents engaged within a same transition and playing more fluid roles, and the fact that, even though they have strong conviction

and share similar values they may hold contested visions. Therefore, our application of the framework was limited in its capacity to analyze the diversity of change agents engaged within a transition, as well as their relations and interactions. Given the political dimensions of transitions, the fact that these are ongoing contested processes involving continuous negotiations about values and visions influences the possibility of building strong political coalitions or movements among change agents (Leach & Scoones, 2007).

The fact that all change agents play simultaneously multiple transformative roles, and overlapping roles amongst them, may question the utility of transformative role categories. If agents are playing all roles in some way or another, does it make sense to apply the concept of change agent roles at all? In line with previous transition studies (Mossberg et al., 2018; Wittmayer et al., 2017), we consider that examining (collective) change agency in transition processes through 'roles' remains useful. Particularly, as in our case, the role categories generated a comprehensive analysis of various change agents, their actions and relations in transitions (Mossberg et al., 2018; Wittmayer et al., 2017). A more fluid approach that considered the multiple roles that agents play, and the salience with which they are enacted in particular contexts, allows us to see how antagonisms may arise in a transition process. As such, roles allowed us to unravel the social complexity and dynamism involved in collective change agency: where a certain type of change agent organization does not specialize in a particular role and function in transition processes.

In addition, in our case change agents did not build inter-organization networks, coalitions and movements on the bases of their shared values and goals but instead different change agents simultaneously played multiple, overlapping roles. We suspect that many change agents in food transitions follow similar patterns of adopting multiple roles and enacting them fluidly and in relation to particular issues. In our case we found that a high stakes issue with broad implications across the food system — institutionalization through certification— generated conflict particularly as different change agents enacted similar roles. Future research could further explore what kinds of issues generate complementarities and contestations among change agents in a more fluid role environment.

CHAPTER 5



Unravelling non-human agency in sustainability transitions

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ABSTRACT

While agency has received considerable attention in recent sustainability transitions studies, as well as in the literature on socio-ecological systems and sustainability transformations, the focus has been on the agency of humans. Given the emphasis on infrastructures and material culture in sustainability transitions studies, it is surprising that non-human agency has not received more attention. This paper aims to add to the body of work on agency and actor-oriented approaches in sustainability transitions, and addresses this gap by investigating the role of non-human agency in shaping sustainability transitions. Through an application of Actor-Network Theory, we followed the Bagrada hilaris pest, and analyzed the roles performed by the Bagrada as a so-called actant within a network of humans, as part of a transition-in-the-making towards more sustainable food systems. The Bagrada has been a key actant in provoking changes towards sustainable pest management in Chile, destabilizing regime practices associated with pesticides, and creating and mediating relationships between different human actors. In terms of transition theories, particularly the multi-level perspective, this case illustrates the relational nature of agency. The main theoretical implications are that: a) actants from all levels (niche, regime, landscape) are linked in networks of relations that make change happen; b) the landscape level is not void of agency; c) boundaries between levels are fluid. We conclude that relating to non-human actants and understanding how to mobilize them for normative goals can help catalyze sustainability transitions.

5.1 Introduction

The issue of agency has been gaining prominence in sustainability transitions studies (de Haan & Rotmans, 2018; Wittmayer et al., 2017), as well as in the neighboring field of sustainability trans- formations (Westley et al., 2011, 2013). Sustainability transitions studies were initially criticized for an over-functionalistic approach and for neglecting issues of agency and power struggles (Duygan et al., 2019; Fischer & Newig, 2016; Grin et al., 2011; Shove & Walker, 2010; Smith et al., 2005). This critique led to new theorizing around agency in transitions, furthering our understanding about the actions, strategies, functions and roles different actors perform in a process of transition. Recent studies have contributed to understanding transition politics by conceptualizing (shifting) power relations between actors in sustainability transitions (Avelino & Wittmayer, 2016), and has theorized the roles of different actors in transformative change (de Haan & Rotmans, 2018; Wittmayer et al., 2017). Empirical studies have shown how diverse actor groups can contribute to transitions; including: social movements (Ornetzeder & Rohracher, 2013; Seyfang et al., 2014); incumbents (Musiolik et al., 2012; Späth et al., 2016; Turnheim & Geels, 2013); technology manufacturers (Musiolik & Markard, 2011); policy makers (Quitzau et al., 2012), and intermediary actors (Hargreaves et al., 2013; Kivimaa, 2014).

Understandings of agency in sustainability transitions have been based on concepts such as (collective) institutional entrepreneurship (Duygan et al., 2019; Hassink et al., 2018; Heiskanen et al., 2019; Hermans et al., 2013; Jolly et al., 2016) and institutional work (Fuenfschilling & Truffer, 2014; Rogers et al., 2015). Concepts such as institutional entrepreneurship and institutional work refer to different activities through which actors may be able to create new institutions, as well as disrupt or maintain existing dominant ones (Duygan et al., 2019; Fuenfschilling & Truffer, 2016; Rogers et al., 2015). These actions include the construction of expectations and visions, the creation of alliances and networking, the creation of legitimacy and institutional support (Berkhout et al., 2006; Bos et al., 2015; de Haan & Rotmans, 2018; Kivimaa, 2014; Klerkx & Aarts, 2013; Westley et al., 2013). Other studies have indicated the role of intermediary actors as relevant agents that catalyze transitions due to their mediating function among dispersed, diverse or previously disconnected actors, for instance, by connecting, coordinating or helping to distribute relevant information for transitions (Bush et al., 2017; Fischer & Newig, 2016). A few studies have proposed more comprehensive theories on transformative agency (Westley et al., 2013), and recognized different agency roles actors should perform for a transition to happen (de Haan & Rotmans, 2018). Lawrence et al. (2013) have argued that agency is a task distributed across several actors. This is aligned with studies with an institutional work perspective, that emphasize the role of collective actors in transition, explicitly refraining from heroic formulations of

sole actors, as often depicted in the institutional entrepreneurship literature (Jolly & Raven, 2015; Smink et al., 2015).

While many studies have improved both our empirical and theoretical understanding of agency in sustainability transitions, they have been limited to human agency. In this paper we pay attention to the role non-human actor play in facilitating change towards more sustainable systems. More specifically, we consider the role of non-human agency in relation to human agency in a case of sustainable food systems transition, by analyzing a so-called 'transition-in-the-making' (Elzen et al., 2011). We show that taking non-human agency seriously can help better understand processes of transition across multiple levels that may impact the long-term trajectory and significance of a sustainability transition. While non-human actors, such as pests, diseases or viruses, can be considered a material foundation influencing social change within an MLP framework, 'real agency' is most often attributed to human actors. Correspondingly, we ask the following research question:

> *What is the role of the non-human actor Bagrada hilaris in shaping the transition-in-the-making towards more sustainable food systems in Chile?*

We answer this question by following the relations set in motion through the arrival to Chile's central area of an agricultural pest *Bagrada hilaris*, or *Chinche Africano*[10] (painted bug). Since its appearance, the Bagrada has been destabilizing the local pest management regime –based on high use of chemical pesticides– while prompting changes in the practices of conventional farmers towards integrated pest management (IPM). In Chile, the excessive use of pesticides and resulting residues in vegetables has been recognized as a problem by public agencies, particularly with regards to the domestic vegetable market (Coria & Elgueta, 2022). By taking the example of the Bagrada and its relations to other actors, (human and non-human), we uncover and analyze the actions and roles a non-human actor can play in a process of transition-in-the-making towards more sustainable food systems.

In doing so, we contribute to work on sustainability transitions, and multi-level perspectives in particular, by exploring the agency of a non-human actor from the landscape level, the Bagrada pest, in provoking and catalyzing sustainability transitions; particularly, in the Chilean agricultural sector. We also further contribute to studies addressing sustainability transitions in the agricultural sectors or the agri-food system

10 *Bagrada hilaris* corresponds to the bug's scientific name, and *Chinche Africano* to its, make use of the common name Chinche in interviewees quotes, as was the name more often used by them, or when we provide a descriptive account of the pest. Whereas, we will use the scientific name Bagrada when referring to the bug as an actant with its own agency.

(Bui et al., 2016; Ingram, 2018; Loconto et al., 2017; Schiller et al., 2020) and the need to take into account (biological) material relations in sustainability transitions processes and analysis (Birch, 2017; Coenen et al., 2012; Grin et al., 2011; Kok et al., 2021; Markard et., 2012; Rosin et al., 2017; Svensson & Nikoleris, 2018). This has also been noted as particularly relevant for food system transitions (Darnhofer, 2020; Ollivier et al., 2018; Pigford et al., 2018).

In what follows (Section 5.2), we further develop our theoretical framework for analyzing the role of non-human agency in sustainability. In order to do so, we make a complementary use of two theories: the Multi-level Perspective (MLP), a theory that conceptualizes transitions and that provides an heuristic structure for guiding the search for patterns, causes and impacts of different phenomena during transition (Ingram, 2015); and, Actor-Network Theory (ANT) which allows us to account for non-human agency (Shim & Shin, 2019; Shin, 2016). ANT has been referenced by transition scholars as a useful theory for examining processes of transition-in-the-making (Geels, 2010). We then provide the case description and methods. This is followed by a presentation of our findings about the agency of the Bagrada in terms of its actions, the networks it creates or induces, as well its relational role within these networks. Finally, we discuss our findings in connection to the literature on non-human agency and sustainability transitions and provide our conclusions.

5.2 Theoretical framework

5.2.1 Transitions in-the-making

Transitions are processes of technological and social change that is radical or considerable, so that the way a socio-technical system (the regime) functions is profoundly transformed (Markard et al., 2012). We refer to a transition-in-the-making as a process that we cannot be certain will progress to an overall transition (e.g., the complete elimination of chemical pesticides in the Chilean vegetable food system), but in which we can see the emergence of (new) practices, networks and framings that question and destabilize an existing regime, having the potential to start and lead to a broader transition (Elzen et al., 2011). We are thus interested in emergent practices, networks and framings that are able to disrupt and challenge institutions (formal and informal), technologies, organizational, and political and/or cultural dimensions configuring a pest management regime based on the heavy dependence on chemical pesticides. Furthermore, a transition-in-the-making examines on-going processes of transition during a limited period of time; focusing on occurring developments, practices, actions, projects (Loconto et al., 2017). Whether or not these efforts will lead to a transition (e.g. a regime change affecting a broader spatial

scale) can only be determined retrospectively, which is out the scope of this study (Diaz et al., 2013).

5.2.2 Analytical lens: unravelling non-human agency in transitions-in-the- making by connecting the multi-level perspective and actor-network theories

Building upon Diaz et al. (2013), we propose a cross-over and complementary application of the Multi-level Perspective on socio-technical transitions theory (MLP) and Actor-Network Theory (ANT) to examine the agency of the Bagrada in the transition-in-the-making from heavy pesticide use towards more sustainable modes of production. While the MLP can be a useful heuristic to position different actors involved in a transition at different levels (Diaz et al., 2013), the theory does not provide the analytical lens to analyze actor (inter)actions (Diaz et al., 2013; Elzen et al., 2012; de Haan & Rotmans, 2018; Ingram, 2015). Diaz et al. (2013) brought MLP and ANT together to analyze interactions between niche and regime actors, and it was also suggested by Pigford et al. (2018) as a way to better account for materiality and ecology in sustainability transitions. Here, we make use of ANT in order to unravel the actions of the Bagrada non-human actor. In what follows, we explain both theories and how we complement them.

The multi-level perspective and agency at different levels

The multi-level perspective on socio-technical transitions (MLP) depicts transitions as emerging from the interplay of three analytical levels: landscape, socio-technical regime, and niches. According to different interactions among these three levels, different transition pathways are developed, for instance, transforming or replacing an existing socio-technical regime (Geels & Schot, 2007).

The socio-technical regime refers to social (e.g. organizational, institutional, political, cultural, market) and technological arrangements configuring and stabilizing, in this case, the dominant Chilean local vegetable-food system (Ingram, 2015). The regime is usually locked-in to incremental innovation pathways that hinder transformation (Brunori et al., 2013; Seyfang et al., 2010). The niche level represents a source and breeding ground for radical innovations that may start a transition process with the potential to transform the regime (Geels & Schot, 2007).

In a conventional MLP model, significant transitions are more likely to begin at the niche level and aggregate up to the regime and landscape level through a somewhat linear process. By assuming niche development as the starting point of transitions, this model did not take into account other transition pathways (Geels et al., 2016) wherein

change originates from landscape or regime level (Kivimaa, Hyysalo, et al., 2019). Some authors have highlighted the critical role of 'hybrid actors' (actors belonging to both the niche and regime) play in advancing sustainability transitions, as well as the role of 'intermediaries' and 'boundary spanners' for mediating and connecting other actors from different MLP (or other) (Kivimaa, Boon, et al., 2019; Kivimaa, Hyysalo, et al., 2019; Smink et al., 2015). As such, changes have been proposed which emphasize a less linear change trajectory, and a broader diversity of potential actors.

The landscape corresponds to macro-level factors, while also being a context of social and physical factors where niches and regimes are situated (Smith et al., 2010). Because the landscape level highlights the 'technical and material backdrop that sustains society', it is the level that most explicitly addresses materiality (Geels, 2011; Svensson & Nikoleris, 2018). Landscape level inducements are fundamental in the development of all transition pathways, putting pressure to the regime and opening opportunities for niches (Geels et al., 2016; Geels & Schot, 2007). The general assumption is that actors can only respond to this level, and that there is no room for agency (Raven et al., 2012) or at least actors cannot influence it in the short run (Geels & Schot, 2007). Thus, there is a tendency to include it as a 'background': a scale with no 'activities' (Coenen & Truffer, 2012). In a systematic literature review, Fischer & Newig (2016) identified actors at the landscape level as having weak or no agency, although studies have suggested that civil society could be a landscape actor insofar as civil society represents general landscape-level cultural trends able to induce regime changes (Seyfang et al., 2010). In this article we elucidate the agency role of a landscape-level actor, the Bagrada pest, in provoking sustainability transition in the Chilean agricultural sector. It has been argued earlier that in transition studies the role of biological and ecological agents, such as pests, needs to be contemplated better (Pigford et al., 2018; Vermunt et al., 2020). However, we must first clarify how we conceptualize a pest as an actor.

Actor network theory (ANT)

ANT was proposed as an alternate approach to social theory by science and technology study scholars Michel Callon and Bruno Latour (1981). ANT can be usefully applied to analyses of technology in research that move beyond the assumption that technology is simply an instrument utilized by humans (Shim & Shin, 2019; Shin, 2016). Instead, ANT claims that any element of the material and social world can be an actor, or in their parlance, an actant. Hereinafter, we distinguish both human and non-human actants, and when only 'actor' is used it refers to human actants. Following the logic of ANT, any action is the product of a network of actants who have characteristics and capacities that work collaboratively in a sphere of action. As such, a change agent (or mediator in ANT terms) is any 'entity' – whether this is 'social', 'natural' or 'technical' –that problematizes

or destabilizes a network, or enables others to come together by connecting, mediating among and mobilizing others (Latour, 2005; Sayes, 2014); contributing to previously unrealized action (Legun & Henry, 2017; Rosin et al., 2017). The challenge of applying ANT is that it can be counter-intuitive in so far as it 'reverses our common understanding of actors and agency, e.g., when it cuts across the subject-object division underlying our thinking about the world we live in' (Jessen & Jessen, 2014).

To be clear, ANT does not attribute intentionality to non-humans neither does it presuppose that agency implies intentionality (Sayes, 2014). Intentional human action is a type of action that it is not the only nor incompatible with other forms of agency, and indeed, must rely on external agencies beyond individual control (Sayes, 2014).

Following ANT, humans and non-humans are linked together in a web of relations referred to as actor-networks (Iskandarova, 2016). Networks (loosely defined) do not naturally and inherently exist. Networks emerge when multiple actants start interacting with each other, and form relations. Networks are constituted and re-constituted in actual processes of doing (Arora & Glover, 2017). The stability and cohesiveness of a network is a product of the ability of any actant to become indispensable to the continuity of the network, enrolling the other participants (Rosin et al., 2017).

In ANT, the process by which actants make relations is referred as translation. Translation involves four phases:

i. Problematization (actants frame problems and solutions, identifying potential allies to be enrolled in their network);

ii. Interessement (the actions actants employ to interest others to enroll them in the network);

iii. Enrolment (a successful interessement leads to setting-up the alliances with the interested actants, while negotiating and coordinating their roles and interest within the network);

iv. Mobilizing allies (identifying spoke-persons that legitimately represent the network in order to gain support from others and expand the network).

Translation is not a linear process but supposes continuous moves and countermoves among the different phases according to on-going (re) negotiations and (re)making of relations between actants. For instance, actors may (re)negotiate problem framings and their solutions, and relations between actants can be collaborative or conflictual. Relations can also be primarily semiotic or material in ways that become mutually constitutive in a network. That is, a material is understood conceptually within a network (e.g. the Bagrada is conceptually a pest that eats vegetables within an agricultural network) and a concept is only meaningful insofar as it is materially grounded in a network (the meaning of pest management is dependent on the material presence of plants and bugs, and may not have the same meaning, or any meaning at all, in another set of material relations) (see Law, 2009). This semiotic-material stance of ANT helps to account for both the material characteristics and symbolic meanings that enable non-humans to act in ways that are coherent to us, and it describes how networks are stabilized.

5.2.3 Connecting the MLP and ANT to unravel non-human agency

Some scholars have pointed-out that it is unclear how relational ontologies –including ANT– can be useful to analyze transition dynamics beyond the empirical mapping of cases (Geels, 2010), and to the incompatibility between MLP levels and ANT's flat ontology, which denies the analytical usefulness of 'levels' (Geels, 2011). ANT is not an explanatory theory. It does not seek to explain why or how a network takes a certain form (Latour, 2005). Instead, Latour presents ANT as a method of how to examine and describe relations and actions. In applying ANT, the focus should not be in mapping the resultant network, but on how the network forms; thus, on the work that actants do to create and sustain those networks and relationships (Müller & Schurr, 2016). Whereas, studies crossing-over MLP and ANT have contributed to unravel how the boundaries of the niche are fluid (Diaz et al., 2013).

We also want to note that the phases of translation resemble many actions recognized by previous studies on agency and transitions that have not used ANT. For instance, problematization relates to actions such as vision making, or the framing of problems and solutions (Bakker et al., 2012; de Haan & Rotmans, 2018; Klerkx & Aarts, 2013; Westley et al., 2013). Actions such the creation of alliances (Kivimaa, Boon, et al., 2019; Musiolik & Markard, 2011; Westley et al., 2013), connecting actors and facilitating negotiation amongst them (Smink et al., 2015), are similar to translation phases of interessement, enrolment and mobilizing allies. Likewise, the mobilizing of allies relates to what previous transitions studies have identified as the creation of legitimacy and institutional support (Kivimaa, Boon, et al., 2019). Hence, ANT remains coherent with the actions attributed to actors by previous works examining (human) agency in sustainability transitions.

The MLP will serve as heuristic to conceptualize the transition from heavy use of pesticides (regime) towards integrated pest management and biological control, and to position the different actants involved in this transition-in-the-making. ANT will allow us to follow the Bagrada, tracing the emergent networks of relations that surround it. Through further analysis of these networks, and by focusing on the actions and relations of each actant, we can better understand the roles the Bagrada and other actants are playing within their networks, as well as the relevance of these roles and relations for transitions.

5.3 Case description and methods

5.3.1 Case description

This study is a qualitative study based on an empirical case study of the *Bagrada hilaris,* a bug that has been recorded as an aggressive pest for several vegetables in Asia, Africa, Europe, North America and, recently, in South America (Faundez et al., 2017). In Chile, the Bagrada was first detected in late 2016 in Estero Las Cruces, Metropolitan Region, very close to the case study area (Lampa), from where it spread to other Chilean regions. It is suspected that the pest arrived by land or international air transport (Faundez et al., 2017).

As will be elaborated in the Findings Section, since its arrival, the Bagrada has been destabilizing the existing pest management regime at the local, regional, and to a lesser extent Chilean national levels. This pest management regime is based on the high use of chemical pesticides (Coria & Elgueta, 2022; Corral et al., 2017); and external inputs in general. The problem of high-pesticides use in Chile has been made public by researchers (Corral et al., 2017; Elgueta et al., 2017; Muñoz-Quezada et al., 2016), by newspapers (Cornejo, 2019), and to a lesser extent by the Ministry of Agriculture, through the agency INIA (Zolezzi, 2012). Particularly, in the Metropolitan Region during the periods 2003–2007 it was found that 61% of lettuces could not be exported to the European Union due to pesticides residues, only 28% of spinaches complied with Chilean maximum pesticides allowed (lower than the EU), and 92% of cabbages presented *methamidophos*, an extremely dangerous pesticides for human health that was not allowed by the Ministry of Health (Rojas-Walker et al., 2007).

The Bagrada has also been mobilizing a whole network of actants –human and non-human– working to get the pest under control. Given the challenges associated with high-pesticides use, these networks have had to search for alternative methods such as

Integrated Pest Management (IPM), and biological control. IPM has been defined as '...a decision-based process involving coordinated use of multiple tactics for optimizing the control of all classes of pests (insects, pathogens, weeds, vertebrates) in an ecologically and economically sound manner.' For a farmer, IPM implies the following: i) simultaneous management of multiple pests; ii) regular monitoring of pests, and their natural enemies, and antagonists as well; iii) use of economic or treatment thresholds when applying pesticides; and iv) integrated use of multiple, suppressive tactics (Ehler, 2006).

While through IPM a reduction in farmers' pesticide use and dependence might be achieved, it is not a radical innovation targeting, for instance, radical changes in farmers' practices (e.g. eliminate chemical use), or other political and institutional dimensions. Lamine (2011) indicates how IPM might seem less radical when compared to, for example, organic agriculture, as IPM entails a reduction in the use of chemicals, whereas organic farmers must dispense from their use. Still, IPM remains relevant because it forms part of several conventional farmers transition trajectories towards ecological practices; including organic agriculture (Lamine, 2011). We accept that a transition to more responsible pesticide use is a small intervention in the broad scheme of agricultural systems, and so it may easily be envisioned as simply a process of spraying quantifiably less. However, moving away from broad-spectrum chemicals routinely applied, to targeted chemicals applied strategically and in combination with other pest-management strategies requires a shift in basic, long-practiced cultural norms in farming. Previous food systems transition studies have addressed IPM as a niche (Lamine, 2011; Loconto et al., 2017), that might help a transitions towards more sustainable agricultural practices, and more general 'ecologization' of agricultural practices (Lamine, 2011). Hence, such a transition process and efforts should not be underplayed as a breeding ground for transitions due to a supposed lack of radicality.

The transition-in-the-making process undertaken by the Bagrada and its related network can be linked to what Smith et al. (2005) coined as an 'endogenous renewal context'. Such a context arises as a response from the regime to external pressures for change –in this study, caused by the Bagrada aggressively eating crops–, and are characterized by a conscious and articulated response from regime members willing to change the regime. However, because innovative activity is constructed from within the regime itself, innovations tend to be incremental and path-dependent (Smith et al., 2005).

The Bagrada case illustrates an on-going process of a network of actants emerging around a technological niche (in this case, IPM and biological pest control overlapping niches) in their attempts to bring-up changes within the current Chilean domestic vegetable production regime; specifically, to significantly reduce farmers' heavy use and

dependence on chemical pesticides for vegetable production. For this, we consider the case of the Bagrada as a good example of a transition-in- the making process.

5.3.2 Methods

Qualitative data was gathered between September 2018 and June 2019 in Chile, following similar methods from studies examining non-human agency through ANT (Shim & Shin, 2019; Shin, 2016), or complementing ANT with MLP (Diaz et al., 2013). In order to follow the Bagrada, the lead author undertook observation from November 2018 until July 2019 in different activities related to the Bagrada; these include the *Mesa-multisectoral de Bagrada hilaris de Lampa* (Multi-sector round-table for *Bagrada hilaris* from Lampa), and in public agencies organized seminars related to the *Bagrada hilaris.* In addition, semi-structured interviews with some Mesa participants were conducted, and secondary data was revised.

The Mesa is a public-private platform where once a month different actors meet in Lampa, a rural county of the greater Metropolitan Region, to discuss how to manage the Bagrada pest. Among the Mesa participants are affected farmers, and public officers from various municipal, metropolitan, and regional departments. INIA, a private-public agency aimed at developing agricultural research and extension, and the SAG (*Servicio Agricola y Ganadero;* National Agricultural and Livestock Service), the national agency responsible for the country's phytosanitary control and protection, are also engaged. Both agencies are funded by the Ministry of Agriculture. The lead author also attended and undertook observation in two seminars related to *Bagrada hilaris*: i) Expo- Chile-Agrícola (October 2018, Santiago), where the SAG presented the actions it has taken in relation to the Bagrada; and, ii) a seminar where the project 'Developing an Integrated Pest Management with low environmental impact for mitigating *Bagrada hilaris*' populations for a competitive and sustainable horticulture' was launched by the INIA (November 2018, Lampa, Metropolitan Region). The seminar included presentations by INIA researchers and SAG officers.

Observations in the Mesa and in seminars were complemented with six purposive semi-structured interviews conducted with some participants from the Mesa. Interviews were carried out with two affected farmers, an officer from the SAG, two INIA regional extension officers, and a Municipal agricultural officer. Interviewees were asked about how they have been affected by the Bagrada, and what they envision as solutions. They were also asked about what they expect from, and contribute to the Bagrada network that exists around the Mesa. A personal history focusing on what has happened since the Bagrada became a significant pest was also recorded for each interviewee. Finally,

secondary data was reviewed. This included different public agency documents related to the Bagrada (SAG, 2017), as well as webpages news.

Data was coded and analyzed using Atlas.ti software. A combination of deductive and inductive-coding was applied. Deductive codes were derived from the application of MLP and ANT theories, such as MLP levels of actants involved; actions taken by different actants (e.g. enrolment, mobilizing allies, others); relations between actants, while at the same time being open to emergent observations (e.g. interactions of conflict, collaboration; resources).

5.4 Findings

In this section we first reconstruct the actor-network that has been invoked by the Bagrada, tracking the relations between different actants (from different MLP levels) that have been enrolled into the Bagrada's network. Thereafter, we explain the roles the Bagrada plays within this network, analyzing how, by enrolling other actants into its network, it has provoked changes in their roles and relations. Finally, we summarize our findings.

5.4.1 Networks invoked by the Bagrada: tracking the relations

Around September 2016 the Bagrada, also known as the Chinche, arrived for the first time to the central area of Chile (Metropolitan Region), affecting different counties including the Municipality of Lampa. The Bagrada spread rapidly (also to the Valparaiso Region) (Faundez et al., 2017), eating considerable hectares of vegetable crops, resulting in severe losses to farmers (Farmer 1, Farmer 2). As a farmer indicated, '*we were desperate*' (Farmer 1). Since its arrival, the Bagrada has problematized the issue of 'pest management', enrolling a whole range of different actants from the regime into its network, while also triggering the formation of two new regime actors networks; these networks are: i) the Lampa's Farmers Association, and ii) the Mesa (described above) (Farmer 1, Farmer 2, Interview 1, Interview 2, Interview 4) (Figure 5-1). The Bagrada can be seen as a landscape actant: an external shock putting pressure within regime actors from the pest management regime, opening opportunities to the Integrated Pest Management and biological control niches, as we further elaborate below.

Among the first actants enrolled into the Bagrada's network were affected conventional farmers who sought help to control the pest by connecting to three other regime actants: pesticides, the Municipality of Lampa, and an INIA extensionist (Farmer 1, Farmer 2, Interview 3, Interview 4, Interview 5). Surprised by the large number of Bagrada in farmers' crops, the INIA extensionist reported the situation to a SAG regional officer

(the SAG is the Ministry of Agriculture's Agency in charge of pest control and plants protection), who in turn, informed SAG's national authorities that the Bagrada was becoming a serious problem. Farmers told us that at first, the SAG national authorities had a slow response (Farmer 1, Farmer 2). Whereas, a slow and bureaucratic response from the SAG was necessary in order to properly understand the pest (e.g. its behavior and biology) in order to create an adequate plan for its control (Interview 3).

