

Universität Passau

Sozial- und Bildungswissenschaftliche Fakultät

Knowledge in the making:
Embodying transdisciplinary moments on organic
agriculture in Yogyakarta, Indonesia

Dissertation zur Erlangung des akademischen Grades

Doktor der Sozialwissenschaften

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vorlegt von

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Passau, März 2023

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Table of contents

Table of contents.....	3
Preface.....	6
Summary	7
Acknowledgements	9
Part I. Knowledge in the making	11
Chapter 1. How does research contribute to knowledge(s) of organic agriculture?	12
1.1 Introduction.....	12
1.2 The transdisciplinary approach to knowledge production.....	15
1.2.1 A brief history of transdisciplinarity	15
1.2.2 Transdisciplinarity as norms and practice	17
1.2.3 Research gap in transdisciplinary research	19
1.3 Organic agriculture in Indonesia	20
1.4 Methodological reflection on doing a PhD work in a transdisciplinary context	22
1.4.1 Epistemic living space and co-presence as foundations of PhD research practice.....	22
1.4.2 IndORGANIC as a transdisciplinary project	27
1.4.3 Inhabiting different “field sites”	28
1.4.3.1 Indonesia as a site for growing into field research	28
1.4.3.2 Germany as a field for growing into embodied writing	30
Chapter 2. Institutions of organic agriculture and sustainability	32
2.1 Societal debates on sustainable agriculture in Indonesia	32
2.2 Professional networking and scientific publication.....	32
2.3 Policy analysis and Net-Map	33
2.4 The historical development of organic agriculture in Indonesia.....	33
2.5 Institutional theory.....	34
2.6 Strategic engagement in institutions of organic agriculture.....	35
2.7 Different perspectives and aspirations on transdisciplinary work.....	37
Chapter 3. Transdisciplinary perspective on societal transformation	39
3.1 Societal transformation towards sustainable agriculture	39
3.2 Three knowledge types of institutional structures	40
3.2.1 System knowledge.....	40
3.2.2 Target knowledge	41
3.2.3 Transformation knowledge	41
3.3 Synthesizing epistemological and methodological plurality in transdisciplinarity?.....	42
Chapter 4. The embodiment of agricultural knowledge	44
4.1 Hierarchization of agricultural knowledge in alternative agriculture	44

4.2 Epistemic living space in (academic) experimental writing	44
4.3 Dialogical analysis of a book and a fieldwork.....	45
4.4 New ways of managing pests and the creation of organic commodities	46
4.5 Embodiment of knowledge as a critique to politics of knowledge	47
4.6 The partiality of regulatory institutions as technoscientific regimes of power	48
4.7 Knowledge as process – linking PhD research and journal publication	49
Chapter 5. Transdisciplinary moments as an entangled approach to transdisciplinary collaboration.	51
Chapter 6. Conclusion – Embodying transdisciplinary moments as a PhD student.....	55
6.1 Potential future engagement of transdisciplinarity with its (perhaps) distant kin	56
Publication bibliography.....	58
Part II. Publications.....	67
Chapter 1. Strategic Engagement in Institutions of Organic Farming in Indonesia	70
1. Introduction.....	70
2. Study Area	72
2.1. The Historical Development of Conventional Farming in Indonesia.....	72
2.2. Civil Society and OF	73
2.3. The Indonesian Government and OF	73
3. Theoretical Framework	75
3.1. Institutional Theory	75
3.2. The Institutions of OF	75
3.3. The Institutionalization Process in OF	76
3.4. Institutional Analysis and SNA.....	77
4. Research Methodology and Limitations.....	77
5. Results—OF Actors and Links	80
5.1. The Disengaged Group	80
5.2. The Partially Engaged Group	82
5.3. The Fully Engaged Group.....	84
6. Discussion—OF Institutions in Indonesia and Future Implications.....	86
7. Policy Implications.....	90
References.....	93
Chapter 2. Turning Indonesia Organic: Insights from Transdisciplinary Research on the Challenges of a Societal Transformation	99
1. Introduction.....	100
2. The Emergence of Organic Agriculture in Indonesia.....	101
3. Conceptual Framework and Applied Research Methods.....	102
3.1. Conceptual Framework	102