One of the first measures of the resulting SAG action plan was testing and registering chemical pesticides to control the Bagrada (Interview 3, Interview 4, SAG, 2017). Because the Bagrada has been absent in Chile, when it started to spread there were no pesticides legally approved for its control (Interview 3). Under a situation of emergency –officially declared because of the great damage the Bagrada was causing to farmers´ crops– the SAG approved nineteen pesticides that had shown to be effective for controlling the Bagrada (Interview 3, Interview 4; SAG, 2017). This action was collaboratively taken across three agencies associated with the Ministry of Agriculture: INIA (who tested the pesticides), SAG (who officially registered them), and FIA (who provided the funding) (Interview 3, Interview 4). This first measure corresponds to regime practices associated to pest management; so far, most farmers have depended on pesticides for managing the Bagrada, and pests in general. And, it was seen as necessary to give farmers a fast and effective response, while stopping the Bagrada from spreading to other territories, as both SAG and INIA officers indicated (Interview 3, Interview 4).

During the period that came after this list of 19 pesticides was approved, SAG inspector officers in the field noticed that farmers were applying too many chemicals in order to control the Bagrada (Interview 3, Interview 4). Many farmers were fined by the SAG, and tensions among the SAG and farmers emerged due to the, at times, excessive or improper use of pesticides to control the Bagrada (Farmer 1, Farmer 2, Interview 3, Interview 4).

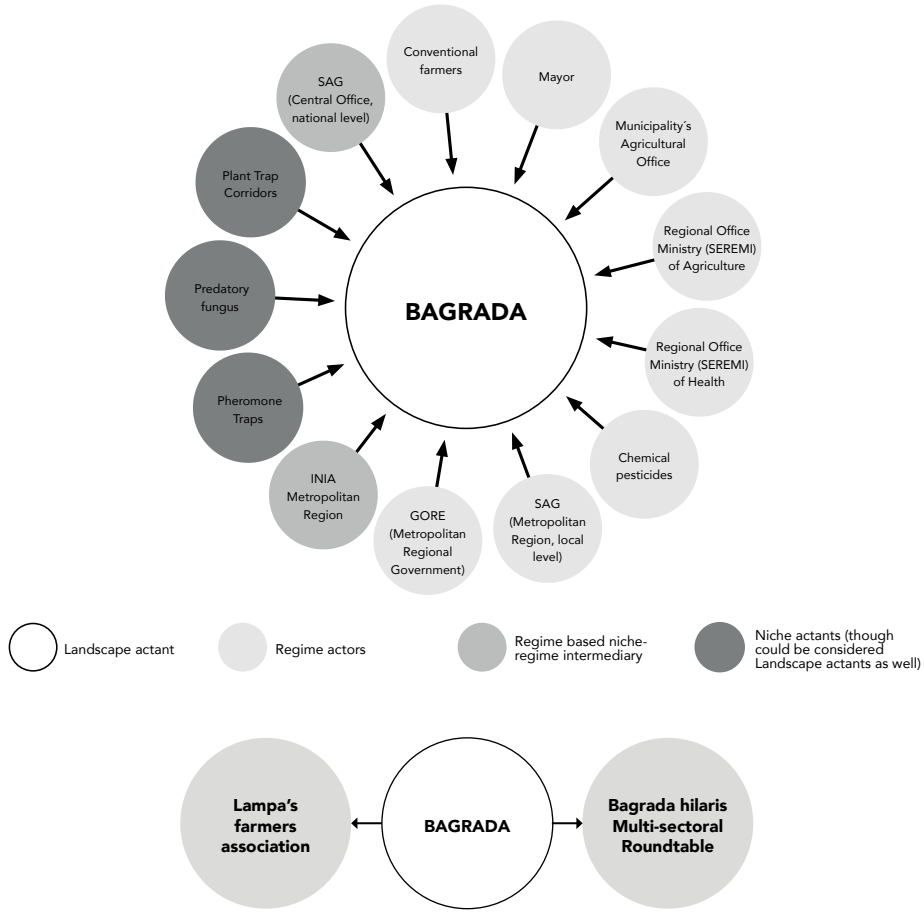

Figure 5-1: Tracking the relations, actants and networks invoked by the Bagrada.

a) Actants –from different MLP levels– enrolled into the Bagrada's network.

b) New formal networks triggered by the Bagrada.

Alternative methods to pesticides to help control the Bagrada and reduce chemical applications were investigated by INIA researchers and extension officers with support of both SAG and FIA (Interview 3, Interview 4). In turn, three more actants were enrolled into the Bagrada's network: i) entomo-pathogenic fungus, ii) insect's pheromones, and iii) plant-trap-corridors. These were being investigated and introduced by INIA and SAG officers in farmers' fields under the two-years project entitled 'Developing an Integrated Pest Management with low environmental impact for mitigating *Bagrada hilaris*' populations for a competitive and sustainable horticulture'. This project was mandated by the SAG, funded by the FIA, and implemented by the INIA (Interview 3, Interview 4). As indicated by both a SAG and INIA officers, the objective of the project

was not to eliminate farmers use of chemicals, but to make them transit to an integrated pest management (Interview 3, Interview 4).

Entomo-pathogenic fungi, which are fungi that attack insects, are effectively killing, and thus controlling, the Bagrada. Additionally, pheromones have been shown to effectively attract the Bagrada, and will allow farmers to remove pheromone-field-traps full of Chinches and, in the case of plant-corridors, sprays to be targeting the corridor rather than the crop (Interview 3, Interview 4, Interview 6). The relations be- tween the Bagrada and the three new network actants constitute promising alternatives to conventional pesticide use by helping to either reduce or replace chemical use, or at least to avoid chemical spreading over crops (Interview 3, Interview 4). Therefore, these fungus and plant- trap-corridors emerged as a focus for INIA researchers, who, through this two-year project implemented and tested these methods in both conventional and organic fields in Lampa. Entomo-pathogenic fungi, pheromones and plant-based corridors can be considered as actants from the niche, on which's relations to other actants the transitioning towards IPM and biological pest management methods depend.

We consider INIA, and partly the SAG, as 'hybrid actors': they belong to the regime level food system agencies (the Ministry of Agriculture), while also being the actors connecting and translating niche innovations (IPM, biological control) to the regime (Elzen et al., 2012). Further and more precisely, we consider the INIA and SAG, as regime-based intermediaries (Figure 5-1.a): they are part of the established institutions in the predominant socio-technical regime, but mandated or willing to work towards transformative change; as such, they also differentiate from non-transition-oriented regime intermediaries (Kivimaa, Boon, et al., 2019). As indicated by an INIA officer, '*the Bagrada will serve us as a tool, because it has been such an aggressive pest, leaving everyone surprised and the whole story, we will take it as an opportunity to persist with the issue of reducing and minimizing pesticides use*' (Interview 4). Hence, the Bagrada can be seen as both a catalyst and supporter of these regime-based intermediaries in their efforts to introduce IPM and, who in turn, are playing an important role in this transition-in-the-making, linking the need for IPM and biological control methods to the practices of regime conventional farmers.

As mentioned above, farmers also sought help from the Municipality of Lampa. There, the mayor advised farmers to organize themselves in order to have more strength in their demands to public agencies (Farmer 1). The advice and support of the mayor resulted in the creation of the first '*Asociación de Agricultores de Lampa*' (Lampa's Farmers Association) in history, which now has 74 members, all of which are conventional farmers (regime actors) from Lampa. The formation of the 'Lampa's Farmers Association' was a relatively fast process taking around two months, during which Lampa's municipal social workers

and lawyers were at farmers' disposal, in order to guide them in social and legal aspects related to what means to constitute and function as an organization (Farmer 1, Farmer 2). As a result of this work, farmers formed their association and voted to elect a President and Vice-President. The elected President and Vice-President were two farmers who had previously put together a list of names and signatures of all farmers from Lampa whose crops were being eaten by the Bagrada. While the aim of the list was to present it to public agencies in demand for support, it also helped as a first step to identify, convoke and organize farmers (Farmer 1, Farmer 2). Since then, both the President and Vice-President have been the spokespersons of the Association in the *Mesa-multisectorial de Bagrada hilaris de Lampa* (Farmer 1, Farmer 2, Mesa Observation).

The *Mesa-multisectorial de Bagrada hilaris de Lampa* (*Bagrada hilaris* Multi-sectoral Roundtable) is another network triggered by the damage brought about by the Bagrada (see Figure 5-1.b). The Mesa was born out of the demand of the Lampa's Farmers Association –in their aim to receive support to tackle the Bagrada–, and convoked by Lampa's Agricultural Office (Interview 5). The Mesa is a multi-sectoral roundtable gathering together private actors (farmers) and public agencies from the local, regional and national level. Participants of the Mesa include: conventional farmers; Lampa's Municipality Agricultural Office; INIA La Platina (Metropolitan Region); the Regional Office of the Ministry of Agriculture (SEREMI *de Agricultura*); the Regional Office of the Ministry of Health (SEREMI *de Salud*); SAG officers from both the regional (field inspectors) and national levels (National Officer for protection against pests) (Interview 5, Mesa Observation). As indicated in an official Mesa's meeting-agenda, the aim of the Mesa is '*to create a space for communication, evaluation and developing coordinated strategies in order to face the problem Bagrada hilaris is causing in fields from Lampa and adjacent counties*' (Mesa Observation, 05–06–2019).

In the Mesa, farmers and the different actors from the public sector local, regional, and national levels work together to find solutions for the Bagrada based on sustainable pest management methods (Mesa Observation). One of the Mesa actions has been the creation of a radio pro- gram broadcasted by Lampa's local radio. As an officer of Lampa's Agricultura Office mentioned, '*the radio program is aimed to improve farmers and public agencies relations, as farmers used to see* [SAG] *inspectors as enemies*' (Interview 5). The latter, reflects the conflictual relations that at times have emerged, for example between SAG and Lampa's Farmers Association with regard to pest management as a response to excessive pesticide use.

As a result of the work done by the actors in the Mesa, the Bagrada's pest management network has continued to expand. One of the latest Mesa achievements has been mobilizing a considerable amount of eco- nomic resources from the GORE (*Gobierno*

Regional – Regional Government) in order to fight the Bagrada. The Mesa lobbied with COREs (*Consejeros Regionales* – Advisors from the Regional Government), who are elected representatives from the GORE, in order to secure funding for the pheromone-traps that have proven to be effective to attract and trap the Bagrada (Mesa Observation). Advised by COREs, the initial project of testing pheromone-traps turned into a more ambitious one: a project able to educate and reinforce in farmers the implementation of IPM practices (e.g. crop rotation, pest monitoring, applying the least pesticides possible, and in an informed and targeted manner), alongside with the other biological methods that were proving to be effective (Interview 3, Mesa Observation). Following CORE's advice, for a couple of months, in their meetings Mesa participants discussed what the project would look like (Mesa Observation), while this was co-written by INIA and SEREMI of Agriculture public officers (also Mesa participants), and continuously revised by the GORE for project improvements (Interview 3, Interview 4). Finally, the project was approved by the GORE.

In the Ministry of Agriculture Project, 'Developing an Integrated Pest Management with low environmental impact for mitigating *Bagrada hilaris*' populations for a competitive and sustainable horticulture', biological control agents have been researched by INIA officers as alternatives to chemical pesticides. The new project implies the transfer of both projects' findings to a total of 450 farmers in the Metropolitan Region, including management alternatives for the Chinche for conventional farmers, as well as organic farmers or those transitioning towards organic (Interview 4).

5.4.2 Roles of the Bagrada in the network

We can see the Bagrada provoking antagonistic relationships with all other actors in the Mesa, destabilizing an existing pest-management regime. Yet, we can see that the Bagrada catalyzes new elements being introduced, and new relationships forming within the pest management network so that vegetable production can continue. That is, as an antagonist, we see that the Bagrada has reorganized all other network actants (human and non-human), while also being an intermediary among these actants' relations, semiotically holding them together. For instance, while not physically present, the Bagrada is the central conceptual actant of the Mesa, as many Mesa participants indicated (Farmer 1, Farmer 2, Interview, 3, Interview 4, Interview 5, and Mesa Observation). As a farmer explained in a Mesa meeting "*if I am here is because of the Chinche*" (Mesa Observation, 05–12–2018). With this we mean that the Bagrada is the actant maintaining the network, connecting previously disconnected regime actors, making them collaborate and coordinate their actions for a common objective: tackling the Bagrada.

We can also see how the Bagrada is producing changes in actants' roles and also in different human actants' (or actors) relations, as we will further explain here. In changing the roles of those actors, the Bagrada is requiring new actants to enter the network to stabilize its function. These may have broader regime and landscape changes in the overall system.

First, triggered by the Bagrada, while also supported by Lampa's mayor, we can see a change in conventional farmers' role in two senses. First, from uncoordinated and disparate actors within the territory to a legally constituted farmers' organization: the Lampa's Farmers Association. As an INIA officer indicated, "*the benefit of the Chinche is the organization that farmers have achieved among them, which is a tool they have from now on, that will help them in anything they aim to achieve"* (Interview 4). The latter statement illustrates how regime changes may be emerging from the Bagrada. Indeed, while so far the work of both the Lampa's Farmers Organization and the Mesa have been focused on the battle against the Bagrada, the farmer's association –also through their work in the Mesa– has discussed how to approach and demand public agencies support for other agricultural issues, such as water scarcity, which every year appears more severe (Mesa Observation, 06–03–2019; Interview 5). Farmers value the organization they have achieved since the Bagrada arrived, signaling that they have realized how having an official organization is useful to them to achieve outcomes (Farmer 1, Farmers 2).

Second, as perceived by both farmers and an INIA officer, the Bagrada has been an opportunity to change the relationships among public officers and farmers (Farmer 1, Farmer 2, Interview 4). Since the Lampa's Farmers Association and the Mesa were created, farmers have taken an active role in the search of solutions for the Chinche, rather than being, as previously, subjects to which INIA researchers and extensionist 'transfer' research outcomes.

Third, the Bagrada and the work done in the Mesa has also produced changes among farmers' and SAG, as well as a change of role from the SAG. As a farmer would indicate:

'*... the SAG came here and inspected us, saying that we were applying pesticides wrongly. But they assume that because you are a farmer you know all the legal, environmental and sanitary norms associated to pesticides application. One of the effects of the Bagrada is our labor-union is unravelling and we don't have idea at all. That is why in the Mesa we demanded that they train us in legal, environmental and sanitary issues associated to pesticides use*' (Farmer 2).

These tensions were exposed by farmers in the Mesa (Farmer 1, Farmer 2, Interview 3). As part of the solution, Mesa participants agreed on the implementation of training courses for farmers about the impacts of pesticides, as well as proper and safe use. So far,

courses on 'maximum chemical-residues-allowed', 'credentials for chemical applicants', and 'Decreto 158' (a Ministry of Health legal norm concerning chemicals residues in vegetable), have been offered to farmers by public officers from the SAG, INIA and the Regional Office of the Ministry of Health, respectively. These courses, as well as a change of role of the SAG, are perceived by farmers as one of the Mesa's best achievements, along with the funding mobilized from the GORE project (Farmer 1, Farmer 2). As farmers indicated, they value a change of role in the SAG, which passed from been merely an inspector of pesticide use to also been a facilitator –in collaboration with the INIA– to farmers on the proper use of these chemicals (Farmer 1, Farmer 2). This change of role of the SAG has also helped to smooth farmers-SAG relations, which in turn have allowed them to better collaborate against the Bagrada, while slowly making farmers more aware and better informed about legal, health, safe and environmental issues related to pesticides use (Farmer 1, Farmer 2, Interview 3, Interview 4).

The Bagrada has been active in connecting previously disconnected regime actors, including farmers and public agencies, as well as public agencies that usually worked uncoordinated; such as the INIA and the SAG. Despite these two agencies belong to the Ministry of Agriculture, so far they have rarely worked together in addressing pest management issues (Interview 3, Interview 4). Also, by enrolling in the Mesa the SEREMI *de Salud* (Regional Office of the Ministry of Health), and its participation in giving training courses to farmers about pesticides damages and adequate use. In spite both the Ministry of Health and the Ministry of Agriculture have a role in safeguarding adequate pesticides use (e.g. inspecting, testing pesticides) both Ministries also use to work uncoordinatedly, independent from each other (Interview 3, Interview 4). As indicated by a Mesa member, "*if we can attribute something to the Chinche is that is has helped farmers and public agencies to collaborate, and to realize that working together we can achieve better outcomes*" (Interview 4).

The Bagrada is also producing changes in the relations farmers have to pesticides, requiring new forms of knowledge and institutional support, as well as in the role pesticides play within the network, requiring the introduction of new pest management strategies. While there are also efforts to change farmers' use of pesticides in vegetable production through legal and social means, to some extent, the changes we describe have been compelled directly by the Bagrada and its effects on the very functioning of pesticides. That is, changes in the relation of farmers towards pesticides are not solely due to both the inspecting and educating role of the SAG (which in turn, derived from the excessive use farmers were doing to control the Bagrada). If it were up to many of these farmers, they would continue to apply as much pesticides as they can (Interview 3, Interview 4). However, the Bagrada is such an aggressive pest that it would demand excessive chemical applications for an effective control, which ultimately is not economically viable for

farmers (Farmer 1, Farmer 2, Interview 3, Interview 4). The problem of the Bagrada is its high mating rates; thus, while pesticides can kill adult Chinches, they don't destroy the huge amount of eggs present in the soil, which then hatch, leading to crops full of Chinches again, as explained by an INIA officer.

The lack of an effective response of the Bagrada to pesticides is compelling farmers to realize for the first time, that pesticides will not be an effective nor economical solution to tackle the Bagrada, challenging previous reliance on pesticides. Farmers have come to see that: "*the solution* [for controlling the Bagrada] *will be to research and see which are going to be the best fungus* [for a biological control of Bagrada], *because it was already proven that chemicals did not gave results and that biological control is the ideal…Chemicals are not solution because on the one side, it is not business* [as an effective chemical control for Bagrada demands too much applications]*, but also because they harm people's health*" (Farmer 1).

In other words, we can see that the Bagrada changes the function of chemical pesticides, by translating them from an easy pest control to one that is expensive and unreliable. This is compounded by the network effects of public concern, regulation, and audits, which also help to reframe chemical pesticides as dangerous and undesirable. Without anything to combat the Bagrada, the pest management network is unstable, and requires the introduction of new actants to keep the Bagrada in check. Therefore, while the Bagrada is changing farmers' relations to pesticides, as they do not appear effective anymore, niche biological control actants –such as entomo-pathogenic fungus– are starting to be more appealing for farmers, gaining a particularly meaningful role in the network and enabling changes to dominant relations between farmers and pesticides, characterized by farmers' strong dependence on chemicals as the primary and only means of pest control.

5.5 Discussion

In this paper we address the role of non-human agency in sustainability transitions specifically asking what is the role of a non-human actant, the agricultural pest *Bagrada hilaris*, drawing on a case of a transition-in-the-making towards integrated pest management, and less and more responsible chemical use in agriculture.

Here we reflect on our main findings, particularly with regard to three main elements. First, the actions and roles of non-human agency in sustainability transitions. Second, the relational nature of agency. And third, the implications of our findings for the MLP theory, particularly, in regard to how actants from the three MLP levels may interact.

5.5.1 Non-human agency in transitions: supportive and antagonistic actions and roles that condition human agency

By tracing the emergent networks surrounding the *Bagrada hilaris*, we have illustrated how non-human actants play a role in sustainable food systems transitions through the actions of destabilizing regime practices and framings associated with pesticides use, creating and intermediating relationships, changing the roles of other human and non-human actants and disrupting their networks, and compelling new actants to join the pest management network. One of the reasons the Bagrada was effective at catalyzing transitions was that it has multiple network effects: it creates or illuminates the shortcomings of pesticides, the need for new organization and knowledge networks, the value of entomo-pathogenic fungi, traps and corridor techniques that create a world in which the IPM niche is rational and practically necessary. These multiple network effects, together, can be seen to amount to a broader regime change that includes shifts in institutional organization, cultural norms and practices.

Some of the agentic actions and roles played by the Bagrada are in line with those identified in previous studies about agency in transitions. These included connecting previously disperse (human) actors (Fischer & Newig, 2016; Kivimaa et al., 2019) from the regime, triggering the creation of alliances and networking (Kivimaa, Boon, et al., 2019; Kivimaa, Hyysalo, et al., 2019; Musiolik et al., 2012; Westley et al., 2013), and in that sense also acting as a 'boundary object' (Franco-Torres et al., 2020). Further, we see the Bagrada playing simultaneously different roles in relation to other actants. While being an antagonist to all other actants from its network, the Bagrada has also performed the roles of a catalyst for the need of transition towards IPM, and of other actants' agency as well; thus, being a connector (de Haan & Rotmans, 2018), triggering the development of two new formal networks of actors committed to defeating it; an intermediary or facilitator of these networks of both material and semiotic relations; and a supporter (de Haan & Rotmans, 2018) of other actants' agency –in our case, of human niche-regime based intermediaries that have been striving to push on IPM and reduce chemical use in Chilean agriculture. Yet, the supporter role performed by the Bagrada differs from the one defined by de Haan & Rotmans (2018), who define (human) supporters as actors that are not transformative themselves, but whose endorsement provides legitimization by expressing the societal need for changed systems (de Haan & Rotmans, 2018). In contrast, also as a supporter the Bagrada is a transformative agent, which emerges in several ways from the findings.

We see the Bagrada as a transformer in that it has transformed other actants roles and practices and, in doing so, it has also changed the relations between actants, both human and non-human. The Bagrada has induced or mediated changes in the roles of the

SAG, pesticides, and biological control agents (e.g., pheromone traps and entomopathogenic fungi), among other examples depicted in the findings section. At first the SAG was limited to being an inspector of farmers' chemicals use –which generated tensions among SAG and farmers–, to thereafter also adopting the role of a facilitator –together with the Ministry of Health, the INIA, and the Municipality– for farmers on relevant information and knowledge on why and how to make a responsible pesticide use. This change of role in the SAG helped to smooth conflictual relations between the SAG and farmers. With regards to pesticides, at the beginning these were the most efficient technology to tackle the Bagrada –for both farmers and public agencies–, to later on being conceived by public agencies as dangerous artefacts which's application must be reduced, while inefficient and uneconomic technologies to combat the Bagrada for farmers. Whereas, predatory fungi went from being unknown or disregarded by farmers, to being an auspicious solution to control the Bagrada for them and public agencies. These examples illustrate how fundamental changes in actants roles and in their relations are for advancing a transition process.

These findings have several theoretical implications for understanding (non-human) agency in sustainability transitions. First, as indicated above, the Bagrada's capacity of changing actants roles and their relations, constitutes a significant role in advancing this transition-in-the-making. This is in line with Wittmayer et al. (2017) indication that fundamental changes in the roles of (human) actors and their (changing) relation to other roles are a vital element of any sustain- ability transition. Also ANT translation phases of enrolment and interessement emphasize the importance of actions that attempt to constantly (re)work on other actants' roles and relations in order to create, maintain and expand the network. Therefore, reinforcing Wittmayer et al. (2017), we consider that the capacity of changing actants roles –by creating new roles, breaking down or altering existing ones (Wittmayer et al., 2017)–, should be consider as a relevant agentic role within studies and frameworks about agency in transition, and also addressed as part of the set of actions of 'institutional work'.

Second, the fact that the Bagrada simultaneously plays different agency roles –while at the same time being an antagonist to all other actants from its network– coincides with previous studies indicating that (human) actors' roles in transitions are erratic, as actors can belong to different (role) categories that change over time and phase of the transition (Fischer & Newig, 2016). Furthermore, in our case the Bagrada was not only an antagonist to all other actants from its network, but also triggered paradoxical actions. On the one hand, producing an excessive application of pesticides, while, on the other hand, catalyzing and inducing different actions and network effects supporting the feasibility of the IPM niche. These findings challenge binary notions of actors as either opponents or supporters of transitions, which has been noted earlier (Geels et al.,

2016). Research on agency in transitions should not focus on the expected roles to be performed by different types of actors (e.g. opponents and supporters; government are incumbents, or opponents to transitions) as conducted in previous research (Farla et al., 2012), but instead, following Wittmayer et al. (2017), on the multiple and diverse roles –socially constructed, negotiated and open to change– different types of actors (as well as non-human actants) may simultaneously play (Wittmayer et al., 2017); something that can be further studied.

Third, the fact that some of the agentic actions and roles played by the Bagrada have also been identified in previous studies about human agency in transitions does not mean that non-human and human agency are equal, as previous authors also signal (Latour, 2005; Sayes, 2014; Svensson & Nikoleris, 2018). Nonetheless, it does show that there are relevant actions and roles for advancing sustainability transitions that both humans and non-humans may do and portray. Furthermore, in line with previous authors, we do not attribute to the Bagrada, and other non-humans as well, material determinism (Latour ,2005; Legun & Henry, 2017; Müller & Schurr, 2016; Svensson & Nikoleris, 2018). The Bagrada does not determine human agency, but as we have shown in our findings, it has the capacity to condition other actors' agencies; limiting, enabling or supporting their possible actions. Hence, it is important to start taking into consideration non-human agency within sustainability transition frameworks and research as others have also noted recently (Kok et al., 2021; Pigford et al., 2018).

5.5.2 Agency as relational, constructed and dependent on different actants interactions

Previous transition studies on strategic agency to support regime change have shown and emphasize how agency is relational and constituted by the interactions and dependences among different actors (Werbeloff et al., 2016). The relational, network effects of our non-human subject, the Bagrada, is clear. In our case we can see that a transition to less and responsible pesticide use and more biologically-based pest-management strategies had been attempted previously by regime-based actors as the INIA, and efforts were underway to convince farmers to switch onto these alternative practices. Alone, these discussions were unlikely to lead to significant practical change in the short-term. Moreover, despite these regime-based intermediaries intentions and normative ideals for IPM, what finally triggered this particular transition-in-the-making were the conflicts that arose among farmers and policy officers due to heavy pesticide use because of the Bagrada excessively eating crops, as well as farmers' economic (rather than normative) motivations for adopting IPM in order to reduce their expenditures in pesticides. These findings illustrate that we should not limit our understanding of agency in transitions to human agency through intentional, rational and strategic actions, as has so far been

the focus of most transition and transformation studies about agency (Brown et al., 2013; Farla et al., 2012; Geels, 2020; Werbeloff et al., 2016; Westley et al., 2013). While intentional human action is a type of action, it is not the only type of action nor is incompatible with other forms of agency (Sayes, 2014). In line with previous studies (Legun, 2015; Legun & Henry, 2017; Rosin et al., 2017), we contend that regardless of how intentional and/or strategic human agency is, at the end, agency is conditioned (limited or enhanced) and dependent on the interactions with both other non-humans and humans (Legun, 2015; Legun & Henry, 2017; Rosin et al., 2017; Sayes, 2014).

These findings reinforce previous studies that caution against too much emphasis on sustainability transitions as consensual or deliberative processes that can be intentionally managed into a certain normative direction (Hargreaves et al., 2013; Meadowcroft, 2009; Rossi et al., 2019; Shove & Walker, 2007). We agree with other authors that such an understanding of transitions may neglect interactions of conflict or (political) struggles among the involved actors, which not only seem unavoidable but also relevant in the transition-in-the-making (Avelino & Wittmayer, 2016; Geels, 2020; Genus & Coles, 2008; Jolly & Raven, 2015; Jørgensen, 2012; Meadowcroft, 2009), or overlook the role of contingency, unpredictability and untidiness in transitions: something that flat ontology approaches –including ANT– can contribute to transition studies (Geels, 2011).

Nonetheless, the existence of (previous) regime-based actors efforts influenced the significant effects that the Bagrada had on pest-management, as the tools and discourses of IPM and biological controls were readily available and pushed by the INIA, mainly. Likewise, we could see chemical regulations and SAG as influencing the effects of the Bagrada, as together they shaped the development of new training courses on chemicals and residues. We can also see how their actions for creating farmers' awareness about an informed and responsible pesticides use, and encouraging them to adopt IPM and biological control methods, are supported and dependent on non-human actants; including the Bagrada, entomo-pathogenic fungus, plant-based corridors. Further, the pathogenic nature of the relationship between the Bagrada and an entomo-pathogenic fungus has led to an expansion of research and a promising pathway forward for biological controls. While we focus on the Bagrada as a non-human actant, it is not a bounded, solitary actant, but the agency it has is very much defined by its network relations.