3.2. Research Methods: Combining Qualitative Stakeholder Interviews and Ethnographic Studies with Randomised Controlled Field Experiments	103
4. Inter and Transdisciplinary Research Findings on the Sustainability of Organic Farming	105
4.1. System Knowledge	105
4.2. Target Knowledge.....	107
4.3. Transformation Knowledge	109
5. Discussion	110
6. Conclusions: Policy Recommendations and Lessons of Transdisciplinary Research.....	112
References.....	114
Chapter 3. Farmers' Creativity and Cultivated Senses: The Immediacy of Embodied Knowledge in Alternative Agriculture	120
1. Technoscientific World of Alternative Agriculture.....	120
2. Regulatory Institutions as Technoscientific Regimes of Power.....	125
2.1 New Ways of Managing Pests	125
2.2 The Creation of Organic Commodities	127
3. The Corporeality of Technoscientific Knowledge Among Farmers	131
3.1 Economic Threshold – from Disembodied to Embodied Concept	132
3.2 Tactile and Visual Evaluation – a Matter of Experience.....	135
4. Heterogenous Knowledges in Alternative Agriculture	138
4.1 Epistemological Difference.....	138
4.2 Model Farmer	140
5. Re-thinking Alternative Agriculture.....	144
References.....	146

Preface

This cumulative dissertation consists of three research articles (two of which have been published and the remaining one is under revision). The three research articles are:

Laksmana, Dimas Dwi and Martina Padmanabhan. 2021. "Strategic engagement in institutions of organic farming in Indonesia." In *Transitioning to Sustainable Life on Land*, edited by Volker Beckmann, 381. Switzerland: MDPI.

Fritz, Manuela, Michael Grimm, Patrick Keilbart, Dimas Dwi Laksmana, Nathalie Luck, Martina Padmanabhan, Nurcahyaningtyas Subandi, and Kristian Tamtomo. 2021. "Turning Indonesia Organic: Insights from Transdisciplinary Research on the Challenges of a Societal Transformation." *Sustainability* 13 (23): 13011. <https://doi.org/10.3390/su132313011>.

Laksmana, Dimas Dwi. (forthcoming). "Farmers' Creativity and Cultivated Senses: The Immediacy of Embodied Knowledge in Alternative Agriculture."

Summary

Organic agriculture in Java, Indonesia, has been historically intertwined with social movements that struggled for more economically, ecologically, culturally, and socially sustainable agriculture. While these grassroots movements emerged under an authoritarian government that showed little interest in organic agriculture, the turn of the 21st century saw the rapid involvement of the Indonesian government in supporting, regulating and, arguably, commodifying organic agriculture. Institutionalization triggered diverse responses from competing organic actors, reflecting their different standpoints and knowledges. In this context, a transdisciplinary approach is deemed suitable to provide context-specific insights into organic agriculture.

This dissertation draws on anthropology and Science and Technology Studies (STS) to explore the politics of knowledge of organic agriculture in Yogyakarta, Indonesia, as a contribution to a critique of transdisciplinarity. My interest on the hierarchization of different knowledges is inspired by the work of anthropologists of knowledge that asks how the communities they study construct knowledge and how they themselves construct knowledge about these communities. Since transdisciplinary knowledge is co-produced by science and society and reflects their embedded power relations, transdisciplinary research needs to be open to different interpretations, and reflexive towards the unequal distribution of resources, accountability, and responsibility. By linking these two lines of thought, I examine the making of knowledges through reflexive transdisciplinary work. I reflect on how “epistemic living space” (Felt 2009) and “co-presence” (Chua 2015) affect research and shape the politics of knowledge of organic agriculture in Yogyakarta, Indonesia. I argue that the hierarchization of different knowledges of organic agriculture was intertwined with my shifting positionalities, as a field researcher in Indonesia and PhD student at Passau University, as I moved between these two different “field sites”.

This cumulative dissertation is divided into two parts. In Part I, “Knowledge in the making”, I present my contributions towards transdisciplinary knowledge production and politics of knowledge of organic agriculture. Part II, “Publications”, comprises the three stand-alone papers. The first contribution is my formulation of the notion of knowledge in the making. Knowledge in the making refers to an approach towards a synthesis that is based on the actual practice of research, avoids analytical closure on what organic agriculture is, underlines the implications of its different conceptualizations, and highlights the temporal dimension of research practice, where different research agendas and intellectual traditions are drawn upon at different stages of research.

The second is my exploration of the ways that reflexive transdisciplinary work, and living and intersubjective experience shape knowledge in the making. As a transdisciplinary researcher, I was expected to produce different outputs and participate in project-related activities. In contrast, as a PhD candidate, my cumulative dissertation is solely evaluated based on scientific publications. To respond to the contradictory nature of doing a transdisciplinary-PhD-research, this dissertation problematizes a call to see transdisciplinarity as a reflexive process (Fritz and Binder 2020), by asking: Who reflects on whose experiences? For what ends is this reflexive gesture performed? And under which conditions is reflection possible?