This serves to emphasize the ways that an actant is, in part, defined by other humans and non-humans' capacity and likely to be changed by them. As such, our findings underpin previous transition studies emphasizing agency as relational and constituted by the interactions and dependences among different actors (Rossi et al., 2019; Werbeloff et

al., 2016); including both humans and non-humans (Rosin et al., 2017). Our findings also are in line with those studies drawing from institutional theory concepts such as institutional work and collective-institutional entrepreneurship that refrain from notions of heroic change agents that are able to bring-up systemic change on their own (Jolly, 2016). Therefore, we recognize the possible need to go beyond transformative agency frameworks that explain transformative change as the outcome of particular strategies played by transformative actors (Westley et al., 2011), or, as the consequence of the intentional actions of different typological actor roles, that is, ideal types of transformative change agents with different strategies and abilities (de Haan & Rotmans, 2018). In turn, we have shown how research about agency in transitions can benefit from theoretical approaches that allow us to capture the relational and interactional dynamics among multiple and diverse actants –human and non-human– involved in transition processes. For instance, following the work of Kivimaa, Boon, et al. (2019) who use an 'ecology of intermediaries' perspective (or, as in our case, an 'ecology of actants'). Such a perspective emphasizes that, while some type of intermediaries (e.g. niche, systemic) are the most important for transitions, these need be complemented by a full ecology of intermediaries; including regime based intermediaries (Kivimaa, Boon, et al., 2019). Or, in line with the authors of previous transition studies, through the application of relational approaches such as ANT (Diaz et al., 2013; Garud & Gehman, 2012; Geels, 2010; Genus & Coles, 2008) or assemblages (DeLanda, 2016; Legun & Henry, 2017). These approaches conceive agency as a result from the relations of heterogeneous entities, both human and non-human (Müller & Schurr, 2016). As such, they can help us not only to address non-human agency, but also to examine the interdependences and interactions among diverse human and non-human actants.

In view of our findings, we argue that complementing the MLP with ANT can help us to understand the interactions among the actants across different levels involved in a transition process, and how their agencies relate to each other.

5.5.3 Implications of non-human agency for the MLP :actants' interactions at different MLP levels

Our analysis and findings have two theoretical implications for the MLP as an heuristic to understand and structure transitions.

First, the case of the Bagrada shows how a whole network of both human and non-human actants distributed across the three MLP levels (and intermediate spaces between levels) are involved in the transition-in-the-making process. These findings support Jørgensen (2012) who argues that agency for transitions is not necessarily confined to any particular level, while (human) actors engaged at all levels are not working in isolation.

Our findings also concede with previous studies indicating that distinctive boundaries between niche and regime become less clear empirically as the MLP implies (Smith et al., 2010), and that niche boundaries are not so clear cut but fluid, continuously (des)enrolling new actors (also from the regime) and redefining the links that hold the network together (Diaz et al., 2013; Jørgensen, 2012). In the case of the Bagrada we see this in the difficulty associated with categorizing biological pest agents as niche or landscape actants, as well as in the important role for advancing the IPM niche played by the INIA and SAG regime-based intermediaries, and the fact that the network of actants supporting the IPM niche belong to the landscape, regime, and regime-niche intermediate levels, rather than to the niche level. This reinforces previous studies that, through a crossing-over between MLP and ANT, have unraveled the fluidity of niches (Diaz et al., 2013).

Second, supporting previous studies (Antadze & McGowan, 2017; Avelino et al., 2017; Svensson & Nikoleris, 2018; Weng et al., 2020), the landscape no longer appears as a level without agency, void of actors (or actants) performing functions that help to advance transitions (Fischer & Newig, 2016), nor as a level in which its material aspects lack autonomous causal efficacy (Svensson & Nikoleris, 2018). As indicated by Kivimaa, Boon, et al. (2019) there is a lack of studies on regime-landscape and landscape-level intermediation. We have shown how non-human actants at the landscape level are relevant change agents, and argue that this deserve further attention. Our findings demonstrate how a landscape non-human actant –the Bagrada– is an actant causing, supporting, and reinforcing the transition from heavy chemical use to other more sustainable methods. The usefulness of distinct levels for the understanding and categorization of change agents, and actors in general, has already been questioned by previous studies (El Bilali, 2019b; Elzen et al., 2012; Jørgensen, 2012; Shove & Walker, 2010; Smith et al., 2010). Analytically, actors (and actants) cannot be attached only to one level, for example, niche-actors, regime-actors; empirically, actors are involved in transforming and intervening at all levels, without necessarily the MLP explicit about distinguishing between them (Jørgensen, 2012).

5.6 Conclusion: theoretical and practical recommendations for transition studies

While agency in transitions has received considerable attention lately in transition studies, this is focused on agency of humans. Non- humans within transition studies –such as infrastructures or the natural environment– have been recognized as relevant factors influencing sustainability transitions. However, they have not been adequately considered as agents in transition studies. By answering the question '*what is the role*

of the non-human actor Bagrada hilaris in shaping the transition-in-the-making towards more sustainable food systems in Chile?' we have shown that non-humans can be relevant change agents in provoking and catalyzing a process of transition, simultaneously doing and performing varied agentic actions and roles that disrupt the regime and reinforce a transition process, while also conditioning human agency: limiting, enabling or supporting humans possible actions. Therefore, we conclude that non-humans can be an important foundation influencing human agency and overall social change for transitions.

5.6.1 Theoretical and methodological recommendations for future research

For reasons outlined above, including non-human agency alongside human agency deservers further consideration in transition studies. Furthermore, research on agency in transitions should not be limited to strategic intentional human action, nor focused on the expected roles to be performed by different types of human or non-human actants, but on the relational and interactional dynamics among multiple and diverse agents –human and non-human– involved in transition processes (echoing Darnhofer, 2020; West et al., 2020). The agency of non-human and/or human actants, or their capacity for making transformative change happen, seems very much defined by their network relations, while likely to be changed by them. Our study indicates that actions related to changing actants roles and their relations, play a significant role in advancing this transition-in-the-making. Therefore, with regard to the MLP as an heuristic to understand and structure transitions our study has two main theoretical implications. First, that a whole network of both human and non-human actants distributed across the three MLP levels (and intermediate spaces between levels) are involved in the transition process. Secondly, that considering non-human agency implies that the landscape is no longer a level where there is no agency.

As a methodological recommendation, in line with previous studies (Diaz et al., 2013; Svensson & Nikoleris, 2018), the cross-over between the MLP and ANT proved fruitful for our research. The MLP allowed us to place actants at three different levels, helping us to unravel that diverse human and non-human actants from these levels are involved in a transition. ANT allowed us to trace and analyze the actions and relations of each actant within emerging networks of relations, which further allowed us to understand actants interactions across all MLP levels. Given this, research about agency in transition may benefit from cross-overs with ANT or other relational approaches such as assemblages approaches (Darnhofer, 2020; Legun & Henry, 2017; Shim & Shin 2019; West et al., 2020), that allow to address non-human agency, as well as agency as a composite involving both humans' and non-humans' action (Kok et al., 2021).

Finally, we are aware that our conclusions are derived from a single case study. A study such as ours could be repeated in other places and at other scales, to further examine varied forms of non-human agency in transition studies. Moreover, while our findings showed the positive effects of a non-human actant in catalyzing a transition, being cognizant of power dynamics in relational approaches (Kok et al., 2021), further research should examine the ways in which non-humans might block sustainability transitions and, in general, the multiple and varied ways in which humans and non-humans interactions help to either advance and hinder sustainability transitions.

5.6.2 Reflections for transition practice

A number of reflections for transition practice have emerged from our analysis. A first reflection for those willing to steer processes of sustainability transitions is the importance of identifying changes in actants roles and in the relations between actants needed for advancing sustainability transitions through a mapping approach such as the one applied in this paper.

Secondly, considering the specific context of every transition and socio-technical system, for any particular transition process transition practitioners need to recognize the multiplicity and diversity of agencies involved. They need to make sure these diverse agencies are addressed in ways that allow for both the identification of and for coping with the limitations of our human agency, and facilitate the interdependencies between the different agencies involved in a particular transition process. This would imply, following recent work of West et al. (2020), the importance of bringing relational ontologies into transdisciplinary research processes and sustainability interventions.

CHAPTER 6

6

Discussion and Conclusions

6.1 Introduction

There is global consensus about the need to transition from, and to transform, current mainstream food systems if we are to feed a growing population in sustainable and equitable ways (De Schutter, 2019; Duncan et al., 2022; Foran et al., 2014; HLPE, 2020; IPES-Food, 2015; Melissa Leach et al., 2020; Webb et al., 2020). To contribute to this ambition, this research has advanced empirical and theoretical understandings of sustainable food system transition pathways in Chile through an inquiry into the role of agency in transitions. This thesis brings together theories of change agency with institutional logics and relational approaches. The justification for this was outlined in Chapter 1. This thesis thus asked:

> ***How does agency play out in sustainable food systems transitions-in-the-making in Chile?***
>
> SRQ1: *How does the institutionalization of different logics influence the capacity of agents to direct transformation pathways? (Chapter 3)*
>
> SRQ2: *What are the transformative roles and relations of diverse change agents in transitions towards sustainable food systems? (Chapter 4)*
>
> SRQ3: *How does the relational agency between human and non-human change agents emerge and play out in the transition towards sustainable food systems? (Chapter 5)*
>
> SRQ4: *What are the implications of institutional logics and relational agency for sustainability transitions frameworks?*

These research questions are answered across four chapters. Chapter 2, elaborated on the context of Chilean food systems, its history and current dynamics. This context is critical to understanding how change agency in food system transitions plays out in people's daily lives (Jørgensen, 2012; Scoones et al., 2020). Chapter 2 allows agency in this thesis to be interpreted and situated within its context, in relation to specific historical processes that occurred in Chile, as well as current structures, cultures and dynamics (Novalia et al., 2020; van Poeck et al., 2017).

The three empirical research chapters examined agency and institutionalization processes within different (albeit interconnected) sustainability transformation pathways: organic agriculture (chapter 3), agroecology (chapter 4), and integrated pest management (IPM) (chapter 5). Altogether, as I describe throughout the following sections (6.2.1-6.2.5),

this body of work furthers our understanding of how agency plays out in sustainable food system transitions-in-the-making in Chile, and beyond.

In synthesizing the theoretical contributions of the research more broadly in section 6.3, I re-engage with the multi-level perspective (MLP), which was integral to the initial formulation of this research. This framework is arguably the most widely used for examining sustainability transition processes in general, and food systems transitions in particular (Darnhofer, 2015; El Bilali, 2019b; Leeuwis et al., 2021; Sarabia et al., 2021). While some food system transition scholars argue that MLP is a valuable approach to understanding and explaining large-scale transformations of socio-technical systems, it is less appropriate in explicating more nuanced transformation processes where the creation and mobilization of agency is less straightforward. This has led other authors to call for further examination of the potential contributions of institutional and relational approaches in order to improve our understanding of and analytical tools to examine agency in food system transitions (Huttunen et al., 2021; Köhler et al., 2019).

In this thesis, I use institutional and relational approaches to examine how agency plays out in sustainable food system transitions-in-the-making in Chile. Drawing from this empirical work, I argue that agency is messy, contingent and situational in terms of space, place and time. This echoes earlier work that also finds that agency is fluid, dynamic, multi-faceted, and ever-unfolding in unpredictable ways (Darnhofer, 2020; Garud & Gehman, 2012; Haxeltine, Avelino, et al., 2016; Huttunen et al., 2021; Pel, 2016; West et al., 2020).

Furthermore, agency cannot be attributed to, nor controlled by, single change agent organizations. If this were the case it would pose risks for the possibility of food system transformation. Rather, meaningful transformation always involves a multiplicity of diverse actors –both human and non-human– in plural ways. In view of these theoretical implications, I elaborate on various methodological implications for MLP, institutional and relational approaches to examine agency in food system transitions.

I end this chapter with recommendations for policy, food systems practitioners and further research.

6.2 Answering the sub-research questions: A synthesis of the main findings

6.2.1 Chapter 3: How does the institutionalization of different logics influence the capacity of agents to direct transformation pathways?

Understanding the role of agency within sustainable food system transformations goes back to a longstanding debate in the social sciences between structure and agency. Following Giddens (1984), I move beyond the dualism between structure and agency, seeing agents and structures as mutually constitutive entities. From this perspective, to understand agency and transitions, we also need to understand the institutions that underpin both mainstream and emerging food systems, since they provide the 'rules [formal and informal] of the game that structure (e.g., enable or constrain) human interactions and activities' (North, 1990; p. 3) within a given context, and the structures that need to be transformed by change agents in order to advance transition processes and transform food systems. As indicated in Chapter 1, I understand the transformation of the food system as the ultimate goal, with transitions as the processes and trajectories leading towards that goal.

Given this, Chapter 3, entitled '(Un) intended lock-in: Chile's organic agriculture law and the possibility of transformation towards more sustainable food systems' analyses how the institutionalization of different logics influences the capacity of agents to direct transformation pathways (SRQ 1). This chapter examined the institutions of Chile's mainstream food system through the analytical lens of 'institutional logics'. Institutional logics are the "socially constructed, historical [observable] patterns of cultural symbols and material practices, assumptions, values and rules by which individuals produce and reproduce their material subsistence, organize time and space, and provide meaning to their daily activity and social reality" (Thornton et al., 2012). From an institutional logics perspective, the dominant institutional logics within a system represent and are embodied in the systems' institutions. Yet, institutional logics also contains the notion of 'embedded agency': the idea that institutions and institutional logics shape the behavior of individuals and organizations. However, the latter do not simply passively adopt these logics: actors also have the capacity to (re)shape and resist prevailing institutional logics and introduce alternate logics through new practices (Hayes & Rajão, 2011; Thornton et al., 2012).

I found that, when organic agriculture was legally and formally institutionalized in Chile, the logics selected by the public sector were those that were coherent with Chile's mainstream food system policies. These logics followed a productivist export-oriented, industrial agriculture paradigm. By contrast, the logics of transformative

organic agriculture, which imply major changes to, and within, this mainstream food system (e.g. promoting human health, domestic markets, ecological integrity and rural development) were excluded. This resulted in Chile's organic legislation inhibiting – rather than driving– organic agriculture's potential as a pathway for food system transformation. This also disempowered the non-public sector change agents who were involved as it excluded their transformative organic logics from the design of organic institutions: further undermining the potential for organic agriculture to generate food system transformation. Nonetheless, there was resistance to the public sector's organic agriculture logic from change agents within the organic sector and other related fields (e.g., agroecology). This resistance emerged through the contestation of the public sector's logics and advocating agendas around human health and domestic markets' logics. It also appears through advocacy for agroecology which, in the view of non-state change agents, is a transformative food pathway that does entail a political project that challenges power relations in the mainstream food system.

In terms of answering the question "*How does the institutionalization of different logics influence the capacity of agents to direct transformation pathways?",* this chapter shows how transformational logics can be co-opted by dominant, in this case neoliberal, logics, but that change agents can continue to contest these dominant logics in diverse ways. It concludes by reinforcing the importance of making visible the way in which different food system drivers (i.e., laws) are constituted through, and by, diverse, and often competing, institutional logics. This is key to unraveling how the institutionalization of different logics may affect mainstream food system transformation (or reproduction). It shows that we cannot just simply assume that the existence of a supposedly transformative food system law (or other formal forms of institutionalization) will actually be a driver for food system transformation. Indeed it shows that we need to be cautious about formal institutionalization processes, to understand their underlying logics and make visible the political relations between different actors and their unequal power in deciding what becomes formally institutionalized (or not). As this chapter shows, when transformative food pathways are formally institutionalized but their transformative logics are excluded, this may not only hamper the possibility for food system transformation but may even be counterproductive.

6.2.2 Chapter 4: What are the transformative roles and relations of diverse change agents in transitions towards sustainable food systems?

With a clear understanding of the institutional context of Chile's mainstream food system, Chapter 4, 'Change agency roles in the Chilean agroecology transition-in-the-making', examined different change agents organizations –including farmers, scientists, NGOs and those from the public sector – and considered their role as human change agents striving to advance agroecological food systems in Chile. A central element of this chapter involved understanding and explaining how they relate to one another.

I found that there are different change agent organizations and networks within the Chilean agroecology transition-in-the-making. Each of these organizations is composed of similar types of societal actors, making them quite internally homogeneous (i.e., only including one type of societal actor). Each organization has a focus on changing a different part of the food system. For example, scientists pursue knowledge-related activities and contribute to the institutionalization of agroecology within universities. Farmers institutionalize agroecology food production and distribution, and Chilean NGOs institutionalize agroecology through practical knowledge dissemination activities targeted at farmers. With respect to the transformative roles these organizations play, these change agents organizations were both distinct in their activities and the composition of the roles they played, but the majority did engage in activities that aligned to multiple kinds of roles aimed at food system transformation. As a result, many organizations played several and the same roles, albeit in different ways.

These change agents perform these multiple overlapping roles in both complementary and antagonistic ways and I found little inter-organizational cooperation between the different organizations. There was a degree of collective agency in fostering change, although this was generally uncoordinated and only incidental. This happens because each change agent organization is seeking to contribute to the institutionalization of agroecology within a certain component of the food system. I also found competing and contesting framings of agroecology, both within and between the organizations. This came to the fore in an escalating conflict between farmers' organizations and INDAP (a Ministry of Agriculture organization), that arose when the latter tried to institutionalize agroecology at the policy level with little consideration for other change agents' different framings of agroecology.

Though I noted some shortcomings about the framework of transformative roles applied in chapter 4, adopting these role categories allowed me to unravel the relational

complexity involved in the transformative roles and the relations of diverse change agents promoting transitions towards sustainable food systems.

In addressing the question '*What are the transformative roles and relations of diverse change agents in transitions towards sustainable food systems?,* I conclude that the roles of change agents are erratic: one category of change agent cannot be associated with one particular transformative role, as they may simultaneously play multiple and changing roles, which sometimes overlap. Yet, while all the change agents can play multiple roles, some change agents are better placed to take on some transformative roles, according to their resources, organizational skills, or social position.

This chapter highlights the fluid and multi-faceted nature of roles adopted by change agents and points to the need for these to be recognized. The implications for how we understand and study change agents in transition processes is that we should not see change agents as tied to static roles and interests, or as fulfilling a specific function in a pseudo-mechanistic system. Also, just because change agents share similar goals and values (e.g., the goal of an agroecological transition), it cannot be assumed that they will build inter-organizational networks, coalitions or movements. While at times change agents complement (albeit incidentally, as in this case) each other in their actions and roles, they also contest and compete with each other in other ways. Research into change agency needs to pay attention to where change agents adopt multiple, overlapping roles and to the fluidity of their relations around particular (contingent) issues.

6.2.3 Chapter 5: How does the relational agency between human and non-human change agents emerge and play out in the transition towards a sustainable food system?

Chapters 3 and 4 focused on institutional logics and the dynamics of human change agency. However, as the literature indicates, agency in transitions is not limited to humans, and transition frameworks could better account for the ecological and technological materialities and processes involved in transitions, while also understanding them as 'actants' with agency of their own (Hinrichs, 2014; Huttunen et al., 2021; Ollivier et al., 2018).

Hence, Chapter 5 focuses on 'Unravelling non-human agency in sustainability transitions'. Through a cross-over and complementary application of Multi-Level Perspective on socio-technical transitions (MLP) and Actor-Network Theory (ANT) (Diaz et al., 2013) this chapter follows the story of the *Bagrada hilaris* pest, and analyzed the roles performed by the *Bagrada* as an actant within a network, with a view towards understanding an ongoing transition towards more responsible use of pesticides by

conventional farmers. MLP allowed me to position the different actors involved in the transition at different levels (niche, regime, landscape). To complement this, I used ANT to unravel the actions of the *Bagrada* (and other humans and non-humans) and the (inter)actions of actors and actants across different MLP levels.

I found that the *Bagrada*, whilst an antagonist to all the other actants in its network (both non-humans and humans), has also been key in provoking changes towards sustainable pest management in Chile. It destabilized regime practices that involved heavy pesticide use and created and mediated relationships between different human actors. For instance, it drove civil servants from the ministries of (human) health and agriculture, who usually work separately and with no coordination, to cooperate in supporting conventional farmers to move towards IPM practices. Furthermore, by tracing the emergent networks surrounding *Bagrada hilaris*, this case also shows how a transition toward IPM practices was dependent on the relations of farmers with other non-human agents. Farmers' reliance on pesticides was seriously disrupted by the *Bagrada*; yet, at the same time, with support of human actors (i.e. researchers and extensionists) this created new farming practices, including the use of predatory fungi, pheromone traps for insects and plant-trap corridors.

This chapter illustrates that human and non-human change agency for transitions is relational and can emerge through unanticipated interactions. These relations are constructed and dependent on dynamic interactions between different actants (humans and non-humans) that can include conflicts, negotiation and cooperation. It should also be noted that the capacity and agency of actors (and actants) to advance food system transitions is, to a great extent, defined by the capacity of other human and non-human actors and actants, and is likely to be influenced by them.

What are the implications of this chapter for MLP as a framework for understanding and explaining how change agency plays out in transition processes? The theoretical implications are that actors and actants from all levels (niche, regime, landscape) are linked in networks of relations that make transformative change happen. In addition the landscape level is not void of agency and the boundaries between the different levels are fluid. Human actors engaged in MLP (at all levels) do not work in isolation. This chapter provides a theoretical and empirical challenge to the logic of the boundaries between niche and regime that is often implied and applied by MLP (Smith et al., 2010). In resonance with earlier work (e.g., Diaz et al., 2013) I found that niche boundaries are not clear cut but are fluid, and involve the continuous (dis)enrollment of new actors (including some from the regime) and redefining the links that hold the network together (Diaz et al., 2013).

6.3 How does agency play out in sustainable food systems transformations-in-the-making: Theoretical and methodological implications

6.3.1 Implications for MLP as a framework for examining agency in food systems transitions

As noted in the literature the methodological approach of MLP allows us to examine and explain systemic changes towards more sustainable food systems (Hinrichs, 2014; Leeuwis et al., 2021; Ollivier et al., 2018; Smith et al., 2010). MLP's main strength is its ability to provide a systemic 'big picture' of the dynamics of large-scale socio-technical food systems that present persistent sustainability challenges (Smith et al., 2010). This socio-technical systemic perspective is consistent with the food system lens (Leeuwis et al., 2021).Transformative change is needed in all the components of food systems and this is a dynamic process. It is important to unravel how a positive change in one component affects other components and how this can trigger (un)desirable changes in others (Gaitán-Cremaschi et al., 2019; HLPE, 2020; IPES-Food, 2015; Leeuwis et al., 2021; Ollivier et al., 2018).

MLP provides an heuristic that allows for a relatively straightforward ordering and simplifying of the analysis of complex, large-scale structural transformations in production and consumption patterns driven by the normative goal of sustainable development (Smith et al., 2010). As other food system scholars have indicated (Hinrichs, 2014; Leeuwis et al., 2021), this can help us to identify and understand the linkages, drivers and levers that work across niches, regimes and the landscape and can reveal critical connections within these components of the food system and other systems (e.g., the energy, transport sectors) that influence the attainment of a transformation of the food system. Furthermore, in my view, and in line with previous work, MLP's structuration levels (of niche, regime and landscape) are useful in conceptualizing and examining transitions as processes that require the institutionalization of niches in order to leverage wider processes of transformation, while deinstitutionalizing regimes that lock-in harmful practices (Fuenfschilling & Truffer, 2014).

With respect to change agency, MLP provides a good entry point for a general perception and overview of multiple change agents. For instance, conceptualizing change agents – and, in general, actors– as being niche, regime, intermediary or landscape actors and positioning them within those levels (or inter-levels spaces) helps us locate them within the food regime (e.g., to what food system component they relate) and assess their likely level of influence. Nonetheless, in view of my findings, and in line with previous work (Hinrichs, 2014; Huttunen et al., 2021; Pesch, 2015; Smith et al., 2010), MLP would

benefit from a more nuanced examination of change agency in transitions. Below, I elaborate on three areas where this thesis adds to the literature on MLP and indicate how the theory could be improved.

First, MLP could benefit from a more critical approach to analyzing the movement between niche and regime, which can be referred to as structuration or institutionalization. More attention to the actors involved in structuration and their shifting agencies would generate better understandings of dynamic structuration processes, which do not always follow linear trajectories. For example Hacker & Binz (2021) indicate that when the logics of niche and regime actors are compatible, the regime may be transformed in more subtle or incremental ways. More critical findings have examined the politics of capture or co-optation (Dalmoro, 2022; Loconto & Fouilleux, 2019; Pel, 2016; Schiller et al., 2019). A deeper understanding of agency within MLP would generate more insights into the movement from niche to regime and ways that this empowers and disempowers different actors. This thesis also shows that, while institutionalization might presuppose a transition from niche to regime, if the niche's transformative logics are undermined in the process, it may well be that the regime inhibits and derails the niche level change actors who initiated the institutionalization processes. In the next section, I further elaborate on how institutional logics provides a methodology that can facilitate such critical insights.

Second, this research found that non-human actants also play an important role in multi-level processes. Change agency is constructed through the interactions between non-human and human actants, with actants from all MLP levels linked in networks of relations that make change happen. As this research found, transitions can be generated by non-humans. In this case the *Bagrada*, and these non-humans may operate across different levels, simultaneously changing niches, regimes and the landscape. MLP often focuses on linear social change in which change is cultivated at smaller levels and scales before the regime, and ultimately the landscape, are influenced. Yet non-humans are actants that can operate in a distinctly non-linear fashion. MLP could benefit from integrating relational approaches that enable the tracing and analyzing of actors' (and actants') actions and interactions within emerging networks of relations across all MLP levels. This could help MLP to address criticisms about the analytical usefulness of these levels for understanding and examining agency (El Bilali 2019b; Jørgensen, 2012). The methodological advantages of drawing inspiration from these approaches is further discussed in the following section 6.3.3.

In sum, I conclude that MLP offers a useful heuristic for examining food system transitions, to the degree that it allows for a systemic perspective. Furthermore, while some scholars have questioned the utility of MLP for examining agency in transitions

(de Haan & Rotmans, 2018; Fischer & Newig, 2016; Genus & Coles, 2008; Jørgensen, 2012; Pesch, 2015; Upham et al., 2018), I conclude that MLP does not, as a framework, preclude more nuanced approaches to agency. This thesis shows MLP can be a more useful framework for understanding transformative change when we incorporate dynamic understandings of agency (Stirling, 2011). In so doing, we can better understand why processes of niche structuration might fail, how transformation processes may be influenced by the dynamics of cooperation and conflict between actors, and how the potential for multi-level change can emerge from non-humans. Finally, MLP needs to adopt a deeper critical examination of the dynamics of institutional(ization) which may appear to advance transitions when in fact they do not.

For a more nuanced examination of food system transition processes, and how change agency is played out within them, MLP would benefit from being complemented by other approaches, including institutional and relational ones (Cohen & Ilieva, 2015; Fuenfschilling & Truffer, 2014; Huttunen et al., 2021; Köhler et al., 2019; Scoones et al., 2020). Similarly, institutional and relational-focused approaches need support from systemic perspectives to deepen our understanding of social change (Hinrichs, 2014; Huttunen et al., 2021; Scoones et al., 2020).

6.3.2 Implications of institutional logics to examine agency in sustainable food systems transitions-in-the-making

In view of my findings, and in relation to the literature, I conclude there are two main implications on how institutional logics can contribute to MLP as a tool for analyzing transition processes and the role of agency therein.

Firstly, as indicated in the previous sub-section, institutional logics can assist MLP by providing a conceptual tool that enables the qualitative examination of how emergent transformative food systems relate to (or not) to mainstream ones (Svensson & Nikoleris 2018). This is important in order to evaluate the extent to which (and in which aspects) we are advancing or inhibiting the transformation of food systems through formal (policy) institutionalization.

Second, previous work has indicated the need for a more nuanced examination of the diversity of change agents and their relationships throughout transition processes (Hinrichs, 2014; Huttunen et al., 2021; Scoones et al., 2020). It is important to have more details about different agents' values, identities, motivations, purposes and actions. Institutional logics can assist MLP –and other transition and transformation frameworks– in this. Institutional logics allows us to unravel different change agents' values, motivations, assumptions and (material) practices irrespective of the change

agents position within the MLP framework (or any other type of role categorization). By examining and further analyzing the relations between the logics of different change agents, the approach makes visible the points of convergence and complementarity, as well as the inevitable contestations involved in the politics of transition processes (Haxeltine, Avelino, et al., 2016) and power differentials therein. In relation to the latter, for instance, we can examine those logics that are being (formally or informally) institutionalized, those logics that are being excluded, why, and whose interests this serves. In these respects, institutional logics can assist MLP in developing a more nuanced and critical examination of agency in transition processes, and of institutionalization processes as well.

6.3.3 The implications of relational approaches for examining agency in sustainable food systems transformations-in-the-making

The most evident contribution of relational approaches, ANT in particular, in this thesis is that they allow for the inclusion of non-human agency (Latour, 2005). Overall there are two other main contributions that relational approaches can make when examining change agency in food system transformations.

First, the 'follow the actant' approach of relational approaches allows us to construct actants' (changing) networks of relations in which change agency is constituted. This allows us to identify forms of change agency that are more situated and contingent to a specific context. At times these may be counter-intuitive. Examples from chapter 5 of this thesis include the agency of conventional farmers who previously made heavy use of pesticides or the *Bagrada* itself (an antagonist to all the other actants within its network). The agency of these farmers would be overlooked by some transition approaches that limit their focus to central, and evident, types of actors consciously promoting transitions (e.g., frontrunners, niche-innovators, niche or regime-based intermediaries) (Huttunen et al., 2021). Indeed, this group might even be conceptualized as resistant to change within such a framework (i.e., anti-change agents). While, it has recently been acknowledged that regime actors can have transformative agency (Smith et al., 2010; Turnheim & Geels, 2019), this is only recognized when they take actions that are identified as relevant for advancing transitions (Table 1-1, Chapter 1). In a similar vein, relational approaches can contribute to MLP by identifying actions that are situated within, and relevant for, a determinate network of actors and its context. This is relevant, given that not all actions identified by MLP or previous transition studies are relevant for advancing transitions nor are they possible for actors within all contexts. Relational approaches can contribute to overcoming idealized, heroic, notions of change agents, and capture more less overt change agents, whose practices might be the most damaging and thus most in need of transformation (Huttunen et al., 2021).

Second, transitions are processes of institutionalizing the socio-technical [and ecological] sustainable configurations (niches) of food systems in order to make them more sustainable (Fuenfschilling & Truffer, 2014; Köhler et al., 2019). Instead of a focus on human change agents as connectors or intermediaries between niches and regimes (de Haan & Rotmans, 2018), relational approaches enable a thorough examination and reflection of the relations that need to be created and transformed to develop sustainable socio-technical-ecological configurations of food systems that have a high potential to be institutionalized (i.e., be practiced by more people) in a given context. This can involve reflecting on the construction of sustainable configurations (niches) of food systems that *interest* other humans and non-humans, that *enrol* them in the sustainable food system network, and that *mobilize* the actors (or actants) within it. This point is relevant for sustainability transition scholars and practitioners alike. Likewise, previous applications of a Practice Theory Approach indicate that the elements of more ecological and equitable practices must be in place and the alternatives must be preferable for users, not merely possible (Cohen & Ilieva, 2015). Strategically altering practices also involves considering the accessibility of new elements of practice (in different contexts) and the people with whom these practices will resonate (Cohen and Ilieva 2015). Relational approaches open up new domains and methods for sustainability interventions that nurture relationships in the context of place and practice (West et al., 2020).

One particular limitation of ANT and its 'follow the actant' approach is it limits the examination of change within actants' networks. This excludes other actants who are not part of this network. As Geels (2011) indicates, it is unclear how relational approaches can be used to analyze transition dynamics beyond the empirical studies of individual cases. This limits the possibilities for using ANT to examine large-scale, systemic change beyond a situated actants-networks. However, I argue that this depends on the actant one decides to follow. Whereas, Cohen and Ilieva (2015) address these criticisms of practice theory and its micro-scale focus, showing that focusing on practices can help scholars analyze the role of cities in socio-technical transitions, and help policymakers and activists to steer socio-technical change. Crossovers between relational and systemic approaches (e.g. MLP) may also contribute to the former gaining in relevance as a means for examining normative sustainable, large-scale, systemic processes of social change (i.e. transitions).

6.3.4 Implications for food systems transformation studies

Although it may be stating the obvious, it is essential to consider agency and understand its role (including its limitations) in transforming food systems. Nevertheless, agency has only recently being proposed –together with sustainability– as a critical dimension

of food security alongside availability, access, utilization, stability, food policy and analytical frameworks of food systems (Clapp et al., 2022; HLPE, 2020).

These authors argue that there are several reasons why it is essential to incorporate agency as a key dimension of food security. These include, encompassing the broader dynamics that affect hunger and malnutrition; addressing widening inequities within food systems (including imbalances of power between actors); and enabling processes that strengthen the capacity of individuals and communities to make meaningful decisions about, and to participate in any policy discussions that could affect their livelihoods or food systems. Furthermore, enhanced collective agency through having a greater voice and more participation in food system governance results in better food security and nutritional outcomes (Clapp et al., 2022; HLPE, 2020). Accepting these arguments, this thesis identifies three main implications about the importance of considering agency as an important component of food security and the sustainable transformation of food systems, and identifies ways of incorporating agency in these domains.

Firstly, the notion of agency complements systemic, macro-scale frameworks of food systems with more nuanced understandings and analysis of micro-politics and interactions. Food system frameworks have made valuable contributions to our understanding of food system transitions (Fanzo et al., 2020; Gaitán-Cremaschi et al., 2019; HLPE, 2017, 2020; Kanter et al., 2015; Weber et al., 2020) and have helped identify the variety of human and non-human drivers, interactions between system components, and the trade-offs and synergies involved between competing development objectives and the resultant outcomes (HLPE, 2017). Inserting agency within these frameworks can help us to unravel the micro-dynamics, practices and politics involved in food systems, to further comprehend the relations between macro and micro-scales, and more broadly understand the dynamics involved in food system transformations, both generally and in specific contexts.

Second, we need to consider the agency of non-humans. This is important both in terms of understanding how to better mobilize them for advancing food system transitions and how human agency is constrained by them. Furthermore, and especially in consideration of the COVID 19 outbreak, it is essential to have a broader picture of the relationship of food systems with zoonosis, and centrality of the latter in pandemics and the socio-economic consequences (Rivera-Ferre et al., 2021). Integrating non-humans within food system frameworks can also enhance understanding of, and strengthen connections between, two key emergent dimensions of the food security concept: human agency and sustainability.

Third, in order to integrate agency within food system studies and frameworks, we need approaches that account for agency as diverse, fluid, dynamic, multi-faceted, contextual, and relational. These approaches also need to consider both the manifest and the subtle forms of change agents (Huttunen et al., 2021). Analysis of change agency in food systems transformations should not be limited to engaged or 'skillful' actors working on transition processes (Darnhofer, 2015). It is also important to consider the agency of actors who are not actively engaged in transformative changes; and avoid dichotomic conceptualizations of proponents and resistors within transition frameworks. Limiting agency to the actors who contribute 'to make change happen' downplays the importance of understanding the agency of actors whose practices most urgently need to be transformed. In my view this, somehow paradoxically, also implies considering the agency of incumbents. Furthermore, we also need to consider those actors who may be willing to advance the transformation of food systems but who, due to a variety of contextual reasons (e.g., gender, poverty, power dynamics, uneven knowledge distribution or cognitive justice) or, a lack of capacity and skills to organize with others, do not have agency to become involved or make change happen (HLPE, 2020). Hence, when integrating agency within food system studies and frameworks we need to challenge dualistic, static and, sometimes, heroic notions of change agents; while, embrace more dynamic, fluid and relational concepts of agency.

Such an approach will enhance the potential of the inclusion of agency as a key dimension of food security in manners that contribute to addressing power inequalities (in all its dimensions) in food systems; including, giving adequate weight to the agency of nature and less powerful actors. Considering the diversity of change agents and their dynamic and multi-faceted interactions, it is also important to recognize and address cooperative and antagonistic interactions, making explicit –rather than downplaying– the politics and differentials of power at different places and scales (Rossi et al., 2019). All this can help us to further understand, explain and try to overcome the challenges in forging more cooperative, synergistic collective change agency within food systems transitions and transformations.

6.4 Recommendations

6.4.1 Policy recommendations

As is clear from this thesis, especially Chapters 2 and 3 (concerning Chile's mainstream food system background, and the Organic Agriculture Law, respectively), there is some evidence of the public sector's awareness about the need to transform the country's national mainstream food systems towards more sustainable forms. Yet, despite their

possibly good intentions, successive governments have continued to support mainstream food systems (Béné, 2022; Vanloqueren & Baret, 2009) and have backed away from the challenge of supporting food system transformations. The transformation of mainstream food systems implies trade-offs for the public sector; including uncertainty (Duncan et al., 2022), sunk costs from past investments in mainstream food systems (Conti et al., 2021; Kuokkanen et al., 2017), confronting powerful corporate industries (at times, even more powerful than certain governments) (IPES-Food, 2017), or making public serious political issues (e.g., those associated with high pesticide use in horticulture). This means that while public policy may reasonably be expected to play a key role in advancing the transformation of food systems (HLPE, 2020; Leeuwis et al., 2021), in practice it finds it challenging to do so. In view of my findings and previous studies, I identify some policy recommendations to address this challenge, which are elaborated below.

Take complexity seriously and adopt a food 'system' lens to policy

It is important for the public sector to acknowledge that sustainable policies for food systems are complex and multi-dimensional, as is the task of developing a 'food systems analysis' that allows for a refined understanding of how different parts of the food system function and interact with each other (Leeuwis et al., 2021). There are many food system frameworks that have been put forward by scholars and experts that can assist public sectors in this task (Fanzo et al., 2020; Gaitán-Cremaschi et al., 2019; HLPE, 2017, 2020; Kanter et al., 2015; Weber et al., 2020).

There are many good reasons for adopting a food system perspective to policy and here I highlight two that emerge from my findings and from earlier research. First, it is a way to responsibly address transformative food policy and deal with inevitable uncertainty (Duncan et al., 2022; Leeuwis et al., 2021). For instance, it enables the generation of detailed knowledge and understanding about food system dynamics and the likely positive and negative consequences of any transformations. At the same time it helps to identify what will need to be maintained within a certain context (Juri et al., 2022). It is essential that policy makers anticipate and accommodate the inherent social complexities –for example, the tensions, struggles, power relations and the winners and losers of transformation– and the negative consequences of existing and proposed food policies. In order, to make a responsible food system transformation policy, it is important to adequately compensate those who will be negatively affected (Duncan et al., 2022; Leeuwis et al., 2021).

Second, we cannot change a complex system by intervening at any single point in the system, as there are many interdependencies and dimensions involved that cannot be tackled by a single intervention (e.g., a policy, or a technological or social innovation). Nor is it realistic to approach a complex system in its entirety and intervene in every food system component and location simultaneously. Such an approach would be unfeasible and paralyzing in terms of the resources, funds and knowledge required (Leeuwis et al., 2021).

A food system analysis can help policy makers to identify plausible leverage points for food system transformation (Slater et al., 2022; West et al., 2020). These are 'entry points' into the system, where changes are most likely to catalyze subsequent changes elsewhere in the system (HLPE, 2020). Policy makers can identify plausible leverage points, and prioritize the most feasible and relevant ones (for example in terms of economic or political resources required) within any given context. This will help focus on the most relevant changes with the power to catalyze changes among other components of the food system, enhancing the possibility of transforming the whole food system (HLPE, 2020; Leeuwis et al., 2021).

For example, Chile's Organic Agriculture Law only refers to farm and food manufacturing practices and downplays the logic relating to human health. This also applies to most agroecological policies adopted in Latin America (Martínez et al., 2017). Only recently has policy started to address the relevance of health and (mal)nutrition in Chile (Kanter et al., 2019; Paraje et al., 2021). Addressing all forms of nutrition and food safety is a key dimension for attaining sustainable food systems (HLPE, 2020), which can also influence the relevant drivers of food systems' transition by making explicit concerns that might be of more relevance to citizens (e.g., in contrast to the preoccupation of the benefits that ecological agriculture has for environmental protection). This may create key leverage points for mobilizing the agency of citizens, which in turn may be more effective in affecting the agency of farmers.

Engage with a plurality of food system transformative pathways

Rather than opting for one transformative food pathway, policy makers should simultaneously support a diversity of pathways. It is important to realize that food systems are diverse (Gaitán-Cremaschi et al., 2019) and that different segments and networks of producers, traders, processors, retailers, consumers and overall change agents who work and think in different –at times antagonistic ways–, coexist within the same geographical space. This diversity means that there is not just one food system that operates according to one particular logic, but that there are multiple parallel systems serving different producers and consumers (Leeuwis et al., 2021). It also means that,

while people might agree on the final goal of building sustainable food systems, they often disagree on which of these pathways should be pursued, which are the most feasible and the most promising (Duncan et al., 2022; Scoones et al., 2020). Furthermore, there may be several possibilities to support farmers to make a transition to practice pesticide-free forms of agriculture (e.g., organic agriculture). Yet, these might not be feasible for all conventional farmers, whose practices are the most urgent to disrupt.

Hence, policy should embrace a plurality of pathways for transforming food systems (Scoones et al., 2020). This plurality should acknowledge that food system transformations include multiple, and often competing, visions and accept the viability of these plural visions. Pluralization comes with the recognition that there are no 'one-size fits all' solutions, either in the way future priorities are identified, nor in the composition of stakeholders, and that transformations will take on distinct characteristics depending on the time, local environment, territory and other contexts (Duncan et al., 2022). Embracing a plurality of transformative food pathways will make policy more able to cope with uncertainty, and result in better designed policy instruments and interventions that are coherent and plausible, according to the diversity of food system actors, their visions, interests, values and their possibilities to transform their practices and mobilize their capacities (Duncan et al., 2022); or, in other words, develop agency.

Support transformative food system pathways whilst disrupting mainstream ones

While policy that supports a plurality of food system transformative pathways (Scoones et al., 2020) is importante, much more is needed. Policy support for a diversity of food system pathways *must* be accompanied by policies that directly seek to disrupt mainstream food systems, and make explicit the relations between transformative food pathways and mainstream food systems (Eyhorn et al., 2019; Kivimaa & Kern, 2016; Michelsen, 2001a,b; Rogge & Reichardt, 2016).

Policy makers acting as facilitators of people´s change agency

Policies for sustainably transforming food systems also require a transformation in the roles of policy makers, in which they shift from the role of policy 'formulators' towards one of being 'facilitators' or 'coordinators' of policy spaces and processes where sustainable food system policies can be co-formulated (Béné, 2022; Garud & Gehman, 2012) alongside a plurality of change agents and other actors. Other 'actors' refers to those who may not be readily recognized as change agents (e.g., organizations committed and continuously working to advance food system transitions), but who are or will be affected –for better or worse– by sustainable food system transition policies.

This change in the role of policy makers is required because the possibilities for the public sector to steer and purposefully (re)design food system policies are limited (Garud & Gehman, 2012; Leeuwis et al., 2021; Scoones et al., 2020). Top-down, 'command and control', coordinated 'from the outside' policies may have rather limited and even counterproductive effects on food system transformation. This is because they tend to ignore key and often antagonistic institutional relational and political dynamics (Garud & Gehman, 2012; Scoones et al., 2020; Leeuwis et al., 2021; Duncan et al. 2022), as illustrated in chapters 3 and 4 of this thesis.

It is possible for policy makers to facilitate and coordinate spaces for a plurality of change agents, and other actors, to debate, deliberate on and co-construct policy (Scoones et al., 2017, 2020; West et al., 2020). Such spaces can facilitate change agents' collaborative efforts to navigate transformative pathways through facilitating productive interactions in which problem definitions, solutions and options are negotiated; differences resolved, and; common goals, overlapping visions, and obstacles for change are identified (Duncan et al., 2022; Scoones et al., 2020). Such spaces can also help build closer relationships amongst change agents (e.g., alliances and social networks of cooperation) that mobilize and catalyze their collective commitments and agency (Duncan et al., 2022). Most food system change agents and actors –including food system policy makers are likely to have only a partial and selective view of it and such fora would enable them to broaden their views (Leeuwis et al., 2021). Facilitating spaces for these diverse change agents to interact and share their diverse knowledge and experiences (beyond scientific) into account (i.e., promoting transdisciplinary) would help change agents detach themselves from their existing thinking routines, foster creativity and imagination, and bring in a cross-fertilization of ideas that would contribute to better sustainable food system policies (Duncan et al., 2022). By facilitating spaces for policy co-construction, policy-makers can mobilize and support the diversity of change actors and enhance their agency.

Policy makers will need to consider some key issues if they are to make such pluralist deliberative policy making processes legitimate and effective. Explicit attention will need to be paid as to how decisions are made: who decides, who is included (and excluded), the power inequalities at play, and what and whose knowledge is included and excluded (Leeuwis et al., 2021). These spaces would need to encourage participants to make their values and interests explicit (Duncan et al., 2022) and make the space for competing logics, whilst fostering a continuous and recursive policy making process of contestation, cooperation and negotiation among multiple and diverse change agents and actors; including, social movements, the private and public sectors (Campbell & Liepins, 2001). This implies the need to facilitate safe, respectful spaces, in which different actors can express their (contested) values and interests (Wijen & Ansari, 2007).

6.4.2 Recommendations for sustainable food systems practitioners: Take relationality seriously

'Taking relationality seriously' means that food system practitioners seeking food system transformation need to continually reflect on how their agency relates to that of other actors, and to be aware of points of convergence and contestation.

In this respect, practitioners should refrain from adopting heroic change agency roles (e.g., topplers, spokeperson). Certainly, leader change agents play a key role in mobilizing and transmitting coherent, normative and inspirational discourses to others, including policy makers (Charli-Joseph et al., 2018). Yet, leadership should not just be assigned to those individuals or organizations who are willing and able to lead transition processes. Legitimate leadership is gained through interactions with, and recognition by, other change agents. Only in this way, can the politics of representation be addressed. Relational approaches remind us that relations are being continuously (re)worked and negotiated by actors, including negotiations that lead to the emergence of recognized spokespersons.

Secondly, there are many essential change agents who advance transitions who are content to adopt less heroic roles and adopt less visible roles (such as those of supporters and connectors). Public extensionists and some NGOs in Chile fall into this category, being more content to support others through knowledge generation and dissemination activities.

Networking and political coalition building are key activities in the process of advancing the sustainable transitions of food systems. However, my research into the Chilean context –which is supported by the literature from elsewhere (Bendjebbar & Fouilleux, 2022; Cid-Aguayo 2011; Dale, 2020; Gaitán-Cremaschi et al., 2020; Muñoz et al., 2021; Norder et al., 2016; Rossing et al., 2020)– found that there is often little collaboration amongst change agents engaged in agroecology or organic agriculture, even though there is a potential for these actors to cooperate and develop synergies among themselves (Wezel, Goette, et al., 2018; Wezel, Goris, et al., 2018). To a certain extent, this dispersion and lack of collaboration may explain why, despite agroecology scholars frequently calling for the need to create unified agroecological movements (at different, and between, scales), it remains difficult to precisely define what agroecology is as a movement. This is partly due to the diversity and dispersion of agroecological organizations and movements in most contexts (Wezel et al., 2009, Wezel, Goris, et al., 2018) and suggests the need for more practitioners who play connecting roles. They might do so by creating connections between their own and other organizations, or by facilitating connections between organizations (not necessarily their own) that

they identify as having a potential to collaborate, complement or support each other (Hargreaves et al., 2013). Such change agents, playing the roles of connectors, can be critical in identifying existing opportunities for collaboration that currently are blocked or thus far unrealized, thus, contributing to developing synergies amongst change agents in order to accelerate the transformation of food systems.

Third, the building of cooperative relations should not be solely focused on those actors who share clear commonalities or agreement on all (or most) issues. It is also important that practitioners discuss their differences, developing dialogues around the issues where they have divergent views (Borras et al., 2018; Rossi et al., 2019; Scoones et al., 2015; Smith et al., 2014; Temper et al., 2018). This may enable them to set aside antagonistic differences and negotiate mutually acceptable strategies for moving forward food transitions. In doing so, change agents can co-construct better, and more comprehensive, inputs to inform policy development (Favilli et al., 2015) that are more widely perceived as legitimate by all (or at least a majority) of them. Again in this respect, it is important that change agents refrain from competing to attain dominant positions, or seeking to brand themselves as the pioneers of transitions (Mintrom & Rogers, 2022). Thus implies that change agents need to abstain from imposing their own visions and take into account the visions, values, interests and needs of other change agents' organizations or actors. This might relate to the direction or speed of transitions, or how a certain transformative food pathway should be practiced or institutionalized.

Fourthly, change agents in more privileged positions (e.g., firms, scientists, some NGOs) should not lay claim to represent the voice of other less privileged organizations (e.g., marginalized farmers) but should seek ways to help them find and make heard their own voice (Gonzales de Molina et al., 2019). For example, as noted by previous authors (e.g., Leach & Scoones, 2007), some agroecologists tend to depict idealized types of farmers or peasants who do not always –if not, in most cases– represent reality in terms, for example, in terms of peasants' values, interests and motivations. Those organizations that are more privileged, who are often invited to participate at round tables and whose views carry more weight in policy making processes can play a significant role here by ensuring that marginalized or excluded actors are invited to participate and are meaningful involved in these processes (Juri et al., 2022).

Fifthly, practitioners should be cautious about the formal policy institutionalization of the pathways they are supporting. In other words, practitioners should not celebrate those processes before understanding their contents and how, and by whom, these were designed. Practitioners must require to public sectors to include them in food systems governance and policy-making processes.

6.4.3 Recommendations for further research

In view of my findings and in relation to previous transitions and transformation (food) systems studies, I identify six areas where further research may be fruitful.

First, one of the conclusions of this thesis is that, while MLP is a useful framework in many respects, it does not offer the conceptual tools for a more nuanced examination of change agency. It could and should therefore be complemented by other approaches (e.g., institutional or relational ones). Nonetheless, a hasty combination of these frameworks, without critical reflection on their ontologies, would generate theoretical inconsistencies and multiply the limitations of these different approaches. Thus, careful attention needs to paid as to how to combine these different approaches (Ollivier et al., 2018). There is potential for examining the conceptual (in)consistencies between MLP and these other approaches and their potential for integration in order to examine food system transitions-in-the-making and the role of change agency therein.

Secondly, future research could also benefit from studying the possibility of developing a comprehensive theoretical framework of agency in transitions and transformations towards sustainable food systems, although there needs to be reflection on whether, and in which respects, this might ultimately be useful (or not). For instance, both transition and transformation studies have seen attempts to elaborate theoretical frameworks about agency (Haxeltine, Avelino et al., 2016; de Haan & Rotmans, 2018; Westley et al., 2013). Others (e.g. Huttunen et al., 2021) have questioned whether a single coherent framework for agency in transitions is feasible, and argue that the more nuanced understandings of agency comes from accepting plurality and a combination of theoretical approaches.

Thirdly, there is a need for research that examines the challenges, controversies, paradoxes and dilemmas of collective agency, both within the same food system transformation pathways, and amongst different but related pathways (e.g., organic agriculture and agroecology). It would also be interesting to compare the more radically transformative pathways (e.g., organic agriculture and agroecology) with the more incremental ones in which conventional farmers participate (e.g., Integrated Pest Management). Such studies would help us better understand ways in which to forge more cooperative and synergistic collective change agency between multiple and diverse change agents that often have different –and sometimes competing or contested– institutional logics.

Fourthly, one limitation of this thesis is its focus on collective forms of agency (e.g., organizations, networks, etc.). I contend that there is no or very little chance for any individual nor single organization to transform food systems, even within a local or community context. But this does not mean that individual change agency is unimportant (Charli-Joseph et al., 2018; Pesch et al., 2017; Rauschmayer et al., 2015). Individual change agents are crucial, in enabling and strengthening their own organizations' agency. Thus the agency of individual change agents and the dynamics of this within organizations deserves further research. Also, we should find out more about how individuals, organizations, intra and inter-network dynamics influence change agency within transitions and transformations and how individual and collective agents co-create contexts that contribute to the transformation of food systems (Haxeltine, Avelino, et al., 2016; Haxeltine, Jørgensen, et al., 2016).

Fifthly, policy actions that explicitly, and directly, engage in disrupting mainstream food systems play a key role in enabling food system transformation. Yet, it is not always easy for the public sector to adopt such a stance. If public policy is to play a critical role in advancing food system transformations, further research can examine how the public sector can cope with these challenges, engage with disrupting mainstream food systems and seek to overcome path dependency and locks-in.

Finally, some scholars have already provided some quantitative metrics for measuring and evaluating agency in order that it can be effectively considered and integrated as a food security dimension (e.g., Clapp et al., 2022). This thesis has contributed other theoretical qualitative approaches (namely, institutional and relational ones). However, the qualitative approaches explored in this thesis can be complemented with other approaches (e.g., political economy, political ecology, discourse analysis, governance and others) (De Schutter, 2019; Duncan et al., 2019; Moragues-Faus & Marsden, 2017; Termeer et al., 2018). Quantitative and qualitative approaches should be used in a complementary way to understand the role of agency within food security and food system transformations (Köhler et al,. 2019). Further research is needed on how to combine or complement quantitative and qualitative approaches to better understand the role of agency within sustainable food system frameworks and their transformation (Clapp et al., 2022).

6.5 Final reflections

On the 4th of September 2022 Chile voted on the constitution proposed by the *Convención Constitucional*. This time the vote was compulsory. With 85% participation (the highest in Chile's history) the revised constitution was opposed by 62% of voters. This was a striking contrast to the first referendum, in which 78% of voters (with a participation rate of just under 51%) had approved the writing of a new constitution. Opposition to the proposed new constitution gained a majority in 346 (out of 351) of the country's districts, including all low-income districts and those where the indigenous population is in a majority.

The overwhelming triumph of the reject option implied a continuation of Chile's existing constitution. Nonetheless, given the results of the first referendum, political parties (except for *Republicanos*) agreed on opening a new process for writing a new constitution.

On May 7 2023, Chilean citizens voted to elect new *Consejo Constitucional* members. If the referendum results of the previous year had been a surprise, this time the results were even more striking. Of the total of the *Consejo's* 50 seats, 22 elected members were *Republicanos* (Chile's extreme right), 11 from the right wing, and 16 members from the left and center-left and one reserved indigenous seat. Previously the left had a majority representation on *La Convención Constitucional*. Today the right has absolute veto power over the *Consejo*, with most *Consejo's* members being *Republicanos*, open supporters of Pinochet who have, since the *Estallido,* implacably opposed the idea of a new constitution for Chile.

What happened in between the first and second referendums? How a country transition from approving the writing of a new constitution, with 78% of votes, in a *Convención Constitucional* where the left was the majority, to rejecting that proposal and now having a *Consejo Constitucional* where almost half of the members are affiliated with Chile's extreme right political party?

There are some hypotheses. Including, the role of fake news against the *Apruebo* (approve) option. Or, the division of voters and politicians from *La Concertación* –since the return to democracy, what in Chile has being the center-left block–. With some famous erudite people from this block actively campaigned for the reject option, arguing that approval of the new constitution would have negative effects for Chile. A third hypothesis relates to the uncertainties associated with the approve option. For instance, the approve option campaign was centered around the slogan *"Apruebo para reformar"* (Approve to reform); somehow making explicit that there were some problematic issues within

the proposal. The invitation was to approve the proposal and later resolve these issues. Another hypothesis relates to the presence of a few arrogant constitutional members with a very high media profile who contributed to transform the *Convención* in a 'reality show' and to its delegitimization (Castro, 2022; Garín, 2022).

Certainly, we do not know yet what happened in between the first and second referendums. This will require further research and profound reflection. Nonetheless, the transformation process that Chile has been experiencing since the *Estallido* (and probable before it) until today exemplifies the non-linearity, dynamic, multi-actor, political and contentious character of transition processes that have been discussed in this thesis. The current unresolved transformation within Chile clearly shows that transformations cannot be understood as shifts from one regime to another, nor as processes that at some point arrive at an end point. Instead, transformations are better understood as ever-unfolding in uncertain and unpredictable ways through the continually negotiated (rather than controlled) accomplishment of heterogeneous actors, with different motivations and frames of references (Garud & Gehman, 2012; Jørgensen, 2012). The Chilean experience of the *Convención's* constitutional proposal also echoes North's assertion (1991) that good formal institutions are those with clearly defined 'rules of the game' (that leave little space for interpretation), which limit uncertainty, provide stability and are flexible enough to be changed when needed.

Chile's experience since the *Estallido* also illustrates agency in transition processes involves dynamism, fluidity and relationality. Some of the *Convención's* members may not have considered that people's interests, goals, perceptions are not static, determined for instance by class, ethnicity or the results of the first referendum; but that they can change (sometimes dramatically), according to contingency and how they perceive processes unfold. Some members of the *Convención* were also perhaps unaware that, no matter how unequally power is distributed, no actor controls the dynamics of a transition process (Darnhofer et al., 2019). They overlooked that the approval of the proposal did not depend on their temporary majority within the *Convención,* but on citizens' democratic votes. Thus, to a great extent the success of the *Convención* and their constitutional proposition, depended on the relations its members created and maintained with voters; something that required continuous work. They also neglected to remember that they, as advocates of the proposal, were not the only ones with relations to voters, but that opponents of the proposal such as *Republicanos* also had agency.

This thesis has aimed to further our understanding about how change agency is played-out in processes of sustainable food systems transformations. For what remains of the transformation processes in Chile, I invite Chilean citizens to further examine and embrace one of the country's most relevant filmmakers: Raul Ruiz, whom in his first

period in the seventies clearly portrayed the contradictory and fluid humans dynamics. In films where there are no linear story plots, nor heroes, nor characters stuck in the roles that society expect from them, for instance, according to their classs. I invite anyone interested in further understanding and examining the processes of transformation to look at the case of Chile, where they may find a fruitful and fascinating case.

Figure 6-1: Pablo Morales and me.

Pablo Morales, youth farmer and winemaker, member of the Ecological Farmers Organization "*Agricultores Orgánicos y Agroecológicos del Maule*", Talca, Maule Region.

22 of October, 2019.

References

Adasme-Berríos, C., Sánchez, M., Jara-Rojas, R., Engler, A., Rodríguez, M., & Mora, M. (2015). Who are the potential consumers of organic fruits and vegetables in central Chile? A CHAID approach. *Revista de La Facultad de Ciencias Agrarias Universidad Nacional de Cuyo*, *47*(1), 193–208.

Agosin, M. R., & Bravo-Ortega, C. (2009). *The Emergence of New Successful Export Activities in Latin America: The Case of Chile*. *The Emergence of New Successful EExport Activities in Latin America: the case of Chile*. Inter-American Development Bank. Washington, DC. https://doi.org/10.2139/ssrn.1807608

Alaniz, A. (2019). Preface. In A. J. Alaniz (Ed.), *Chile: Environmental History , Perspectives and Challenges*. New York: Nova Science.

Altieri, M. (2016). Una estrategia agroecológica en Chile como base para la soberanía alimentaria. *Ambiente y Desarrollo de CIPMA*, 24–29. Retrieved from http://www.agroeco.org/wp-content/uploads/2016/01/CIPMA-Altieri.pdf%0Ahttp://www.ambientalex.info/revistas/242cimpa2429.pdf

Altieri, M., & Rojas, A. (1999). Ecological Impacts of Chile's Neoliberal Policies, with Special Emphasis on Agroecosystems. *Environment, Development and Sustainability*, *1*, 55–72. https://doi.org/10.1023/A:1010063724280

Anderson, Colin R., & Maughan, C. (2021). "The Innovation Imperative": The Struggle Over Agroecology in the International Food Policy Arena. *Frontiers in Sustainable Food Systems*, *5*. https://doi.org/10.3389/fsufs.2021.619185

Anderson, Colin Ray, Bruil, J., Chappell, M. J., Kiss, C., & Pimbert, M. P. (2021). *Agroecology Now ! Transformations Towards More Just and Sustainable Food Systems*. (Colin R. Anderson, J. Bruil, M. J. Chappell, C. Kiss, & M. P. Pimbert, Eds.) (Springer N).

Antadze, N., & McGowan, K. A. (2017). Moral entrepreneurship: Thinking and acting at the landscape level to foster sustainability transitions. *Environmental Innovation and Societal Transitions*, *25*, 1–13. https://doi.org/10.1016/j.eist.2016.11.001

Apey Guzmán, A., & López Tapia, I. (2011). *Agricultura indígena chilena. Información social y productiva de la agricultura según etnia*. ODEPA & CONADI. Santiago, Chile.

Arcuri, A. (2015). The Transformation of organic regulation: The ambiguous effects of publicization. *Regulation and Governance*, *9*, 144–159. https://doi.org/10.1111/rego.12066

Arora, S., & Glover, D. (2017). Power in Practice: Insights from Technography and Actor-Network for Agricultural Sustainability. In *STEPS Working Paper 100*. Brighton: STEPS Centre.

Avelino, F., Grin, J., Pel, B., & Jhagroe, S. (2016). The politics of sustainability transitions. *Journal of Environmental Policy and Planning*, *18*(5), 557–567. https://doi.org/10.1080/1523908X.2016.1216782

Avelino, F., & Rotmans, J. (2009). Power in Transition: An Interdisciplinary Framework to Study Power in Relation to Structural Change. *European Journal of Social Theory*, *12*(4), 543–569. https://doi.org/10.1177/1368431009349830

Avelino, F., & Wittmayer, J. M. (2016). Shifting Power Relations in Sustainability Transitions: A Multi-

actor Perspective. *Journal of Environmental Policy and Planning*, *18*(5), 628–649. https://doi.org/10.1080/1523908X.2015.1112259

Avelino, F., Wittmayer, J. M., Kemp, R., & Haxeltine, A. (2017). Game-changers and transformative social innovation. *Ecology and Society*, *22*(4). https://doi.org/10.5751/ES-09897-220441

Azar, A., Franetovic, G., Martínez, M., & Santos, H. (2015). Individual, social end environmental determinants of overweight and obesity among Chilean adolescents. *Revista Medica de Chile*, *143*, 598–605. https://doi.org/10.4067/s0034-98872015000500007

Baker, P., Lacy-Nichols, J., Williams, O., & Labonté, R. (2021). The Political Economy of Healthy and Sustainable Food Systems: An Introduction to a Special Issue. *International Journal of Health Policy and Management*, *10*, 734–744. https://doi.org/10.34172/IJHPM.2021.156

Bakker, J., Denters, B., Oude Vrielink, M., & Klok, P. J. (2012). Citizens' Initiatives: How Local Governments Fill their Facilitative Role. *Local Government Studies*, *38*(4), 395–414. https://doi.org/10.1080/03003930.2012.698240

Barley, S. R., & Tolbert, P. S. (1997). Institutionalization and Structuration: Studying the Links between Action and Institution. *Organization Studies*, *18*(1), 93–117.

Barreau, A., Ibarra, J. T., Wyndham, F. S., & Kozak, R. A. (2019). Shifts in Mapuche Food Systems in Southern Andean Forest Landscapes: Historical Processes and Current Trends of Biocultural Homogenization. *Mountain Research and Development*, *39*(1), R12–R23. https://doi.org/10.1659/MRD-JOURNAL-D-18-00015.1

Barrett, H. R., Browne, A. W., Harris, P. J. C., & Cadoret, K. (2001). Smallholder farmers and organic certification: Accessing the EU market from the developing world. *Biological Agriculture and Horticulture*, *19*(2), 183–199. https://doi.org/10.1080/01448765.2001.9754920

Bauer, C., & Catalán, L. (2017). Water, Law, and Development in Chile/California Cooperation, 1960–70s. *World Development*, *90*, 184–198. https://doi.org/10.1016/j.worlddev.2016.09.006

Bell, B. W., & Juma, C. (2007). Technology prospecting: Lessons from the early history of the Chile Foundation. *International Journal of Technology and Globalisation*, *3*(2/3), 296–314. https://doi.org/10.1504/ijtg.2007.014338

Bellisario, A. (2007). The Chilean Agrarian transformation: Agrarian reform and capitalist "partial" counter-agrarian reform, 1964-1980. *Journal of Agrarian Change*, *7*(2), 145–182. https://doi.org/10.1111/j.1471-0366.2007.00143.x

Bellisario, A. (2013). El fin del antiguo régimen agrario chileno (1955-1965). *Revista Mexicana de Sociologia*, *75*(3), 341–370.

Bendjebbar, P., & Fouilleux, E. (2022). Exploring national trajectories of organic agriculture in Africa. Comparing Benin and Uganda. *Journal of Rural Studies*, *89*, 110–121. https://doi.org/10.1016/j.jrurstud.2021.11.012

Béné, C. (2022). Why the Great Food Transformation may not happen – A deep-dive into our food systems' political economy, controversies and politics of evidence. *World Development*, *154*, 105881. https://doi.org/10.1016/j.worlddev.2022.105881

Béné, C., Prager, S. D., Achicanoy, H. A. E., Toro, P. A., Lamotte, L., Cedrez, C. B., & Mapes, B. R. (2019). Understanding food systems drivers: A critical review of the literature. *Global Food Security*,

23, 149–159. https://doi.org/10.1016/j.gfs.2019.04.009

Berdegué, J. A., & López, D. (2017). Mediana agricultura y agricultura familiar en Chile hacia el año 2030. In *Agricultura Chilena. Reflexiones y desafíos al 2030. Perspectivas de Especialistas Externos.* (pp. 179–202). Santiago, Chile: ODEPA.

Berdegué, J. A., & Rojas, F. (2014). *La Agricultura Familiar en Chile*. Serie Documento de Trabajo N° 152. Grupo de Trabajo Desarrollo con Cohesión Territorial. Programa Cohesión Territorial para el Desarrollo. Rimisp. Santiago Chile. Retrieved from http://rimisp.org/wp-content/files_mf/1434743401152AgriculturaFamiliarenChileversionrevisadalarga_editado.pdf. Accessed: 2 July 2023

Berg Johansen, C., & Boch Waldorff, S. (2015). What are institutional logics and where is the perspective taking us? *Academy of Management Annual Meeting Proceedings*, *1*, 14380. https://doi.org/10.5465/ambpp.2015.14380abstract

Berkhout, F. (2006). Normative expectations in systems innovation. *Technology Analysis and Strategic Management*, *18*(3–4), 299–311. https://doi.org/10.1080/09537320600777010

Birch, K. (2017). Materiality and sustainability transitions: integrating climate change in transport infrastructure in Ontario, Canada. *Prometheus*. https://doi.org/10.1080/08109028.2017.1331612

Blanco, G., van Gastel, J., & Lagarrigue, A. (2017). Assembling Responsible Food Markets. The case of Cooperativa La Manzana in southern Chile. In S. Sherwood, A. Arce, & M. Paredes (Eds.), *Food, Agriculture and Social Change: The Everyday Vitality of Latin America* (pp. 184–197). Abingdon, Oxon: Earthscan from Routledge. https://doi.org/10.4324/9781315440088

Blay-Palmer, A., Carey, R., Valette, E., & Sanderson, M. R. (2020). Post COVID 19 and food pathways to sustainable transformation. *Agriculture and Human Values*, *37*, 517–519. https://doi.org/10.1007/s10460-020-10051-7

Boitano, L. (2011). *Análisis de la cadena de distribución en la comercialización de productos frescos en Chile: frutas y hortalizas*. MSc Thesis. Departamento de Ingenieria Industrial. Universidad de Chile.

Bolados, P., Henriquez, F., Ceruti, C., & Sánchez, A. (2017). La eco-geo-political del agua: una respuesta desde los territorios en las luchas por la recuperación del agua en la provincia de Petroca (Zona central de Chile). *Rupturas*, *8*(1), 167–199.

Borras, S. M., Moreda, T., Alonso-Fradejas, A., & Brent, Z. W. (2018). Converging social justice issues and movements: implications for political actions and research. *Third World Quarterly*, *39*(7), 1227–1246. https://doi.org/10.1080/01436597.2018.1491301

Bos, J. J., Brown, R. R., & Farrelly, M. A. (2013). A design framework for creating social learning situations. *Global Environmental Change*, *23*(2), 398–412. https://doi.org/10.1016/j.gloenvcha.2012.12.003

Bos, J. J., Brown, R. R., & Farrelly, M. A. (2015). Building networks and coalitions to promote transformational change: Insights from an Australian urban water planning case study. *Environmental Innovation and Societal Transitions*, *15*, 11–25. https://doi.org/10.1016/j.eist.2014.10.002

Boza, S., Cortés, M., Prieto, C., & Muñoz, T. (2018). Characterization and attitudes of vegetable growers in the Santiago Metropolitan Region, Chile | Caracterización y actitudes de los horticultores de la Región Metropolitana de Santiago, Chile. *Idesia*, *36*(4), 99–107.

Boza, Sofía, Cortés, M., & Guzmán, F. (2015). Caracterización de pequeños empresarios agrícolas

beneficiarios de programas de desarrollo local en la región metropolitana, Chile. *Idesia*, *33*(1), 135–142. https://doi.org/10.4067/S0718-34292015000100014

Boza, Sofía, Cortés, M., Prieto, C., & Muñoz, T. (2019). La Horticultura en la Zona Central De Chile: Caracterización Y Actitudes De Los Pequeños Agricultores. *Chilean Journal of Agricultural & Animal Sciences*, *35*(1), 57–67. https://doi.org/10.4067/s0719-38902019005000201

Boza, Sofía, Mora, M., Osorio, F., & Muñoz, J. (2018). Family farmers' reluctance toward incorporating into the formal economy. *Economia Agraria y Recursos Naturales*, *18*(2), 75–92.

Boza, Sofía, Muñoz, J., & Núñez, A. (2019). Food Policy in Chile. *Reference Module in Food Science*, 1–6. https://doi.org/10.1016/b978-0-08-100596-5.22617-6

Boza, Sofía, Muñoz, J., Núñez, A., & Díaz-Lanchas, J. (2020). Dynamics of chilean fruit exports from a regional perspective (2008-2018). *Chilean Journal of Agricultural and Animal Sciences*, *36*(1), 26–34.

Briggs, J. (2009). *Green revolution*. *International Encyclopedia of Human Geography*. https://doi.org/https://doi.org/10.1016/B978-008044910-4.00099-7

Brown, R. R., Farrelly, M. A., & Loorbach, D. A. (2013). Actors working the institutions in sustainability transitions: The case of Melbourne's stormwater management. *Global Environmental Change*, *23*(4), 701–718. https://doi.org/10.1016/j.gloenvcha.2013.02.013

Brunori, G., Barjolle, D., Dockes, A.-C., Helmle, S., Ingram, J., Klerkx, L., … Tisenkopfs, T. (2013). CAP Reform and Innovation: The Role of Learning and Innovation Networks. *EuroChoices*, *12*(2), 27–33. https://doi.org/10.1111/1746-692X.12025

Bui, S., Cardona, A., Lamine, C., & Cerf, M. (2016). Sustainability transitions: Insights on processes of niche-regime interaction and regime reconfiguration in agri-food systems. *Journal of Rural Studies*, *48*, 92–103. https://doi.org/10.1016/j.jrurstud.2016.10.003

Bulten, E., Hessels, L. K., Hordijk, M., & Segrave, A. J. (2021). Conflicting roles of researchers in sustainability transitions: balancing action and reflection. *Sustainability Science*, *16*(4), 1269–1283. https://doi.org/10.1007/s11625-021-00938-7

Bush, R. E., Bale, C. S. E., Powell, M., Gouldson, A., Taylor, P. G., & Gale, W. F. (2017). The role of intermediaries in low carbon transitions – Empowering innovations to unlock district heating in the UK. *Journal of Cleaner Production*, *148*, 137–147. https://doi.org/10.1016/j.jclepro.2017.01.129

CADEM. (2020). *Estudio de Percepción del Sector Agrícola*. ODEPA. Santiago, Chile. Retrieved from https://www.cnr.gob.cl/wp-content/uploads/2020/02/Estudio-de-Percepción-del-Sector-Agrícola.pdf. Accessed: 2 July 2023

Callon, M., & Latour, B. (1981). Unscrewing the big Leviathan: how actors macro-structure reality and how sociologists help them to do so. In K. K.-C. & A. V. Cicourel (Ed.), *Advances in Social Theory and Methodology: Toward an Integration of Micro- and Macro-Sociologies* (pp. 277–303). Boston: Routledge & Kegan Paul.

Cambeses, C., Rebolledo, R., Gonzales, S., Feijoo, G., & Moreira, M. T. (2022). Addressing the food, nutrition and environmental nexus: The role of socio-economic status in the nutritional and environmental sustainability dimensions of dietary patterns in Chile. *Journal of Cleaner Production*, *379*, 134723. https://doi.org/10.1016/j.jclepro.2022.134723

Campbell, D. (2001). Conviction seeking efficacy: Sustainable agriculture and the politics of co-optation. *Agriculture and Human Values*, *18*, 353–363. https://doi.org/10.1023/A:1015210215751

Campbell, H., & Liepins, R. (2001). Naming organics: Understanding organic standards in New Zealand as a discursive field. *Sociologia Ruralis*, *41*(1), 21–39. https://doi.org/https://doi.org/10.1111/1467-9523.00168

Candel, J. J. L., & Pereira, L. (2017). Towards integrated food policy: Main challenges and steps ahead. *Environmental Science and Policy*, *73*, 89–92. https://doi.org/10.1016/j.envsci.2017.04.010

Carruthers, D. (2010). Environmental politics in Chile: Legacies of dictatorship and democracy. *Third World Quarterly*, *22*(3), 343–358. https://doi.org/10.1080/01436590120061642

Castro, D. (2022). Qué hacer frente al voto: tres tipos de razones. Retrieved July 2, 2023, from https://www.ciperchile.cl/2022/07/22/que-hacer-frente-al-voto-tres-tipos-de-razones/

Cespedes-Leon, C., Balzarini, M. G., Zoppolo, R. J., Zarza, H. A., Rodriguez, E. M., Granval, N. I., & Torrico, I. A. (2017). Successful Organic Production Practices in the Southern Cone. *Sustainable Agriculture Research*, *6*(3), 26–34. https://doi.org/10.5539/sar.v6n3p26

Challies, E. R. T., & Murray, W. E. (2011). The Interaction of Global Value Chains and Rural Livelihoods: The Case of Smallholder Raspberry Growers in Chile. *Journal of Agrarian Change*, *11*(1), 29–59. https://doi.org/10.1111/j.1471-0366.2010.00282.x

Charli-Joseph, L., Siqueiros-García, J. M., Eakin, H., Manuel-Navarrete, D., Mazari-Hiriart, M., Shelton, R., … Ruizpalacios, B. (2022). Enabling collective agency for sustainability transformations through reframing in the Xochimilco social–ecological system. *Sustainability Science*, *18*, 1215–1233. https://doi.org/10.1007/s11625-022-01224-w

Charli-Joseph, L., Siqueiros-Garcia, J. M., Eakin, H., Manuel-Navarrete, D., & Shelton, R. (2018). Promoting agency for social-ecological transformation: A transformation-lab in the Xochimilco social-ecological system. *Ecology and Society*, *23*(2), 46. https://doi.org/10.5751/ES-10214-230246

Cid-Aguayo, B. (2011). Between Conventionalization and Civic Agriculture: Emerging Trends in the Chilean Agroecological Movement. *Journal of Agriculture, Food Systems, and Community Development*, *1*(3), 53–66. https://doi.org/10.5304/jafscd.2011.013.010

Cid-Aguayo, B. E., & Hinrichs, J. S. (2015). Curadoras de semillas: entre empoderamiento y esencialismo estratégico. *Revista Estudos Feministas*, *23*(352), 347–370. https://doi.org/10.1590/0104-026x2015v23n2p347

Cid, B. (2011). Agroecología y agricultura orgánica en Chile: Entre convencionalización y ciudadanía ambiental. *Agroalimentaria*, *17*(32), 15–27. Retrieved from https://www.saber.ula.ve/bitstream/123456789/33307/1/art1_cid_aguayo_r32.pdf

Cid, B. (2014). Movimientos Agroecológico y Neo Campesino: Respuestas postmodernas a la clásica cuestión agraria. *Agroalimentaria*, *20*(39), 65–78.

Cid, B., & Latta, A. (2015). Agro-Ecology and Food Sovereignty Movements in Chile: Sociospatial Practices for Alternative Peasant Futures. *Annals of the Association of American Geographers*, *105*(2), 397–406. https://doi.org/10.1080/00045608.2014.985626

Clapp, J. (2021). The problem with growing corporate concentration and power in the global food system. *Nature Food*, *2*, 404–408. https://doi.org/10.1038/s43016-021-00297-7

Clapp, J., Moseley, W. G., Burlingame, B., & Termine, P. (2022). Viewpoint: The case for a six-dimensional food security framework. *Food Policy*, *106*, 102164. https://doi.org/10.1016/j.foodpol.2021.102164

Clapp, J., Newell, P., & Brent, Z. W. (2018). The global political economy of climate change, agriculture and food systems. *Journal of Peasant Studies*, *45*(1), 80–88. https://doi.org/10.1080/03066150.2017.1381602

Coenen, L., Benneworth, P., & Truffer, B. (2012). Toward a spatial perspective on sustainability transitions. *Research Policy*, *41*, 968–979. https://doi.org/10.1016/j.respol.2012.02.014

Coenen, L., & Truffer, B. (2012). Places and Spaces of Sustainability Transitions: Geographical Contributions to an Emerging Research and Policy Field. *European Planning Studies*, *20*(3), 367–374. https://doi.org/10.1080/09654313.2012.651802

Cohen, N., & Ilieva, R. T. (2015). Transitioning the food system: A strategic practice management approach for cities. *Environmental Innovation and Societal Transitions*, *17*, 199–217. https://doi.org/10.1016/j.eist.2015.01.003

Constance, D. H., Choi, J. Y., & Lyke-Ho-Gland, H. (2008). Conventionalization, bifurcation, and quality of life: certified and non-certified organic farmers in texas. *Southern Rural Sociology*, *23*(1), 208–234.

Conti, C., Zanello, G., & Hall, A. (2021). Why are agri-food systems resistant to new directions of change? A systematic review. *Global Food Security*, *31*, 100576. https://doi.org/10.1016/j.gfs.2021.100576

Coria, J., & Elgueta, S. (2022). Towards safer use of pesticides in Chile. *Environmental Science and Pollution Research*, *29*, 22785–22797. https://doi.org/10.1007/s11356-022-18843-6

Cornejo, C. (2019). La muerte silenciosa: uso en Chile de plaguicidas prohibidos en el mundo causa daño cognitivo en menores. *El Mostrador*. Retrieved from https://www.elmostrador.cl/destacado/2019/01/17/la-muerte-silenciosa-uso-en-chile-de-plaguicidas-prohibidos-en-el-mundo-causa-dano-cognitivo-en-menores/. Accessed: 20 July 2020

Corral, S. A., de Angel, V., Salas, N., Zúñiga-Venegas, L., Gaspar, P. A., & Pancetti, F. (2017). Cognitive impairment in agricultural workers and nearby residents exposed to pesticides in the Coquimbo Region of Chile. *Neurotoxicology and Teratology*, *62*, 13–19. https://doi.org/10.1016/j.ntt.2017.05.003

Dabbert, S., Lippert, C., & Zorn, A. (2014). Introduction to the special section on organic certification systems: Policy issues and research topics. *Food Policy*, *49*, 425–428. https://doi.org/10.1016/j.foodpol.2014.05.009

Dale, B. (2020). Alliances for agroecology: from climate change to food system change. *Agroecology and Sustainable Food Systems*, *44*(5), 629–652. https://doi.org/10.1080/21683565.2019.1697787

Dalmoro, M. (2022). Between conventionalization and emancipation: Present and future paths for organic food market organization. In R. Bhat (Ed.), *Future Foods: Global Trends, Opportunities, and Sustainability Challenges* (pp. 527–538). Elsevier Inc. https://doi.org/10.1016/b978-0-323-91001-9.00019-0

Darnhofer, I. (2015). Socio-technical transitions in farming: key concepts. In L. Sutherland, L.-A.; Darnhofer, I.; Wilson, G.A.; Zagata (Ed.), *Transition pathways towards sustainability in agriculture: case studies from Europe* (pp. 17–31). Wallingford: CAB International. https://doi.

org/10.1079/9781780642192.0017

Darnhofer, I. (2020). Farming from a Process-Relational Perspective: Making Openings for Change Visible. *Sociologia Ruralis*, *60*(2), 505–528. https://doi.org/10.1111/soru.12294

Darnhofer, I., D'Amico, S., & Fouilleux, E. (2019). A relational perspective on the dynamics of the organic sector in Austria, Italy, and France. *Journal of Rural Studies*, *68*, 200–212. https://doi.org/10.1016/j.jrurstud.2018.12.002

Darnhofer, I., Lindenthal, T., Bartel-Kratochvil, R., & Zollitsch, W. (2010). Conventionalisation of organic farming practices: From structural criteria towards an assessment based on organic principles. A review. *Agronomy for Sustainable Development*, *30*, 67–81. https://doi.org/10.1007/978-94-007-0394-0_18

de Haan, F. J., & Rotmans, J. (2018). A proposed theoretical framework for actors in transformative change. *Technological Forecasting and Social Change*, *128*, 275–286. https://doi.org/10.1016/j.techfore.2017.12.017

de Jong, L. (2020). *Cabildo-making in Santiago, Chile ; a first step towards constitutional change?* MSc Thesis. Sociology of Development and Change Group. Wageningen University.

De Schutter, O. (2019). The Political Economy of Food. In J. Harris, M. Anderson, C. Clément, & N. Nisbett (Eds.), *IDS Bulletin. Transforming Development Knowledge* (Vol. 50). https://doi.org/10.2307/2618491

De Wit, J., & Verhoog, H. (2007). Organic values and the conventionalization of organic agriculture. *NJAS - Wageningen Journal of Life Sciences*, *54*(4), 449–462. https://doi.org/10.1016/S1573-5214(07)80015-7

DeLanda, M. (2016). *Assemblage theory*. Edinburgh: Edinburgh University Press.

DeLind, L. B. (2000). Transforming organic agriculture into industrial organic products: Reconsidering national organic standards. *Human Organization*, *59*(2), 198–208. https://doi.org/10.17730/humo.59.2.hm8263678687n536

Demiryürek, K., Stopes, C., & Güzel, A. (2008). Organic agriculture: The case of Turkey. *Agriculture*, *37*(4), 261–267. https://doi.org/10.5367/000000008787167754

Diaz, M., Darnhofer, I., Darrot, C., & Beuret, J. E. (2013). Green tides in Brittany: What can we learn about niche-regime interactions? *Environmental Innovation and Societal Transitions*, *8*, 62–75. https://doi.org/10.1016/j.eist.2013.04.002

DiMaggio, P. J., & Powell, W. W. (1983). The Iron Cage Revisited : Institutional Isomorphism and Collective Rationality in Organizational Fields. *American Sociological Review*, *48*(2), 147–160.

DIPRES. (2018). *Ministerio de Agricultura. Departamento de Desarrollo Agropecuario. Ficha de evaluación ex-ante de programas públicos. Formulación Presupuestaria*. Direccion de Presupuesto, Gobierno de Chile. Santiago, Chile. Retrieved from https://www.dipres.gob.cl/597/articles-173830_doc_doc_pdf.pdf. Accessed: 2 July 2023

Duncan, J., & Claeys, P. (2018). Politicizing food security governance through participation: opportunities and opposition. *Food Security*, *10*, 1411–1424. https://doi.org/10.1007/s12571-018-0852-x

Duncan, J., DeClerck, F., Báldi, A., Treyer, S., Aschemann-Witzel, J., Cuhls, K., … Brunori, G. (2022). Democratic directionality for transformative food systems research. *Nature Food*, *3*, 183–186.

https://doi.org/10.1038/s43016-022-00479-x

Duncan, J., Levkoe, C. Z., & Moragues-Faus, A. (2019). Envisioning New Horizons for the Political Economy of Sustainable Food Systems. In J. Harris, M. Anderson, C. Clement, & N. Nisbett (Eds.), *IDS Bulletin. Transforming Development Knowledge*. https://doi.org/10.1093/oxfordhb/9780199569441.013.0017

Duncan, J., & Pascucci, S. (2017). Mapping the Organisational Forms of Networks of Alternative Food Networks: Implications for Transition. *Sociologia Ruralis*, *57*(3), 316–339. https://doi.org/10.1111/soru.12167

Duygan, M., Stauffacher, M., & Meylan, G. (2019). A heuristic for conceptualizing and uncovering the determinants of agency in socio-technical transitions. *Environmental Innovation and Societal Transitions*, *33*, 13–29. https://doi.org/10.1016/j.eist.2019.02.002

Echeverría, R., Moreira, V., Barrena, J., & Gopinath, M. (2012). A characterization of Chilean farmers based on their market-production orientation. *Ciencia e Investigación Agraria*, *39*(2), 255–264. https://doi.org/10.4067/s0718-16202012000200002

Eguillor, P. (2022). *Estudio de caracterización de la agricultura orgánica en Chile y la Unión Europea*. "Supporting the development of fair and sustainable trade between the EU and Chile". Financiado por la Unión Europea. Santiago, Chile.

Ehler, L. E. (2006). Integrated pest management (IPM): definition, historical development and implementation, and the other IPM. *Pest Management Science*, *62*, 787–789.

El Bilali, H. (2019a). Research on agro-food sustainability transitions: A systematic review of research themes and an analysis of research gaps. *Journal of Cleaner Production*, *221*, 353–364. https://doi.org/10.1016/j.jclepro.2019.02.232

El Bilali, H. (2019b). The Multi-Level Perspective in Research on Sustainability Transitions in Agriculture and Food Systems : A Systematic Review. *Agriculture*, *9*(74). https://doi.org/10.3390/agriculture9040074

Elgueta, S., Moyano, S., Sepúlveda, P., Quiroz, C., & Correa, A. (2017). Pesticide residues in leafy vegetables and human health risk assessment in North Central agricultural areas of Chile. *Food Additives and Contaminants: Part B*, *10*(2), 105–112. https://doi.org/10.1080/19393210.2017.1280540

Elzen, B., Geels, F. W., Leeuwis, C., & Van Mierlo, B. (2011). Normative contestation in transitions "in the making": Animal welfare concerns and system innovation in pig husbandry. *Research Policy*, *40*, 263–275. https://doi.org/10.1016/j.respol.2010.09.018

Elzen, B., Van Mierlo, B., & Leeuwis, C. (2012). Anchoring of innovations: Assessing Dutch efforts to harvest energy from glasshouses. *Environmental Innovation and Societal Transitions*, *5*, 1–18. https://doi.org/10.1016/j.eist.2012.10.006

Elzen, B., & Wieczorek, A. (2005). Transitions towards sustainability through system innovation. *Technological Forecasting and Social Change*, *72*, 651–661. https://doi.org/10.1016/j.techfore.2005.04.002

Emirbayer, M. (1997). Manifesto for a Relational Sociology. *American Journal of Sociology*, *103*(2), 281–317.

EU, & CONICYT. (2007). *The Fruit Sector in Chile: Research capabilities and science & technology development areas*. Santiago, Chile. Retrieved from http://www.conicyt.cl/documentos/dri/ue/

Frutic_Fruit_BD.pdf

Eyhorn, F., Muller, A., Reganold, J. P., Frison, E., Herren, H. R., Luttikholt, L., … Smith, P. (2019). Sustainability in global agriculture driven by organic farming. *Nature Sustainability*, *2*, 253–255. https://doi.org/10.1038/s41893-019-0266-6

Faiguenbaum, S., Berdegué, J. A., & Reardon, T. (2002). *The rapid rise of supermarkets in Chile: Effects on dairy, vegetable, and beef chains*. *Development Policy Review* (Vol. 20). https://doi.org/10.1111/1467-7679.00183

Fanzo, J., Haddad, L., McLaren, R., Marshall, Q., Davis, C., Herforth, A., … Kapuria, A. (2020). The Food Systems Dashboard is a new tool to inform better food policy. *Nature Food*, *1*, 243–246. https://doi.org/10.1038/s43016-020-0077-y

FAO. (2018). *Catalysing dialogue and cooperation to scale up agroecology: Outcomes of the FAO regional seminars on agroecology*. Rome. https://doi.org/https://www.fao.org/agroecology/database/detail/en/c/1128222/

Farla, J., Markard, J., Raven, R., & Coenen, L. (2012). Sustainability transitions in the making: A closer look at actors, strategies and resources. *Technological Forecasting and Social Change*, *79*(6), 991–998. https://doi.org/10.1016/j.techfore.2012.02.001

Faundez, E., & Lüer, A., Cuevas, A. (2017). The establishment of Bagrada hilaris (Burmeister, 1835) (Heteroptera: Pentatomidae) in Chile, an avoidable situation? *Arquivos Entomoloxicos*, *17*, 239–241.

Favilli, E., Rossi, A., & Brunori, G. (2015). Food networks: collective action and local development. The role of organic farming as boundary object. *Organic Agriculture*, *5*, 235–243. https://doi.org/10.1007/s13165-015-0118-2

Fernandez-Wulff, P. (2019). Collective agency in the making: How social innovations in the food system practice democracy beyond consumption. *Politics and Governance*, *7*(4), 81–93. https://doi.org/10.17645/pag.v7i4.2111

FIA. (2017). *Canales de comercialización alternativos para el desarrollo del mercado nacional de productos agrícolas orgánicos.* Santiago, Chile.

Fischer, L. B., & Newig, J. (2016). Importance of actors and agency in sustainability transitions: A systematic exploration of the literature. *Sustainability*, *8*(476). https://doi.org/10.3390/su8050476

Foran, T., Butler, J. R. A., Williams, L. J., Wanjura, W. J., Hall, A., Carter, L., & Carberry, P. S. (2014). Taking complexity in food systems seriously: An interdisciplinary analysis. *World Development*, *61*, 85–101. https://doi.org/10.1016/j.worlddev.2014.03.023

Fouilleux, E., & Loconto, A. (2017). Voluntary standards, certification, and accreditation in the global organic agriculture field: a tripartite model of techno-politics. *Agriculture and Human Values*, *34*, 1–14. https://doi.org/10.1007/s10460-016-9686-3

Francis, C., Lieblein, G., Gliessman, S., Breland, T. A., Creamer, N., Harwood, R., … Poincelot, R. (2003). Agroecology: The ecology of food systems. *Journal of Sustainable Agriculture*, *22*(3), 99–118. https://doi.org/10.1300/J064v22n03_10

Franco-Torres, M., Rogers, B. C., & Ugarelli, R. M. (2020). A framework to explain the role of boundary objects in sustainability transitions. *Environmental Innovation and Societal Transitions*, *36*, 34–48. https://doi.org/10.1016/j.eist.2020.04.010

Friedmann, H. (2005). From Colonialism to Green Capitalism: Social Movements and Emergence of Food Regimes. In F. H. Buttel & P. McMichael (Eds.), *New Directions in the Sociology of Global Development. (Research in Rural Sociology and Development Vol. 11)* (Vol. 11, pp. 227–264). Bingley: Emerald Group Publishing Limited. https://doi.org/10.1016/S1057-1922(05)11009-9

Fuenfschilling, L., & Truffer, B. (2014). The structuration of socio-technical regimes - Conceptual foundations from institutional theory. *Research Policy*, *43*, 772–791. https://doi.org/10.1016/j.respol.2013.10.010

Fuenfschilling, L., & Truffer, B. (2016). The interplay of institutions, actors and technologies in socio-technical systems - An analysis of transformations in the Australian urban water sector. *Technological Forecasting and Social Change*, *103*, 298–312. https://doi.org/10.1016/j.techfore.2015.11.023

Fuentes Contreras, N. (2017). *Tenencia de la tierra, contrareforma agraria y desigualdad en la comuna de Mlina (1973-1979)*. MSc Thesis. Departamento de Historia, Facultad de Filosofía y Humanidades. Universidad de Chile.

Fuentes, V., Jiménez, J., & Mlynarz, D. (2022). *Ollas comunes: iniciativas de respuesta comunitaria ante el hambre en Santiago de Chile en el contexto de pandemia por Covid-19*. RIMISP: Santiago, Chile.

Fundacion Chile. (2018). *Radiografía del Agua. Brecha y riesgo hídrico en Chile.*

Gaitán-Cremaschi, D., Klerkx, L., Duncan, J., Trienekens, J. H., Huenchuleo, C., Dogliotti, S., … Rossing, W. A. H. (2019). Characterizing diversity of food systems in view of sustainability transitions. A review. *Agronomy for Sustainable Development*, *39*(1). https://doi.org/10.1007/s13593-018-0550-2

Gaitán-Cremaschi, D., Klerkx, L., Duncan, J., Trienekens, J. H., Huenchuleo, C., Dogliotti, S., … Rossing, W. A. H. (2020). Sustainability transition pathways through ecological intensification: an assessment of vegetable food systems in Chile. *International Journal of Agricultural Sustainability*. https://doi.org/10.1080/14735903.2020.1722561

Gao, H., Park, H., & Sakashita, A. (2017). Conventionalization of organic agriculture in China: a case study of Haobao organic agricultural company in Yunnan province. *Japanese Journal of Agricultural Economics*, *19*, 37–42. https://doi.org/10.18480/jjae.19.0_37

Garín, R. (2022). *El fracaso. Como se incendio la convencion*. Santiago, Chile: Catalonia.

Garud, R., & Gehman, J. (2012). Metatheoretical perspectives on sustainability journeys: Evolutionary, relational and durational. *Research Policy*, *41*, 980–995. https://doi.org/10.1016/j.respol.2011.07.009

Garud, R., Hardy, C., & Maguire, S. (2007). Institutional entrepreneurship as embedded agency: An introduction to the special issue. *Organization Studies*, *28*(7), 957–969. https://doi.org/10.1177/0170840607078958

Geels, F. W. (2010). Ontologies, socio-technical transitions (to sustainability), and the multi-level perspective. *Research Policy*, *39*, 495–510. https://doi.org/10.1016/j.respol.2010.01.022

Geels, F. W. (2011). The multi-level perspective on sustainability transitions: Responses to seven criticisms. *Environmental Innovation and Societal Transitions*, *1*, 24–40. https://doi.org/10.1016/j.eist.2011.02.002

Geels, F. W. (2014). Regime Resistance against Low-Carbon Transitions: Introducing Politics and Power into the Multi-Level Perspective. *Theory, Culture & Society*, *31*(5), 21–40. https://doi.

org/10.1177/0263276414531627

Geels, F. W. (2020). Micro-foundations of the multi-level perspective on socio-technical transitions: Developing a multi-dimensional model of agency through crossovers between social constructivism, evolutionary economics and neo-institutional theory. *Technological Forecasting and Social Change*, *152*, 119894. https://doi.org/10.1016/j.techfore.2019.119894

Geels, F. W., Kern, F., Fuchs, G., Hinderer, N., Kungl, G., Mylan, J., … Wassermann, S. (2016). The enactment of socio-technical transition pathways: A reformulated typology and a comparative multi-level analysis of the German and UK low-carbon electricity transitions (1990-2014). *Research Policy*, *45*, 896–913. https://doi.org/10.1016/j.respol.2016.01.015

Geels, F. W., & Schot, J. (2007). Typology of sociotechnical transition pathways. *Research Policy*, *36*, 399–417. https://doi.org/10.1016/j.respol.2007.01.003

Genus, A., & Coles, A. M. (2008). Rethinking the multi-level perspective of technological transitions. *Research Policy*, *37*, 1436–1445. https://doi.org/10.1016/j.respol.2008.05.006

Giddens, A. (1984). *The Constitution of Society: Outline of the Theory of Structuration*. University of California Press, Berkeley.

Gliedt, T., Hoicka, C. E., & Jackson, N. (2018). Innovation intermediaries accelerating environmental sustainability transitions. *Journal of Cleaner Production*, *174*, 1247–1261. https://doi.org/10.1016/j.jclepro.2017.11.054

Gliessman, S. (2016). Transforming food systems with agroecology. *Agroecology and Sustainable Food Systems*, *40*(3), 187–189. https://doi.org/10.1080/21683565.2015.1130765

Gliessman, S. (2017). A brief history of agroecology in Spain and Latin America. *Agroecology and Sustainable Food Systems*, *41*(3–4), 229–230. https://doi.org/10.1080/21683565.2017.1292390

Gongora, M. (1960). *Origen de los "inquilinos" de Chile central*. *Hispanic American Historical Review*. Santiago de Chile: Universidad de Chile. https://doi.org/10.1215/00182168-41.2.322

Gonzales de Molina, M., Petersen, P. F., Garrido Peña, F., & Caporal, F. R. (2019). *Political Agroecology*. (M. Gonzales de Molina, P. F. Petersen, F. Garrido Peña, & F. R. Caporal, Eds.). New York: Taylor & Francis. https://doi.org/https://doi.org/10.1201/9780429428821

González, P. (2019). *Efecto de los plaguicidas sobre la salud humana: Exposición e impactos*. *Aesoría Técnica Parlamentaria*. Valparaiso, Chile. Retrieved from https://obtienearchivo.bcn.cl/obtienearchivo?id=repositorio/10221/26823/2/Efecto_de_los_plaguicidas_en_la_Salud.pdf

Gormaz, T., Cortés, S., Tiboni-Oschilewski, O., & Weisstaub, G. (2022). The Chilean Diet: Is It Sustainable? *Nutrients*, *14*, 3103. https://doi.org/10.3390/nu14153103

Grin, J., Rotmans, J., & Schot, J. (2011). On patterns and agency in transition dynamics: Some key insights from the KSI programme. *Environmental Innovation and Societal Transitions*, *1*(1), 76–81. https://doi.org/10.1016/j.eist.2011.04.008

Gugerell, C., & Penker, M. (2020). Change agents' perspectives on spatial-relational proximities and urban food niches. *Sustainability (Switzerland)*, *12*(6). https://doi.org/10.3390/su12062333

Guthman, J. (2004). Back to the land: The paradox of organic food standards. *Environment and Planning A*, *36*, 511–528. https://doi.org/10.1068/a36104

Guthman, J. (2005). *Agrarian Dreams: The Paradox of Organic Farming in California*. Berkeley and Los

Angeles, California: University of California Press.

Hacker, M. E., & Binz, C. (2021). Navigating institutional complexity in socio-technical transitions. *Environmental Innovation and Societal Transitions*, *40*, 367–381. https://doi.org/10.1016/j.eist.2021.09.003

Haedicke, M. (2016). *Organizing organic: conflict and compromise in an emerging market*. Standford, California: Standford University Press. Retrieved from https://www.ptonline.com/articles/how-to-get-better-mfi-results

Hargreaves, T., Haxeltine, A., Longhurst, N., & Seyfang, G. (2011). *Sustainability transitions from the bottom-up: Civil society, the multi-level perspective and practice theory. CSERGE Working Paper 2011-01. Centre for Social and Economic Research on the Global Environment*. University of East Anglia, Norwich: Social and Economic Research on the Global Environment.

Hargreaves, T., Hielscher, S., Seyfang, G., & Smith, A. (2013). Grassroots innovations in community energy: The role of intermediaries in niche development. *Global Environmental Change*, *23*, 868–880. https://doi.org/10.1016/j.gloenvcha.2013.02.008

Hassanein, N. (2013). Practicing Food Democracy: A Pragmatic Politics of Transformation. *Taking Food Public: Redefining Foodways in a Changing World*, *19*, 461–474. https://doi.org/10.4324/9781315881065-44

Hassink, J., Grin, J., & Hulsink, W. (2018). Enriching the multi-level perspective by better understanding agency and challenges associated with interactions across system boundaries. The case of care farming in the Netherlands: Multifunctional agriculture meets health care. *Journal of Rural Studies*, *57*, 186–196. https://doi.org/10.1016/j.jrurstud.2017.12.018

Hauck, J., Omann, I., Thronicker, I., Spekkink, W., Díaz Ayude, A., Maricchiolo, F., … Pandur, V. (2020). *Understanding actor roles in sustainability initiatives : an exploratory study in five European countries*. *UFZ Discussion Papers*. Leipzig. Retrieved from https://nbn-resolving.org/urn:nbn:de:0168- ssoar-66850-6%0ANutzungsbedingungen:

Haxeltine, A., Avelino, F., Pel, B., Dumitru, A., Kemp, R., Longhurst, N., … Wittmayer, J. M. (2016). *A Framework for transformative social innovation. Transformative social innovation theory. TRANSIT Working Paper # 5*. TRANSIT: EU SSH.2013.3.2-1 Grant agreement no: 613169.

Haxeltine, A., Jørgensen, M. S., Pel, B., Dumitru, A., Avelino, F., Bauler, T., … Wittmayer, J. M. (2016). *On the agency and dynamics of transformative social innovation. TRANSIT Working Paper # 7*. TRANSIT: EU SSH.2013.3.2-1 Grant agreement no: 613169. Retrieved from http://www.transitsocialinnovation.eu/.

Hayes, N., & Rajão, R. (2011). Competing institutional logics and sustainable development: The case of geographic information systems in Brazil's Amazon region. *Information Technology for Development*, *17*(1), 4–23.

Heiskanen, E., Kivimaa, P., & Lovio, R. (2019). Promoting sustainable energy: Does institutional entrepreneurship help? *Energy Research and Social Science*, *50*, 179–190. https://doi.org/10.1016/j.erss.2018.11.006

Hermans, F., Stuiver, M., Beers, P. J., & Kok, K. (2013). The distribution of roles and functions for upscaling and outscaling innovations in agricultural innovation systems. *Agricultural Systems*, *115*,

117–128. https://doi.org/10.1016/j.agsy.2012.09.006

Hinrichs, C. C. (2014). Transitions to sustainability: a change in thinking about food systems change? *Agriculture and Human Values*, *31*, 143–155. https://doi.org/10.1007/s10460-014-9479-5

HLPE. (2014). *Food Losses and Waste in the Context of Sustainable Food Systems*. *A report by the High Level Panel of Experts on Food Security and Nutrition of the Committee on World Food Security*. Rome.

HLPE. (2017). *Nutrition and food systems*. *A report by the High Level Panel of Experts on Food Security and Nutrition of the Committee on World Food Security*. Rome.

HLPE. (2019). *Agroecological and other innovative approaches for sustainable agriculture and food systems that enhance food security and nutrition*. *A report by the High Level Panel of Experts on Food Security and Nutrition of the Committee on World Food Security*. Rome.

HLPE. (2020). *Food security and nutrition: building a global narrative towards 2030*. *A report by the High Level Panel of Experts on Food Security and Nutrition of the Committee on World Food Security*. Rome.

Hoholm, T., & Araujo, L. (2011). Studying innovation processes in real-time: The promises and challenges of ethnography. *Industrial Marketing Management*, *40*, 933–939. https://doi.org/10.1016/j.indmarman.2011.06.036

Hölscher, K., Wittmayer, J. M., & Loorbach, D. (2018). Transition versus transformation: What's the difference? *Environmental Innovation and Societal Transitions*, *27*, 1–3. https://doi.org/10.1016/j.eist.2017.10.007

Hoogstraaten, M. J., Frenken, K., & Boon, W. P. C. (2020). The study of institutional entrepreneurship and its implications for transition studies. *Environmental Innovation and Societal Transitions*, *36*, 114–136. https://doi.org/10.1016/j.eist.2020.05.004

Hruschka, N., Kaufmann, S., & Vogl, C. R. (2021). The benefits and challenges of participating in Participatory Guarantee Systems (PGS) initiatives following institutional formalization in Chile. *International Journal of Agricultural Sustainability*. https://doi.org/10.1080/14735903.2021.1934364

Huttunen, S., Kaljonen, M., Lonkila, A., Rantala, S., Rekola, A., & Paloniemi, R. (2021). Pluralising agency to understand behaviour change in sustainability transitions. *Energy Research and Social Science*, *76*, 102067. https://doi.org/10.1016/j.erss.2021.102067

IFOAM. (2017). Organic 3.0 for truly sustainable farming and consumption. A Landmark Document of the Organic Movement IFOAM - Organics International. *IFOAM-International Federation of Organic Agriculture*. Retrieved from https://www.ifoam.bio/why-organic/organic-landmarks/organic-30-truly-sustainable. Accessed: 2 July 2023

INDAP. (2017). Mesa de Agroecología para la AFC. INDAP: Presentación para la Comisión Nacional de Agricultura Orgánica (CNAO). Santiago de Chile. Retrieved from https://www.odepa.gob.cl/wp-content/uploads/2018/01/IndapCNAO211217.pdf. Accessed: 2 July 2023

INDAP, & CETBioBio. (2016). *Por un Chile Rural Inclusivo. Manual de producción agroecologica*. Instituto de Desarrollo Agropecuario, Ministerio de Agricultura, Chile. https://doi.org/http://www.indap.gob.cl/sites/default/files/2022-02/n°8-manual-de-producción-agroecologica.pdf

INDAP, RIMISP, & DEMOSCOPICA. (2018). *Línea base de los usuarios de INDAP 2015. Informe Final. Estudios y documentos de trabajo INDAP N°14*. Santiago de Chile. Retrieved from https://www.

indap.gob.cl/docs/default-source/default-document-library/n-14---informe-final.pdf?sfvrsn=0. Accessed: 2 July 2023

INE. (2007). *Cambios Estructurales en la Agricultura Chilena. Análisis intercensal 1976 - 1997 - 2007*. Instituto Nacional de Estadísticas. Santiago, Chile. https://doi.org/https://www.ine.gob.cl/docs/default-source/censo-agropecuario/publicaciones-y-anuarios/2007/cambios-estructurales-en-la-agricultura-chilena---analisis-intercensal-1976-1997-2007.pdf?sfvrsn=9dfd0a74_7

Ingram, J. (2015). Framing niche-regime linkage as adaptation: An analysis of learning and innovation networks for sustainable agriculture across Europe. *Journal of Rural Studies*, *40*, 59–75. https://doi.org/10.1016/j.jrurstud.2015.06.003

Ingram, J. (2018). Agricultural transition: Niche and regime knowledge systems' boundary dynamics. *Environmental Innovation and Societal Transitions*, *26*, 117–135. https://doi.org/10.1016/j.eist.2017.05.001

Intriago, R., Amézcua, R. G., Bravo, E., Connell, O., Intriago, R., Amézcua, R. G., & Bravo, E. (2017). Agroecology and Sustainable Food Systems Agroecology in Ecuador : historical processes , achievements , and challenges Agroecology in Ecuador : historical processes ,. *Agroecology and Sustainable Food Systems*, *41*(3–4), 311–328. https://doi.org/10.1080/21683565.2017.1284174

IPES-Food. (2015). *The new science of sustainable food systems: overcoming barriers to food systems reform. International Panel of Experts on Sustainable Food Systems.* https://doi.org/https://www.ipes-food.org/_img/upload/files/NewScienceofSusFood.pdf

IPES-Food. (2016). *From Uniformity to Diversity. International Panel of Experts on Sustainable Food Systems.* Retrieved from http://www.ipes-food.org/_img/upload/files/UniformityToDiversity_FULL.pdf

IPES-Food. (2017). *Unravelling the Food – Health Nexus: Addressing practices, political economy, and power relations to build healthier food systems. The Global Alliance for the Future of Food and IPES-Food*.

Isaac, M. E., Isakson, S. R., Dale, B., Levkoe, C. Z., Hargreaves, S. K., Ernesto, V. M., … Astrid, G. (2018). Agroecology in Canada : Towards an Integration of Agroecological Practice , Movement , and Science, 1–17. https://doi.org/10.3390/su10093299

Iskandarova, M. (2016). From the idea of scale to the idea of agency: An actor-network theory perspective on policy development for renewable energy. *Science and Public Policy*, *44*(4), 476–485. https://doi.org/10.1093/scipol/scw075

Jensen, M. (2021). Transformación de los sistemas alimentarios en Chile. *Estudios Internacionales*, (199), 61–90. https://doi.org/10.5354/0719-3769.2021.59273

Jessen, J. D., & Jessen, C. (2014). Games as Actors - Interaction, Play, Design, and Actor Network Theory. *International Journal on Advances in Intelligent Systems*, *7*(3–4), 412–422.

Jolly, S. (2016). *Collective institutional entrepreneurship for fostering sustainable energy transitions in India*. Technische Universiteit Eindhoven, Eindhoven.

Jolly, S., & Raven, R. P. J. M. (2015). Collective institutional entrepreneurship and contestations in wind energy in India. *Renewable and Sustainable Energy Reviews*, *42*, 999–1011. https://doi.org/10.1016/j.rser.2014.10.039

Jolly, S., Spodniak, P., & Raven, R. P. J. M. (2016). Institutional entrepreneurship in transforming energy systems towards sustainability : Wind energy in Finland and India. *Energy Research & Social Science*,

17, 102–118. https://doi.org/10.1016/j.erss.2016.04.002

Jørgensen, U. (2012). Mapping and navigating transitions - The multi-level perspective compared with arenas of development. *Research Policy*, *41*, 996–1010. https://doi.org/10.1016/j.respol.2012.03.001

Juri, S., Baraibar, M., Clark, L. B., Cheguhem, M., Jobbagy, E., Marcone, J., … Deutsch, L. (2022). Food systems transformations in South America: Insights from a transdisciplinary process rooted in Uruguay. *Frontiers in Sustainable Food Systems*, *6*. https://doi.org/10.3389/fsufs.2022.887034

Kaltoft, P. (2001). Organic farming in late modernity: At the frontier of modernity or opposing modernity? *Sociologia Ruralis*, *41*(1), 146–158. https://doi.org/https://doi.org/10.1111/1467-9523.00174

Kanter, R., & Boza, S. (2020). Strengthening Local Food Systems in Times of Concomitant Global Crises: Reflections from Chile. *American Journal of Public Health*, *110*(7), 971–973. https://doi.org/10.2105/AJPH.2020.305711

Kanter, R., & León, M. (2020). Participatory methods to identify perceived healthy and sustainable traditional culinary preparations across three generations of adults: Results from Chile's Metropolitan Region and Region of La Araucanía. *Nutrients*, *12*(489). https://doi.org/10.3390/nu12020489

Kanter, R., Reyes, M., Swinburn, B., Vandevijvere, S., & Corvalán, C. (2019). The food supply prior to the implementation of the chilean law of food labeling and advertising. *Nutrients*, *11*(52), 1–10. https://doi.org/10.3390/nu11010052

Kanter, R., Walls, H. L., Tak, M., Roberts, F., & Waage, J. (2015). A conceptual framework for understanding the impacts of agriculture and food system policies on nutrition and health. *Food Security*, *7*(4), 767–777. https://doi.org/10.1007/s12571-015-0473-6

Kay, C. (2002). Chile ' s Neoliberal Agrarian Transformation and the Peasantry. *Journal of Agrarian Change*, *2*(4), 464–501. https://doi.org/10.1111/1471-0366.00043

Kennedy, G., Kanter, R., Chotiboriboon, S., Covic, N., Delormier, T., Longvah, T., … Kuhnlein, H. (2021). Traditional and indigenous fruits and vegetables for food system transformation. *Current Developments in Nutrition*, *5*, nzab092. https://doi.org/10.1093/cdn/nzab092

Kern, F. (2015). Engaging with the politics, agency and structures in the technological innovation systems approach. *Environmental Innovation and Societal Transitions*, *16*, 67–69. https://doi.org/10.1016/j.eist.2015.07.001

Kivimaa, P. (2014). Government-affiliated intermediary organisations as actors in system-level transitions. *Research Policy*, *43*, 1370–1380. https://doi.org/10.1016/j.respol.2014.02.007

Kivimaa, P., Boon, W., Hyysalo, S., & Klerkx, L. (2019). Towards a typology of intermediaries in sustainability transitions: A systematic review and a research agenda. *Research Policy*, *48*, 1062–1075. https://doi.org/10.1016/j.respol.2018.10.006

Kivimaa, P., Hyysalo, S., Boon, W., Klerkx, L., Martiskainen, M., & Schot, J. (2019). Passing the baton: How do intermediaries advance sustainability transitions ? Conceptual insights on intermediary action in different transition phases. *Environmental Innovation and Societal Transitions*, *31*, 110–125. https://doi.org/10.1016/j.eist.2019.01.001

Kivimaa, P., & Kern, F. (2016). Creative destruction or mere niche support? Innovation policy mixes for sustainability transitions. *Research Policy*, *45*, 205–217. https://doi.org/https://doi.org/10.1016/j.respol.2015.09.008

Klerkx, L., Aarts, N., & Leeuwis, C. (2010). Dealing with incumbent regimes: deliberateness and randomness of innovation agency. In *9th European IFSA Symposium, Design methods, system approaches and co-innovation*. Vienna.

Klerkx, Laurens, & Aarts, N. (2013). The interaction of multiple champions in orchestrating innovation networks: Conflicts and complementarities. *Technovation*, *33*, 193–210. https://doi.org/10.1016/j.technovation.2013.03.002

Klerkx, Laurens, & Guimón, J. (2017). Attracting foreign R&D through international centres of excellence: early experiences from Chile. *Science and Public Policy*, 1–12. https://doi.org/10.1093/scipol/scx011

Klonsky, K., & Greene, C. (2005). Widespread adoption of organic agriculture in the US: Are market-driven policies enough? In *Agricultural and Applied Economics Association Annual Meeting*. Providence, RI.

Koehrsen, J., & Huber, F. (2021). A field perspective on sustainability transitions: The case of religious organizations. *Environmental Innovation and Societal Transitions*, *40*, 408–420. https://doi.org/10.1016/j.eist.2021.09.005

Köhler, J., Geels, F. W., Kern, F., Geels, F. W., Kern, F., Markard, J., … B, D. W. (2019). An agenda for sustainability transitions research : State of the art and future directions. *Environmental Innovation and Societal Transitions*, *31*, 1–32. https://doi.org/10.1016/j.eist.2019.01.004

Koistinen, K., Teerikangas, S., Mikkilä, M., & Linnanen, L. (2018). Agent based change in facilitating sustainability transitions – a literature review and call for action. In S. Dhiman & J. Marques (Eds.), *Handbook of Engaged Sustainability* (Vol. 2–2, pp. 885–916). Springer. https://doi.org/10.1007/978-3-319-71312-0_49

Koistinen, Katariina, & Teerikangas, S. (2021). The debate if agents matter vs. The system matters in sustainability transitions—a review of the literature. *Sustainability (Switzerland)*, *13*(5), 1–29. https://doi.org/10.3390/su13052821

Kok, K. P. W., Loeber, A. M. C., & Grin, J. (2021). Politics of complexity: Conceptualizing agency, power and powering in the transitional dynamics of complex adaptive systems. *Research Policy*, *50*(3), 104183. https://doi.org/10.1016/j.respol.2020.104183

Kortetmäki, T., & Huttunen, S. (2022). Responsibilities for just transition to low-carbon societies: a role-based framework. *Environmental Politics*, *32*(2), 249–270. https://doi.org/10.1080/09644016.2022.2064690

Kuokkanen, A., Mikkilä, M., Kuisma, M., Kahiluoto, H., & Linnanen, L. (2017). The need for policy to address the food system lock-in: A case study of the Finnish context. *Journal of Cleaner Production*, *140*, 933–944. https://doi.org/https://doi.org/10.1016/j.jclepro.2016.06.171

Lajoie-O'Malley, A., Bronson, K., van der Burg, S., & Klerkx, L. (2020). The future(s) of digital agriculture and sustainable food systems: An analysis of high-level policy documents. *Ecosystem Services*, *45*, 101183. https://doi.org/10.1016/j.ecoser.2020.101183

Lamine, C. (2011). Transition pathways towards a robust ecologization of agriculture and the need for system redesign. Cases from organic farming and IPM. *Journal of Rural Studies*, *27*, 209–219. https://doi.org/10.1016/j.jrurstud.2011.02.001

Lamine, C., Schmitt, C., Palm, J., Derbez, F., & Petersen, P. (2021). How policy instruments may favour an articulation between open ended and deterministic perspectives to support agroecological

transitions? Insights from a franco-brazilian comparison. In C. Lamine, D. Magda, M. Rivera-ferre, & T. Marsden (Eds.), *Agroecology transitions, between determinist and open-ended visions* (pp. 129–151). Brussels: Peter Lang.

Latour, B. (2005). *Reassembling the Social. Reasembling the social: an Introduction to Actor-Netwrok Theory*. Oxford: Oxford University Press. https://doi.org/10.1163/156913308X336453

Law, J. (2009). Actor Network Theory and Material Semiotics. In B. S. Turner (Ed.), *The New Blackwell Companion to Social Theory*. Oxford: Wiley-Blackwell.

Lawrence, T. B., Leca, B., & Zilber, T. B. (2013). Institutional Work: Current Research, New Directions and Overlooked Issues. *Organization Studies*, *34*(8), 1023–1033. https://doi.org/10.1177/0170840613495305

Leach, M., Scoones, I., & Stirling, A. (2007). *Pathways to Sustainability: an overview of the STEPS Centre approach. STEPS Approach Paper*. Brighton. Retrieved from http://sro.sussex.ac.uk/26103/

Leach, Melissa, Nisbett, N., Cabral, L., Harris, J., Hossain, N., & Thompson, J. (2020). Food politics and development. *World Development*, *134*, 105024. https://doi.org/10.1016/j.worlddev.2020.105024

Leach, Melissa, & Scoones, I. (2007). *Mobilising Citizens: Social Movements and the Politics of Knowledge*. *IDS Working Paper 276*. Retrieved from http://w.drc-citizenship.org/system/assets/1052734544/original/1052734544-leach_etal.2007-mobilising.pdf

Lebdioui, A. (2019). Chile's Export Diversification since 1960: A Free Market Miracle or Mirage? *Development and Change*, *50*(6), 1624–1663. https://doi.org/10.1111/dech.12545

Leeuwis, C., Boogaard, B. K., & Atta-Krah, K. (2021). How food systems change (or not): governance implications for system transformation processes. *Food Security*, *13*, 761–780. https://doi.org/10.1007/s12571-021-01178-4

Legun, K. (2011). Cultivating Institutions: Organic Agriculture and Integrative Economic Choice. *Society and Natural Resources*, *24*, 455–468. https://doi.org/10.1080/08941920903002560

Legun, K. (2015). Geoforum Tiny trees for trendy produce : Dwarfing technologies as assemblage actors in orchard economies. *Geoforum*, *65*, 314–322. https://doi.org/10.1016/j.geoforum.2015.03.009

Legun, K. A., & Henry, M. (2017). Introduction to the special issue on the post-human turn in agri-food studies: Thinking about things from the office to the page. *Journal of Rural Studies*, *52*, 77–80. https://doi.org/10.1016/j.jrurstud.2017.05.008

Lehtimäki, T., & Virtanen, M. J. (2020). Shaping values and economics: Tensions and compromises in the institutionalization of organic agriculture in Finland (1991–2015). *Journal of Rural Studies*, *80*, 149–159. https://doi.org/10.1016/j.jrurstud.2020.08.023

Letelier, E., Aguayo, B. C., Saravia, P., Carroza, N., & Vanhulst, J. (2021). Territoriality, environment and hybrid governance tensions in alternative food networks: Cases of small-scale viticulture in Chile. *Environmental Policy and Governance*, *31*, 186–198. https://doi.org/10.1002/eet.1926

Levidow, L., Pimbert, M., & Vanloqueren, G. (2014). Agroecological Research: Conforming—or Transforming the Dominant Agro-Food Regime? *Agroecology and Sustainable Food Systems*, *38*(10), 1127–1155. https://doi.org/10.1080/21683565.2014.951459

Liu, R. H. (2013). Health-promoting components of fruits and vegetables in the diet. *Advances in Nutrition*, *4*, 3845–3925. https://doi.org/10.3945/an.112.003517

Loconto, A., & Fouilleux, E. (2019). Defining agroecology: Exploring the circulation of knowledge in FAO's Global Dialogue. *International Journal of Sociology of Agriculture and Food*, *25*(2), 116–137. Retrieved from http://www.fao.org/director-general/my-statements/detail/en/c/1113703/

Loconto, A., Poisot, A. S., & Santacoloma, P. (2017). Sustainable Practices, Sustainable Markets? Institutional innovations in agri-food systems. In B. Elzen, A. Augustyn, M. Barbier, & B. Van Mierlo (Eds.), *AgroEcological Transitions: Changes and Breakthroughs in the Making* (pp. 176–191). Wageningen University & Research. https://doi.org/http://dx.doi.org/10.18174/407609

Loorbach, D., Frantzeskaki, N., & Avelino, F. (2017). Sustainability Transitions Research: Transforming Science and Practice for Societal Change. *Annual Review of Environment and Resources*, *42*, 599–626. https://doi.org/https://doi.org/10.1146/annurev-environ- 102014-021340 Copyright

Luco, J., Carrillo, A., & Campos Salvaterra. (2019). Declaraciones colectivas sobre el derecho a la alimentación en Chile. *El Mostrador*. Retrieved from https://www.elmostrador.cl/noticias/opinion/columnas/2019/11/10/declaraciones-colectivas-sobre-el-derecho-a-la-alimentacion-en-chile/. Accessed: 2 July 2023

Lynggaard, K. S. C. (2001). The farmer within an institutional environment. Comparing Danish and Belgian organic farming. *Sociologia Ruralis*, *41*(1), 85–111. https://doi.org/https://doi.org/10.1111/1467-9523.00171

MacRae, R. J., Frick, B., & Martin, R. C. (2007). Economic and social impacts of organic production systems. *Canadian Journal of Plant Science*, *87*, 1037–1044.

Markard, J., Raven, R., & Truffer, B. (2012). Sustainability transitions: An emerging field of research and its prospects. *Research Policy*, *41*, 955–967. https://doi.org/10.1016/j.respol.2012.02.013

Mars, M. M., & Schau, H. J. (2017). Institutional entrepreneurship and the negotiation and blending of multiple logics in the Southern Arizona local food system. *Agriculture and Human Values*, *34*, 407–422. https://doi.org/10.1007/s10460-016-9722-3

Martínez, H., Namdar-Iraní, M., & Saa, C. (2017). Las Políticas de Fomento a la Agroecología en Chile. In E. Sabourin, J.-F. Le Coq, C. Schmitt, M. Avila, M. M. Patrouilleau, & P. Niederle (Eds.), *Políticas públicas a favor de la agroecología en América Latina y El Caribe* (pp. 123–156). Porto Alegre: Red PP-AL, FAO.

Maughan, C., Anderson, C., & Kneafsey, M. (2020). A Five-Point Framework for Reading for Social Justice: A Case Study of Food Policy Discourse in the Context of Brexit Britain. *Journal of Agriculture, Food Systems, and Community Development*, *9*(3), 281–300. https://doi.org/10.5304/jafscd.2020.093.024

McDonnell, P. R., & Yáñez, M. A. (2008). *Alimentos órganicos: ¿Qué es lo que busca el consumidor verde?* MSc Thesis. Facultad de Economía y Negocios. Universidad de Chile. Retrieved from https://repositorio.uchile.cl/handle/2250/108469

McGreevy, S. R., Tamura, N., Kobayashi, M., Zollet, S., Hitaka, K., Nicholls, C. I., & Altieri, M. A. (2021). Amplifying Agroecological Farmer Lighthouses in Contested Territories: Navigating Historical Conditions and Forming New Clusters in Japan. *Frontiers in Sustainable Food Systems*, *5*, 1–18. https://doi.org/10.3389/fsufs.2021.699694

McMichael, P. (2009). A food regime genealogy. *The Journal of Peasant Studies*, *36*(1), 139–169. https://doi.

org/10.1080/03066150902820354

McMichael, P. (2016). Commentary: Food regime for thought. *The Journal of Peasant Studies*, *43*(3), 648–670. https://doi.org/10.1080/03066150.2016.1143816

Meadowcroft, J. (2009). What about the politics? Sustainable development, transition management, and long term energy transitions. *Policy Sciences*, *42*(4), 323–340. https://doi.org/10.1007/s11077-009-9097-z

Mellafe, R. (1981). Latifundio y el poder rural en Chile de los siglos XVII y XVIII. *Cuadernos de Historia. Departamento de Ciencias Históricas Universidad de Chile*, 87–108.

Melo, O., Quiñones, N. B., & Acuña, D. (2021). Towards Sustainable Agriculture in Chile, Reflections on the Role of Public Policy. *International Journal of Agriculture and Natural Resources*, *48*(3), 186–209. https://doi.org/10.7764/ijanr.v48i3.2359

Memoria Chilena. (2023a). Exportación de trigo. Retrieved July 2, 2023, from https://www.memoriachilena.gob.cl/602/w3-article-94448.html

Memoria Chilena. (2023b). La Reforma Agraria (1962 - 1973). Expropiar todos los latifundios. Retrieved July 2, 2023, from http://www.memoriachilena.gob.cl/602/w3-article- 97341. html#:~:text=La%2520Unidad%2520Popular%2520utilizó%2520la,realizaron%2520más%2520de%25202.000%2520tomas.

Mercado, G., Hjortsø, C. N., & Honig, B. (2018). Decoupling from international food safety standards: how small-scale indigenous farmers cope with conflicting institutions to ensure market participation. *Agriculture and Human Values*, *35*, 651–669. https://doi.org/10.1007/s10460-018-9860-x

Mialon, M., Corvalan, C., Cediel, G., Baeza, F., & Reyes, M. (2020). Food industry political practices in Chile: "the economy has always been the main concern." *Globalization and Health*, *16*(107), 1–12. https://doi.org/10.1186/s12992-020-00638-4

Michel, S. (2020). Collaborative institutional work to generate alternative food systems. *Organization*, *27*(2), 314–336. https://doi.org/10.1177/1350508419883385

Michelsen, J. (2001a). Organic farming in a regulatory perspective. The Danish case. *Sociologia Ruralis*, *41*(1), 62–84.

Michelsen, J. (2001b). Recent development and political acceptance of organic farming in Europe. *Sociologia Ruralis*, *41*(1), 3–20.

Mier y Terán Giménez Cacho, M., Giraldo, O. F., Aldasoro, M., Morales, H., Ferguson, B. G., Rosset, P., … Campos, C. (2018). Bringing agroecology to scale: key drivers and emblematic cases. *Agroecology and Sustainable Food Systems*, *42*(6), 637–665. https://doi.org/10.1080/21683565.2018.1443313

Migliorini, P., & Wezel, A. (2017). Converging and diverging principles and practices of organic agriculture regulations and agroecology. A review. *Agronomy for Sustainable Development*, *37*(63). https://doi.org/10.1007/s13593-017-0472-4

Miles, M. B., & Huberman, A. M. (1994). *Qualitative Data Analysis. An expanded Sourcebook* (2nd editio). Thousand Oaks, California: SAGE Publications Ltd.

Millaleo, R., Montecinos, C., Rubio, R., Contreras, A., & Borie, F. (2006). Efecto de la adición de compost sobre propágulos micorrícicos arbusculares en un suelo volcánico del centro sur de Chile. *R.C. Suelo Nutr. Veg.*, *6*(3), 26–39.

Minh, T. T., Friederichsen, R., Neef, A., & Hoffmann, V. (2014). Niche action and system harmonization for institutional change: Prospects for demand-driven agricultural extension in Vietnam. *Journal of Rural Studies*, *36*, 273–284. https://doi.org/10.1016/j.jrurstud.2014.09.008

Mintrom, M., & Rogers, B. C. (2022). How can we drive sustainability transitions? *Policy Design and Practice*, *5*(3), 294–306. https://doi.org/10.1080/25741292.2022.2057835

Montalba, R., Infante, A., Contreras, A., & Vieli, L. (2017). Agroecology in Chile: precursors, pioneers, and their legacy. *Agroecology and Sustainable Food Systems*, *41*(3–4), 416–428. https://doi.org/10.1080/21683565.2017.1288671

Montalva, D. (2017). *Propuesta metodológica para construir el escenario de deforestación de formaciones leñosas del norte de Chile*. MSc Thesis. Facultad de Ciencias Agronómicas. Universidad de Chile.

Montecino, S. (2004). *La Olla Deleitosa*. Santiago, Chile: Catalonia.

Monterrubio-Solis, Barreau, A., & Ibarra, J. T. (2023). Narrating changes, recalling memory: accumulation by dispossession in food systems of Indigenous communities at the extremes of Latin America. *Ecology and Society*, *28*(1:3). https://doi.org/https://doi.org/10.5751/ ES-13792-280103

Moragues-Faus, A., & Marsden, T. (2017). The political ecology of food: Carving 'spaces of possibility' in a new research agenda. *Journal of Rural Studies*, *55*, 275–288. https://doi.org/10.1016/j.jrurstud.2017.08.016

Mossberg, J., Söderholm, P., Hellsmark, H., & Nordqvist, S. (2018). Crossing the biorefinery valley of death? A role-based typology for understanding actor networks' ability to overcome barriers in sustainability transitions. *Environmental Innovation and Societal Transitions*, *27*, 83–101. https://doi.org/10.1016/j.eist.2017.10.008

Müller, M. (2015). Assemblages and actor-networks: Rethinking socio-material power, politics and space. *Geography Compass*, *9*(1), 27–41. https://doi.org/10.1111/gec3.12192

Müller, M., & Schurr, C. (2016). Assemblage thinking and actor-network theory: conjunctions, disjunctions, cross-fertilisations. *Transactions of the Institute of British Geographers*, *41*, 217–229. https://doi.org/10.1111/tran.12117

Muñoz-Quezada, M. T., Iglesias, V., Lucero, B., Steenland, K., Barr, D. B., Levy, K., … Concha, C. (2012). Predictors of exposure to organophosphate pesticides in schoolchildren in the Province of Talca, Chile. *Environment International*, *47*, 28–36. https://doi.org/10.1016/j.envint.2012.06.002

Muñoz-Quezada, M. T., Lucero, B., Iglesias, V., Muñoz, M. P., Achú, E., Cornejo, C., … Brito, A. M. (2016). Plaguicidas organofosforados y efecto neuropsicológico y motor en la Región del Maule, Chile. *Gaceta Sanitaria*, *30*(3), 227–231. https://doi.org/10.1016/j.gaceta.2016.01.006

Muñoz-Saez, A., & Renwick, L. L. R. (2022). Agricultural sustainability in Chile ' s proposed new constitution. *Nature*. https://doi.org/https://doi.org/10.1038/d41586-022-02320-8

Muñoz, E. F. P., Niederle, P. A., de Gennaro, B. C., & Roselli, L. (2021). Agri-food markets towards agroecology: Tensions and compromises faced by small-scale farmers in Brazil and Chile. *Sustainability*, *13*, 3096. https://doi.org/10.3390/su13063096

Murray, W. E. (1997). The global agro-food complex , neoliberalism and small farmers in Chile Lessons for the Pacific Islands? *The Journal of Pacific Studies*, *22*, 27–59.

Murray, W. E. (1999). Local Responses to Global Restructuring in the Chilean Fruit Complex. *European Review of Latin American and Caribbean Studies*, *66*, 19–38. https://doi.org/https://www.jstor.org/

stable/25675819

Murray, W. E. (2006). Neo-feudalism in Latin America? Globalisation, agribusiness, and land re-concentration in Chile. *Journal of Peasant Studies*, *33*(4), 646–677. https://doi.org/10.1080/03066150601152281

Musiolik, J., & Markard, J. (2011). Creating and shaping innovation systems: Formal networks in the innovation system for stationary fuel cells in Germany. *Energy Policy*, *39*(4), 1909–1922. https://doi.org/10.1016/j.enpol.2010.12.052

Musiolik, J., Markard, J., & Hekkert, M. (2012). Networks and network resources in technological innovation systems: Towards a conceptual framework for system building. *Technological Forecasting and Social Change*, *79*, 1032–1048. https://doi.org/10.1016/j.techfore.2012.01.003

Nasiritousi, N., Hjerpe, M., & Linnér, B.-O. (2016). The roles of non-state actors in climate change governance: understanding agency through governance profiles. *International Environmental Agreements: Politics, Law and Economics*, *16*, 109–126. https://doi.org/10.1007/s10784-014-9243-8

Nelson, R. C. (2007). Transnational Strategic Networks and Policymaking in Chile : CORFO ' s High Technology Investment Promotion Program. *Latin American Politics and Society*, *49*(2), 149–181.

Nicholls, C. I., & Altieri, M. A. (2018). Pathways for the amplification of agroecology. *Agroecology and Sustainable Food Systems*. https://doi.org/10.1080/21683565.2018.1499578

Niederle, P., Loconto, A., Lemeilleur, S., & Dorville, C. (2020). Social movements and institutional change in organic food markets: Evidence from participatory guarantee systems in Brazil and France. *Journal of Rural Studies*, *78*, 282–291. https://doi.org/10.1016/j.jrurstud.2020.06.011

Nikol, L. J., & Jansen, K. (2021). Rethinking conventionalisation : A view from organic agriculture in the Global South. *Journal of Rural Studies*, *86*, 420–429. https://doi.org/10.1016/j.jrurstud.2021.07.001

Norder, L. A., Lamine, C., Bellon, S., & Brandenburg, A. (2016). Agroecology: Polysemy, pluralism and controversies. *Ambiente & Sociedade*, *19*(3), 1–20. https://doi.org/10.1590/1809-4422ASOC129711V1932016

North, D. C. (1990). *Institutions, Institutional Change and Economic Performance.* Cambridge, UK: Cambridge University Press.

Novalia, W., Rogers, B. C., Bos, J. J., Brown, R. R., Soedjono, E. S., & Copa, V. (2020). Transformative agency in co-producing sustainable development in the urban south. *Cities*, *102*, 102747. https://doi.org/10.1016/j.cities.2020.102747

Núñez, S. R., & Torres, G. (2014). El sector agropecuario en la región de Los Lagos y el paradigma "Chile potencia alimentaria": desafíos para la política agraria nacional. *Mundo Agrario*, *15*(28). https://doi.org/http://www.mundoagrario.unlp.edu.ar/article/view/MAv15n29a12 Resumen

ODEPA. (2011). *Propuesta de plan estratégico para la agricultura orgánica Chilena 2010-2020*. Publicación de la Oficina de Estudios y Políticas Agrarias del Ministerio de Agricultura de Chile, Gobierno de Chile. Santiago de Chile. https://doi.org/https://www.odepa.gob.cl/publicaciones/documentos-e-informes/propuesta-de-plan-estrategico-para-la-agricultura-organica-chilena-2010-2020-enero-de-2011

ODEPA. (2016). *Protocolo de Agricultura Sustentable*. *Ministerio de Agricultura*. Publicación de la Oficina de Estudios y Políticas Agrarias del Ministerio de Agricultura de Chile, Gobierno de Chile. Santiago

de Chile. https://doi.org/https://www.odepa.gob.cl/wp-content/uploads/2017/12/3-Protocolo-Agricultura-Sustentable.pdf

ODEPA. (2019a). *Informe final. Caracterización de la cadena nacional de productos orgánicos*. Publicación de la Oficina de Estudios y Políticas Agrarias del Ministerio de Agricultura Gobierno de Chile. Santiago, Chile. https://doi.org/https://www.odepa.gob.cl/publicaciones/documentos-e-informes/informe-caracterizacion-de-la-cadena-nacional-de-productos-organicos

ODEPA. (2019b). *Panorama de la agricultura chilena*. Oficina de Estudios y Políticas Agrarias. Santiago, Chile. https://doi.org/https://www.odepa.gob.cl/wp-content/uploads/2019/09/panorama2019Final.pdf

ODEPA. (2021). *Agricultura Orgánica: Información actualizada del sector*. Oficina de Estudios y Políticas Agrarias - Gobierno de Chile. Santiago, Chile. https://doi.org/https://bibliotecadigital.odepa.gob.cl/bitstream/handle/20.500.12650/71235/ArtAgriculturaOrganica122021.pdf

OECD. (2008). *Review of Agicultural Polices: Chile*. https://doi.org/10.1787/9789264042247-2-en

Olea Peñaloza, J. (2017). Latifundio y territorio : reflexiones en torno a la reforma en Colchagua, 1969-1973. *Polis. Revista Latinoamericana*, *47*, 83–106.

Ollivier, G., Magda, D., Maze, A., Plumecocq, G., & Lamine, C. (2018). Agroecological transitions : What can sustainability transition frameworks teach us ? An ontological and empirical analysis. *Ecology and Society*, *23*(2), 5.

Ornetzeder, M., & Rohracher, H. (2013). Of solar collectors, wind power, and car sharing: Comparing and understanding successful cases of grassroots innovations. *Global Environmental Change*, *23*, 856–867. https://doi.org/10.1016/j.gloenvcha.2012.12.007

Osei-Amponsah, C., van Paassen, A., & Klerkx, L. (2018). Diagnosing institutional logics in partnerships and how they evolve through institutional bricolage: Insights from soybean and cassava value chains in Ghana. *NJAS - Wageningen Journal of Life Sciences*, *84*, 13–26. https://doi.org/10.1016/j.njas.2017.10.005

Oteros-Rozas, E., Ravera, F., & García-Llorente, M. (2019). How does agroecology contribute to the transitions towards social-ecological sustainability? *Sustainability*, *11*(4372). https://doi.org/doi:10.3390/su11164372

Paraje, G., Colchero, A., Wlasiuk, J. M., Sota, A. M., & Popkin, B. M. (2021). The effects of the Chilean food policy package on aggregate employment and real wages. *Food Policy*, *100*, 102016. https://doi.org/10.1016/j.foodpol.2020.102016

Pel, B. (2016). Trojan horses in transitions: A dialectical perspective on innovation capture. *Journal of Environmental Policy and Planning*, *18*(5), 673–691. https://doi.org/10.1080/1523908X.2015.1090903

Perez Vico, E., Hellsmark, H., & Jacob, M. (2015). Enacting knowledge exchange: a context dependent and 'role-based' typology for capturing utility from university research. *Prometheus*, *33*(1), 3–20. https://doi.org/10.1080/08109028.2015.1060699

Pesch, U. (2015). Tracing discursive space: Agency and change in sustainability transitions. *Technological Forecasting and Social Change*, *90*, 379–388. https://doi.org/10.1016/j.techfore.2014.05.009

Pesch, U., Vernay, A. L., van Bueren, E., & Pandis Iverot, S. (2017). Niche entrepreneurs in urban systems integration: On the role of individuals in niche formation. *Environment and Planning A*, *49*(8),

1922–1942. https://doi.org/10.1177/0308518X17705383

Petersen, P., Mussoi, E. M., & dal Soglio, F. (2013). Institutionalization of the agroecological approach in Brazil: Advances and challenges. *Agroecology and Sustainable Food Systems*, *37*(1), 103–114. https://doi.org/10.1080/10440046.2012.735632

Pigford, A.-A. E., Hickey, G. M., & Klerkx, L. (2018). Beyond agricultural innovation systems? Exploring an agricultural innovation ecosystems approach for niche design and development in sustainability transitions. *Agricultural Systems*, *164*, 116–121. https://doi.org/10.1016/j.agsy.2018.04.007

Poméon, T., Loconto, A. M., Fouilleux, E., & Lemeilleur, S. (2018). Organic farming in France: an alternative project or conventionalisation? In G. Allaire & B. Daviron (Eds.), *Ecology, Capitalism and the New Agricultural Economy: the Second Great Transformation* (pp. 207–226). Abingdon, Oxon: Routledge.

Prihtanti, T. M., Hardyastuti, S., Hartono, S., & Irham. (2014). Social-cultural Functions of Rice Farming Systems. *Asian Journal of Agriculture and Rural Development Journal*, *4*(5), 341–351.

Quitzau, M. B., Hoffmann, B., & Elle, M. (2012). Local niche planning and its strategic implications for implementation of energy-efficient technology. *Technological Forecasting and Social Change*, *79*, 1049–1058. https://doi.org/10.1016/j.techfore.2011.11.009

Rauschmayer, F., Bauler, T., & Schäpke, N. (2015). Towards a thick understanding of sustainability transitions - Linking transition management, capabilities and social practices. *Ecological Economics*, *109*, 211–221. https://doi.org/10.1016/j.ecolecon.2014.11.018

Raven, R., Schot, J., Berkhout, F. (2012). Space and scale in socio-technical transitions. *Environmental Innovation and Societal Transitions*, *4*, 63–78. https://doi.org/10.1016/j.eist.2012.08.003

Reay, T., & Hinings, C. R. (2009). Managing the rivalry of competing institutional logics. *Organization Studies*, *30*(6), 629–652. https://doi.org/10.1177/0170840609104803

Reay, T., & Jones, C. (2016). Qualitatively capturing institutional logics. *Strategic Organization*, *14*(4), 441–454. https://doi.org/10.1177/1476127015589981

Reckwitz, A. (2002). Toward a Theory of Social Practices. A Development in Culturalist Theorizing. *European Journal of Social Theory*, *5*(2), 243–263.

Reganold, J. P., & Wachter, J. M. (2016). Organic agriculture in the twenty-first century. *Nature Plants*, *2*, 15221. https://doi.org/10.1038/nplants.2015.221

Renting, H., Schermer, M., & Rossi, A. (2012). Building Food Democracy : Exploring Civic Food Networks and Newly Emerging Forms of Food Citizenship. *International Journal of Sociology of Agriculture and Food*, *19*(3), 289–307.

RIAL. (2017). *Reporte de notificaciones 2017*. Red de Información y Alertas Alimentarias (RIAL). ACHIPIA. Santiago, Chile. Retrieved from https://www.achipia.gob.cl/wp-content/uploads/2019/02/OR.Informe-RIAL-2017-.pdf

RIAL. (2018). *Reporte de Notificaciones*. *Agencia Chilena para la Inocuidad y Calidad Alimentaria*. Red de Información Alertas Alimentarias. ACHIPIA. Santiago, Chile.

Rick, T., Ontiveros, M. Á. C., Jerardino, A., Mariotti, A., Méndez, C., & Williams, A. N. (2020). Human-environmental interactions in Mediterranean climate regions from the Pleistocene to the Anthropocene. *Anthropocene*, *31*, 100253. https://doi.org/10.1016/j.ancene.2020.100253

Rivas, T. (2012). *Comercialización de productos hortofrutícolas en la pequeña agricultura*. Oficina de Estudios y Políticas Agrarias. Santiago, Chile. https://doi.org/https://www.odepa.gob.cl/publicaciones/articulos/comercializacion-de-productos-hortofruticolas-en-la-pequena-agricultura-2012

Rivas, T. (2013). *Observatorio Canal Feria Libre*. Oficina de Estudios y Políticas Agrarias. Santiago, Chile. https://doi.org/https://www.odepa.gob.cl/wp-content/uploads/2013/05/10462_ArtFeriasLibres042013.pdf

Rivera-Ferre, M. G., López-i-Gelats, F., Ravera, F., Oteros-Rozas, E., di Masso, M., Binimelis, R., & El Bilali, H. (2021). The two-way relationship between food systems and the COVID19 pandemic: causes and consequences. *Agricultural Systems*, *191*, 103134. https://doi.org/10.1016/j.agsy.2021.103134

Robles, C., & Kay, C. (2018). La transición del sistema de hacienda al capitalismo agrario en Chile Central. In I. Jaksik, A. Estefane, & C. Robles (Eds.), *Historia Política de Chile 1810-2010. Tomo III Problemas económicos* (pp. 107–139). Ciudad de México: Fondo de Cultura Económica. Universidad Adolfo Ibáñez.

Rodriguez-Osiac, L., Pinheiro-Fernandes, A. C., Mujica-Coopman, M. F., Caro-Moya, P., & Navarro-Rosenblatt, D. (2021). A description of Chilean food and nutrition health policies. *Revista Medica de Chile*, *149*, 1485–1494. https://doi.org/10.4067/S0034-98872021001001485

Roebke, L., Grillitsch, M., & Coenen, L. (2022). Assessing change agency in urban experiments for sustainability transitions. *Environmental Innovation and Societal Transitions*, *45*, 214–227. https://doi.org/10.1016/j.eist.2022.10.007

Rogers, B. C., Brown, R. R., De Haan, F. J., & Deletic, A. (2015). Analysis of institutional work on innovation trajectories in water infrastructure systems of Melbourne, Australia. *Environmental Innovation and Societal Transitions*, *15*, 42–64. https://doi.org/10.1016/j.eist.2013.12.001

Rogge, K. S., & Reichardt, K. (2016). Policy mixes for sustainability transitions: An extended concept and framework for analysis. *Research Policy*, *45*, 1620–1635. https://doi.org/10.1016/j.respol.2016.04.004

Rohe, S., & Chlebna, C. (2022). The evolving role of networking organizations in advanced sustainability transitions. *Technological Forecasting and Social Change*, *183*, 121916. https://doi.org/10.1016/j.techfore.2022.121916

Rojas-Walker, C., Chacón, A. S., Moyano, A. S., Estay, P., Sepúlveda, R. ., Ormeño, N. J., & González, M. S. (2007). Manejo de Agroquímicos en Sistemas Hortícolas. *Instituto de Investigaciones Agropecuarias*, *Boletin N°*(198). Retrieved from http://biblioteca.inia.cl/medios/biblioteca/boletines/NR35470.pdf

Rosin, C. J., Legun, K. A., Campbell, H., & Sautier, M. (2017). From compliance to co-production: Emergent forms of agency in Sustainable Wine Production in New Zealand. *Environment and Planning A*, *49*(12), 2780–2799. https://doi.org/10.1177/0308518X17733747

Rosset, P. M., & Martínez-Torres, M. E. (2012). Rural Social Movements and Agroecology : Context , Theory , and Process. *Ecology and Society*, *17*(3).

Rossi, A. (2020). From co-learning to shared commitment to agroecology. Some insights from initiatives aimed at reintroducing agrobiodiversity. *Sustainability (Switzerland)*, *12*, 7766. https://doi.org/10.3390/SU12187766

Rossi, A., Bui, S., & Marsden, T. (2019). Redefining power relations in agrifood systems. *Journal of Rural Studies*, *68*, 147–148. https://doi.org/10.1016/j.jrurstud.2019.01.002

Rossing, W. A. H., Kormelinck, A. G., Alliaume, F., Dogliotti, S., Duncan, J., Huenchuleo, C., … Gaitán-Cremaschi, D. (2020). Transitioning to the safe and just space inside 'the doughnut' by means of agroecological niche food systems: insights from Chile and Uruguay. *International Journal of Agriculture and Natural Resources*, *47*(3), 295–311. https://doi.org/10.7764/ijanr.v47i3.2258

Runhaar, H., Fünfschilling, L., van den Pol-Van Dasselaar, A., Moors, E. H. M., Temmink, R., & Hekkert, M. (2020). Endogenous regime change: Lessons from transition pathways in Dutch dairy farming. *Environmental Innovation and Societal Transitions*, *36*(June), 137–150. https://doi.org/10.1016/j.eist.2020.06.001

SAG. (2017). Resolución exenta N°: 1577/2017 Establece control obligatorio de la plaga Chinche pintada Bagrada hilaris (Burmeister,1835) (Hemiptera: Pentatomidae). Santiago, Chile.

SAG. (2019). *Sistema nacional de certificacion de productos orgánicos agrícolas. Ley N° 20.089*. Santiago, Chile. https://doi.org/https://www.sag.gob.cl/sites/default/files/sist_nac_cert_prod_organicos.pdf

Salazar, O., Rojas, C., Baginsky, C., Boza, S., Lankin, G., Muñoz-Sáez, A., … Altieri, M. (2020). Challenges for agroecology development for the building of sustainable agri-food systems. *International Journal of Agriculture and Natural Resources*, *47*(3), 152–158. https://doi.org/10.7764/ijanr.v47i3.2308

San Martín, W. (2017). Nitrogen, science, and environmental change: the politics of the Green Revolution in Chile and the global nitrogen challenge. *Journal of Political Ecology*, *24*, 777–796.

Sandor, J. A., Huckleberry, G., Hayashida, F. M., Parcero-Oubiña, C., Salazar, D., Troncoso, A., & Ferro-Vázquez, C. (2020). Soils in ancient irrigated agricultural terraces in the Atacama Desert, Chile. *Geoarchaeology*, *37*, 96–119. https://doi.org/10.1002/gea.21834

Sarabia, N., & Peris, J. (2021). Socio-technical regimes to understand grassroots innovations and natural capital in Chile. In S. Calvo & A. Morales Pachón (Eds.), *Social Innovation in Latin America: Maintaining and Restoring Social and Natural Capital* (pp. 134–158). Routledge.

Sarabia, N., Peris, J., & Segura, S. (2021). Transition to agri-food sustainability, assessing accelerators and triggers for transformation: Case study in Valencia, Spain. *Journal of Cleaner Production*, *325*, 129228. https://doi.org/10.1016/j.jclepro.2021.129228

Saravia Ramos, P. (2020). Short food commercialization circuits: Analysis of experiences in the Valparaíso region, Chile. *Psicoperspectivas*, *19*(2). https://doi.org/http://dx.doi.org/10.5027/psicoperspectivas-vol19-issue2-fulltext-1914 Published

Saunders, C. (2007). Using Social Network Analysis to Explore Social Movements: A Relational Approach. *Social Movement Studies: Journal of Social, Cultural and Political Protest*, *6*(3), 227–243. https://doi.org/10.1080/14742830701777769

Sayes, E. (2014). Actor-Network Theory and methodology: Just what does it mean to say that nonhumans have agency? *Social Studies of Science*, *44*(1), 134–149. https://doi.org/10.1177/0306312713511867

Schiller, K., Godek, W., Klerkx, L., & Poortvliet, P. M. (2019). Nicaragua's agroecological transition: Transformation or reconfiguration of the agri-food regime? *Agroecology and Sustainable Food Systems*, *45*(5), 611–628. https://doi.org/10.1080/21683565.2019.1667939

Schiller, K. J. F., Klerkx, L., Poortvliet, P. M., & Godek, W. (2020). Exploring barriers to the agroecological

transition in Nicaragua: A Technological Innovation Systems Approach. *Agroecology and Sustainable Food Systems*, *44*(1), 88–132. https://doi.org/10.1080/21683565.2019.1602097

Schwartz, M., Werther, K., & Hernández, M. (2013). *Diagnóstico y estrategia de desarrollo para el sector hortícola chileno*. Trabajo preparado para la Fundación de Innovación Agraria del Ministerio de Agricultura. Santiago, Chile.

Schwindenhammer, S. (2017). Global organic agriculture policy-making through standards as an organizational field: when institutional dynamics meet entrepreneurs. *Journal of European Public Policy*, *24*(11), 1678–1697. https://doi.org/10.1080/13501763.2017.1334086

Scoones, I., Leach, M., & Newell, P. (2017). The politics of green transformations. In I. Scoones, M. Leach, & P. Newell (Eds.), *Pathways to Sustainability. The politics of green transformations*. Abingdon, Oxon: Routledge.

Scoones, I., Newell, P., & Leach, M. (2015). The politics of green transformations. In I. Scoones, M. Leach, & P. Newell (Eds.), *The Politics of Green Transformations* (pp. 1–25). Abingdon, Oxon: Earthscan from Routledge.

Scoones, I., Stirling, A., Abrol, D., Atela, J., Charli-Joseph, L., Eakin, H., … Yang, L. (2020). Transformations to sustainability: combining structural, systemic and enabling approaches. *Current Opinion in Environmental Sustainability*, *42*, 65–75. https://doi.org/10.1016/j.cosust.2019.12.004

Settersten, R. A., Stauber, B., & Walther, A. (2022). The Significance of Relationality in "Doing Transitions." In B. Stauber, A. Walther, & R. A. Settersten (Eds.), *Doing Transitions in the Life Course. Life Course Research and Social Policies, vol 16*. Cham: Springer. https://doi.org/https://doi.org/10.1007/978-3-031-13512-5_15

Seufert, V., & Ramankutty, N. (2017). Many shades of gray—the context-dependent performance of organic agriculture. *Science Advances*, *3*, e1602638 10. https://doi.org/10.1126/sciadv.1602638

Seyfang, G., Haxeltine, A., Hargreaves, T., & Longhurst, N. (2010). *Energy and communities in transition - towards a new research agenda on agency and civil society in sustaianbility transitions*. *CSERGE working paper EDM, No. 10-13*. https://doi.org/10.1017/CBO9781107415324.004

Seyfang, G., Hielscher, S., Hargreaves, T., Martiskainen, M., & Smith, A. (2014). A grassroots sustainable energy niche? Reflections on community energy in the UK. *Environmental Innovation and Societal Transitions*, *13*, 21–44. https://doi.org/10.1016/j.eist.2014.04.004

Seyfang, G., & Longhurst, N. (2013). Desperately seeking niches: Grassroots innovations and niche development in the community currency field. *Global Environmental Change*, *23*(5), 881–891. https://doi.org/10.1016/j.gloenvcha.2013.02.007

Shim, Y., & Shin, D. (2019). Technological Forecasting & Social Change Smartness in techno-nationalism? Combining actor-network theory and institutionalization to assess Chinese smart TV development. *Technological Forecasting & Social Change*, *139*, 87–98. https://doi.org/10.1016/j.techfore.2018.09.004

Shin, D. (2016). Application of actor-network theory to network neutrality in Korea: Socio-ecological understanding of network dynamics. *Telematics and Informatics*, *33*, 436–451. https://doi.org/10.1016/j.tele.2015.10.002

Shove, E., & Walker, G. (2007). CAUTION! Transitions ahead: Politics, practice, and sustainable transition

management. *Environment and Planning A*, *39*(4), 763–770. https://doi.org/10.1068/a39310

Shove, E., & Walker, G. (2010). Governing transitions in the sustainability of everyday life. *Research Policy*, *39*, 471–476. https://doi.org/10.1016/j.respol.2010.01.019

Slater, S., Baker, P., & Lawrence, M. (2022). An analysis of the transformative potential of major food system report recommendations. *Global Food Security*, *32*, 100610. https://doi.org/10.1016/j.gfs.2022.100610

Smink, M., Negro, S. O., Niesten, E., & Hekkert, M. P. (2015). How mismatching institutional logics hinder niche-regime interaction and how boundary spanners intervene. *Technological Forecasting and Social Change*, *100*, 225–237. https://doi.org/10.1016/j.techfore.2015.07.004

Smith, A., Fressoli, M., & Thomas, H. (2014). Grassroots innovation movements: Challenges and contributions. *Journal of Cleaner Production*, *63*, 114–124. https://doi.org/10.1016/j.jclepro.2012.12.025

Smith, A., Stirling, A., & Berkhout, F. (2005). The governance of sustainable socio-technical transitions. *Research Policy*, *34*, 1491–1510. https://doi.org/10.1016/j.respol.2005.07.005

Smith, A., Voß, J. P., & Grin, J. (2010). Innovation studies and sustainability transitions: The allure of the multi-level perspective and its challenges. *Research Policy*, *39*, 435–448. https://doi.org/10.1016/j.respol.2010.01.023

Spaargaren, G. (2011). Theories of practices: Agency, technology, and culture. Exploring the relevance of practice theories for the governance of sustainable consumption practices in the new world-order. *Global Environmental Change*, *21*, 813–822. https://doi.org/10.1016/j.gloenvcha.2011.03.010

Spaargaren, G., & Oosterveer, P. (2010). Citizen-consumers as agents of change in globalizing modernity: The case of sustainable consumption. *Sustainability*, *2*, 1887–1908. https://doi.org/10.3390/su2071887

Späth, P., Rohracher, H., & Von Radecki, A. (2016). Incumbent actors as niche agents: The German Car Industry and the Taming of the "Stuttgart E-Mobility Region." *Sustainability (Switzerland)*, *8*(252). https://doi.org/10.3390/su8030252

Stahlbrand, L. (2016). The Food For Life Catering Mark: Implementing the Sustainability Transition in University Food Procurement. *Agriculture*, *6*(46). https://doi.org/10.3390/agriculture6030046

Stirling, A. (2009). *Innovetion, Sustainability, Development: a new manifesto. Direction, Distribution and Diversity! Pluralising Progress in Innovation, Sustainability and Development. STEPS Working Paper 32*. https://doi.org/http://sro.sussex.ac.uk/16081/

Stirling, A. (2011). Pluralising progress: From integrative transitions to transformative diversity. *Environmental Innovation and Societal Transitions*, *1*(1), 82–88. https://doi.org/10.1016/j.eist.2011.03.005

Story, V., OMalley, L., & Hart, S. (2011). Roles, role performance, and radical innovation competences. *Industrial Marketing Management*, *40*, 952–966. https://doi.org/10.1016/j.indmarman.2011.06.025

Svensson, O., & Nikoleris, A. (2018). Structure reconsidered: Towards new foundations of explanatory transitions theory. *Research Policy*, *47*, 462–473. https://doi.org/10.1016/j.respol.2017.12.007

Temper, L., Walter, M., Rodriguez, I., Kothari, A., & Turhan, E. (2018). A perspective on radical transformations to sustainability: resistances, movements and alternatives. *Sustainability Science*,

13(3), 747–764. https://doi.org/10.1007/s11625-018-0543-8

Termeer, C. J. A. M., Drimie, S., Ingram, J., Pereira, L., & Whittingham, M. J. (2018). A diagnostic framework for food system governance arrangements: The case of South Africa. *NJAS - Wageningen Journal of Life Sciences*, *84*, 85–93. https://doi.org/10.1016/j.njas.2017.08.001

Thornton, P. H., Ocasio, W., & Lounsbury, M. (2012). *The Institutional Logics Perspective. A New Approach to Culture, Structure, and Process*. Oxford: Oxford University Press.

Tittonell, P, Klerkx, L., Baudron, F., Felix, G. F., Ruggia, A., Apeldoorn, D. Van, … Rossing, W. A. H. (2016). Ecological Intensification: Local Innovation to Address Global Challenges. In E. Lichtfouse (Ed.), *Sustainable Agriculture Reviews 19*. Springer. https://doi.org/10.1007/978-3-319-26777-7

Tittonell, Pablo. (2014). Ecological intensification of agriculture-sustainable by nature. *Current Opinion in Environmental Sustainability*, *8*, 53–61. https://doi.org/10.1016/j.cosust.2014.08.006

Tomlinson, I. (2008). Re-thinking the transformation of organics: The role of the UK government in shaping British organic food and farming. *Sociologia Ruralis*, *48*(2), 133–151. https://doi.org/10.1111/j.1467-9523.2008.00457.x

Torres, R., Azócar, G., Rojas, J., Montecinos, A., & Paredes, P. (2015). Vulnerability and resistance to neoliberal environmental changes: An assessment of agriculture and forestry in the Biobio region of Chile (1974-2014). *Geoforum*, *60*, 107–122. https://doi.org/10.1016/j.geoforum.2014.12.013

Tovey, H. (1997). Food, environmentalism and rural sociology: On the organic farming movement in Ireland. *Sociologia Ruralis*, *37*(1), 21–37. https://doi.org/10.1111/1467-9523.00034

Turnheim, B., & Geels, F. W. (2013). The destabilisation of existing regimes: Confronting a multi-dimensional framework with a case study of the British coal industry (1913-1967). *Research Policy*, *42*, 1749–1767. https://doi.org/10.1016/j.respol.2013.04.009

Turnheim, B., & Geels, F. W. (2019). Incumbent actors, guided search paths, and landmark projects in infra-system transitions: Re-thinking Strategic Niche Management with a case study of French tramway diffusion (1971–2016). *Research Policy*, *48*(6), 1412–1428. https://doi.org/10.1016/j.respol.2019.02.002

Tynan, L. (2021). What is relationality? Indigenous knowledges, practices and responsibilities with kin. *Cultural Geographies*, *28*(4), 597–610. https://doi.org/10.1177/14744740211029287

UNCTAD. (2008). Best Practices for Organic Policy. *New York*.

UNDP. (2021). Trapped: high inequality and economic growth in Latin America. In *Regional Human Development Report 2021. Trapped: high inequality and low economic growth in Latin America* (pp. 21–94). New York: UNDP. https://doi.org/https://www.undp.org/latin-america/publications/trapped-inequality-and-economic-growth-latin-america-and-caribbean#:~:text=Latin%20America%20and%20the%20Caribbean%20(LAC)%20is%20a%20regio

Upham, P., Dütschke, E., Schneider, U., Oltra, C., Sala, R., Lores, M., … Bögel, P. (2018). Agency and structure in a sociotechnical transition: Hydrogen fuel cells, conjunctural knowledge and structuration in Europe. *Energy Research and Social Science*, *37*, 163–174. https://doi.org/10.1016/j.erss.2017.09.040

Valdes, A., & Foster, W. (2018). Agricultural and Rural Policies in Chile. In T. Josling, W. H. Meyers, & T. Johnson (Eds.), *Handbook of international food and agricultural policies. Policies for Agricultural*

Markets and Rural Economic Activity (pp. 291–308). Singapore: World Scientific Co. Pte. Ltd.

van Doren, D., Runhaar, H., Raven, R. P. J. M., Giezen, M., & Driessen, P. P. J. (2020). Institutional work in diverse niche contexts: The case of low-carbon housing in the Netherlands. *Environmental Innovation and Societal Transitions*, *35*, 116–134. https://doi.org/10.1016/j.eist.2020.03.001

van Poeck, K., Læssøe, J., & Block, T. (2017). An exploration of sustainability change agents as facilitators of nonformal learning: Mapping a moving and intertwined landscape. *Ecology and Society*, *22*(2), 33. https://doi.org/10.5751/ES-09308-220233

Vanloqueren, G., & Baret, P. V. (2009). How agricultural research systems shape a technological regime that develops genetic engineering but locks out agroecological innovations. *Research Policy*, *38*, 971–983. https://doi.org/10.1016/j.respol.2009.02.008

Veldstra, M. D., Alexander, C. E., & Marshall, M. I. (2014). To certify or not to certify? Separating the organic production and certification decisions. *Food Policy*, *49*(2), 429–436. https://doi.org/10.1016/j.foodpol.2014.05.010

Vermunt, D. A., Negro, S. O., Van Laerhoven, F. S. J., Verweij, P. A., & Hekkert, M. P. (2020). Sustainability transitions in the agri-food sector: How ecology affects transition dynamics. *Environmental Innovation and Societal Transitions*, *36*, 236–249. https://doi.org/10.1016/j.eist.2020.06.003

Vivero-Pol, J. L. (2017). Food as commons or commodity? Exploring the links between normative valuations and agency in food transition. *Sustainability (Switzerland)*, *9*, 442. https://doi.org/10.3390/su9030442

Wallace, T. C., Bailey, R. L., Blumberg, J. B., Burton-Freeman, B., Chen, C. O., Crowe-White, K. M., … Wang, D. D. (2019). Fruits, vegetables, and health: A comprehensive narrative, umbrella review of the science and recommendations for enhanced public policy to improve intake. *Critical Reviews in Food Science and Nutrition*. https://doi.org/10.1080/10408398.2019.1632258

Webb, P., Benton, T. G., Beddington, J., Flynn, D., Kelly, N. M., & Thomas, S. M. (2020). The urgency of food system transformation is now irrefutable. *Nature Food*, *1*, 584–585. https://doi.org/10.1038/s43016-020-00161-0

Weber, H., Poeggel, K., Eakin, H., Fischer, D., Lang, D. J., Wehrden, H. Von, & Wiek, A. (2020). What are the ingredients for food systems change towards sustainability? - Insights from the literature. *Environmental Research Letters*, *15*, 113001. https://doi.org/10.1088/1748-9326/ab99fd

Weng, W., Becker, S. L., Lüdeke, M. K. B., & Lakes, T. (2020). Landscape matters: Insights from the impact of mega-droughts on Colombia's energy transition. *Environmental Innovation and Societal Transitions*, *36*, 1–16. https://doi.org/10.1016/j.eist.2020.04.003

Werbeloff, L., Brown, R. R., & Loorbach, D. (2016). Pathways of system transformation: Strategic agency to support regime change. *Environmental Science and Policy*, *66*, 119–128. https://doi.org/10.1016/j.envsci.2016.08.010

West, S., Haider, L. J., Stålhammar, S., & Woroniecki, S. (2020). A relational turn for sustainability science? Relational thinking, leverage points and transformations. *Ecosystems and People*, *16*(1), 304–325. https://doi.org/10.1080/26395916.2020.1814417

Westley, F., Olsson, P., Folke, C., Homer-Dixon, T., Vredenburg, H., Loorbach, D., … Van Der Leeuw, S. (2011). Tipping toward sustainability: Emerging pathways of transformation. *Ambio*, *40*(7),

762–780. https://doi.org/10.1007/s13280-011-0186-9

Westley, F., Tjornbo, O., Schultz, L., Olsson, P., Folke, C., Crona, B., & Bodin, Ö. (2013). A theory of transformative agency in linked social-ecological systems. *Ecology and Society*, *18*(3), 27. https://doi.org/10.5751/ES-05072-180327

Wezel, A., Bellon, S., Doré, T., Francis, C., Vallod, D., & David, C. (2009). Agroecology as a science, a movement and a practice. *Agronomy*, *29*, 503–515. https://doi.org/10.1007/978-94-007-0394-0_3

Wezel, Alexander, Goette, J., Lagneaux, E., Passuello, G., Reisman, E., Rodier, C., & Turpin, G. (2018). Agroecology in Europe: Research, education, collective action networks, and alternative food systems. *Sustainability (Switzerland)*, *10*, 1214. https://doi.org/10.3390/su10041214

Wezel, Alexander, Goris, M., Bruil, J., Félix, G. F., Peeters, A., Bàrberi, P., … Migliorini, P. (2018). Challenges and action points to amplify agroecology in Europe. *Sustainability*, *10*, 1598. https://doi.org/10.3390/su10051598

Wijen, F., & Ansari, S. (2007). Overcoming inaction through collective institutional entrepreneurship: Insights from regime theory. *Organization Studies*, *28*(7), 1079–1100. https://doi.org/10.1177/0170840607078115

Wittmayer, J. M., Avelino, F., van Steenbergen, F., & Loorbach, D. (2017). Actor roles in transition: Insights from sociological perspectives. *Environmental Innovation and Societal Transitions*, *24*, 45–56. https://doi.org/10.1016/j.eist.2016.10.003

Wittmayer, J. M., & Schäpke, N. (2014). Action, research and participation: roles of researchers in sustainability transitions. *Sustainability Science*, *9*(4), 483–496. https://doi.org/10.1007/s11625-014-0258-4

Wooten, M., & Hoffman, A. J. (2016). Organizational Fields Past, Presente and Future. In R. Greenwood, C. Oliver, K. Sahlin, & R. Suddaby (Eds.), *The SAGE Handbook of Organizational Institutionalism* (pp. 130–148). London: SAGE Publications. https://doi.org/10.2139/ssrn.2767550

Yin, R. K. (2014). *Case Study Research. Design and Methods*. Thousand Oaks, California: SAGE Publications.

Zolezzi, M. (2012). Fortalecimiento de la competitividad hortofrutícola: producción de alimentos inocuos en la Región Metropolitana. In *Instituto de Investigaciones Agropecuarias* (Vol. Boletin N°). Santiago, Chile. Retrieved from http://biblioteca.inia.cl/medios/biblioteca/boletines/NR38420.pdf

Zúñiga-Venegas, L., Saracini, C., Pancetti, F., Muñoz-Quezada, M. T., Lucero, B., Foerster, C., & Cortés, S. (2021). Exposición a plaguicidas en Chile y salud poblacional: urgencia para la toma de decisiones. *Gaceta Sanitaria*, *35*(5), 480–487. https://doi.org/10.1016/j.gaceta.2020.04.020

Zurek, M., Hebinck, A., & Selomane, O. (2021). Looking across diverse food system futures: Implications for climate change and the environment. *Q Open*, *1*, 1–39. https://doi.org/10.1093/qopen/qoaa001

Appendix.

Maria Eugenia Contesse Ayala
Wageningen School of Social Sciences (WASS)
Completed Training and Supervision Plan

Name of the learning activity	Department/Institute	Year	ECTS*
A) Project related competences			
A1 Managing a research project			
WASS Introduction Course	WASS	2017	1.0
Writing research proposal	WASS	2017-2018	6.0
'Distributed agency in food system transformation in Chile: collective action of fragmented individualism'	Transformation Conference. Santiago, Chile	2019	1.0
'Unravelling non-human agency in sustainability transitions-in-the-making'	International Sustainability Transition Conference. Vienna.	2020	1.0
'Distributed agency across spaces, places and scales in the Chilean organic food system transition'	International Sustainability Transition Conference. Vienna.	2020	1.0
A2 Integrating research in the corresponding discipline			
The politics of place: spatial thinking in the social sciences	WASS	2017	4.0
Food value chain research: understanding inter-organizational relationships	WASS	2017	1.5
Systematic literature review	WASS	2017	4.0
STEPS Centre Summer School	Institute of Development Studies, Sussex University	2021	3.0
Building sustainable food systems in times of concomitant crises	Universidad de Chile	2022	2.0
B) General research related competences			
B1 Placing research in a broader scientific context			
Institutions and social transformation	WASS	2018	2.0
Adoption on agricultural and conservation practices	WASS	2017	0.7
Analyzing Discourse: Theories, Methods and techniques CPT56306	WUR	2017	6.0

B2 Placing research in a societal context			
Workshop: *Definiendo acciones para fortalecer la agricultura orgánica*. Facilitator and report writing.	ECOCERT. Santiago, Chile	2019	0.5
Workshop: *Promoviendo la transición hacia sistemas alimentarios agroecológicos.* Organizer, facilitator, report writing.	VIII Agroecology Latin American Congress. Montevideo.	2020	1.0
C) Career related competences/personal development			
C1 Employing transferable skills in different domains/careers			
Independent UN Food System Summit Dialogue. Facilitator	Laboratorio Sistemas Alimentarios Sostenibles, U. de Chile. Wageningen University. Online-Chile	2021	0.3
Young Scientists Group. Selection Committee	World Food Forum	2022	0.5
Total			**35,5**

*One credit according to ECTS is on average equivalent to 28 hours of study load

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