The third is my demonstration of how an understanding of knowledge in the making sheds lights on the politics of knowledge of organic agriculture. This approach serves to examine the politics involved in synthesizing the conceptualizations of organic agriculture employed by different actors into one overarching narrative, such as sustainable agriculture or alternative agriculture. Rooted in the concepts of co-presence and epistemic living space, I revisit my three publications. The discussions on Net-Map as a method for transdisciplinary knowledge co-production show how different perspectives and aspirations of scientific and extra-scientific actors with regard to

transdisciplinary collaboration shape transdisciplinary knowledge co-production. The discussions on transdisciplinary synthesis problematize the production of transformation knowledge, envisioned as a synthesis of the results transdisciplinary research, when this fails to take account how different scientific disciplines are valued and evaluated by societies and communities of practice. The discussions on politics of knowledge in alternative agriculture examine the actual practice of research and, specifically, how my experiences as a PhD researcher in a transdisciplinary project were translated into journal publications to construct different knowledges of organic agriculture.

My final contribution is the notion of transdisciplinary moments, a conceptualization of transdisciplinary research practice that accounts for the politics of knowledge in which both scientific and extra-scientific actors are embedded. This concept extends practice theory by considering research itself as practice. Seeing research as a practice means that issues such as power, culture, subjectivity, agency, and acting subject, all of which are of interest of practice theory are relevant to understand the research practice itself that produces scientific knowledge. The term research practice here refers not only to data collection, but also the process of selecting research problems and writing up of scientific articles that are used to construct different knowledges. In all these stages of research, intersubjective experience and the “living” dimension of the researchers are a crucial element of knowledge production. This means that structural change in contemporary academia, called for in response to the contradictions of transdisciplinarity needs to be understood as occurring through a dialectical relation with research practice. As a bodily and affective process, the concept of transdisciplinary moments serves as a methodological pointer, enabling identification of when critical self-reflection and collective reflection between scientific and extra-scientific actors need to take place in the context of a transdisciplinary collaboration.

As a conclusion, I share the lessons learned from pursuing a PhD as a cumulative dissertation in an unstructured setting within a German–Indonesian research project on Indonesian organic agriculture. Finally, I identify bodies of literature and strands of thinking for future engagement within transdisciplinary research and discuss their potential to contribute to radical change in the institutional and value structures of contemporary academia.

Acknowledgements

A list is just a list. It is helpful, but only to a certain extent. That is, to the extent it is helpful. I see listing the names of all people, who are faraway, nearby, and in-between, and who create shelters where I can explore, rebel, discover, resist, and settle, would not do any justice. To reciprocate their immense energy that moves and nourishes, I dedicate the following lines.

the f worlds

every word is equal

until they are not

what a way to begin and a way to end

fin

asa binasa

tumbuhlah si perasa

While I tend to believe that lives are certainly bigger than any piece of writing, good pieces of writing can capture the vastness, and simultaneously, intimacy of lives.

This dissertation is dedicated to my biological grandmother, Angela Soemitro, who sadly passed away last year, from whom I learned a great deal about generosity and dedication even when time was unkind. I wished I could have completed this work sooner. This dissertation is also dedicated to another grandmother, Ana Vera Estrada, from whom I learned a great deal about commitment and responsibility and whose influence lasts beyond the confine of my master's study. I truly treasure the 1 month I spent in Cuba and your insistence on having a weekly meeting despite your health.

Throughout the whole journey of finishing my PhD, I was reminded by numerous people to be proud of myself for what I have achieved. How could I? Why should I? I quietly resisted it. Until today. Not being proud of what I accomplished, but rather of what I am allowed to share and of gesture that I learned which allows discovery possible. As another fellow writer, whose thinking and doing I occasionally return to, exclaims "knowledge is less about acquiring, and more about receiving".

explore, rebel, discover, resist, accept

again

settle, move, wait, move

again?

write some more

rest ...

“Part of what oppression tries to teach us is that as intellectuals we need not involve ourselves, and that it is undignified and undisciplined to do so. [...] We often write the books we most need to read and do research that in some way touches on core issues in our own lives.”

Aurora Levins Morales (2019, 87), *The Historian as Curandera*.

“There is not much, in the kind of education we receive here in the West, that emphasizes or even recognizes the importance of constantly having contact with what is actually within ourselves, or of understanding a structure from within ourselves first. The tendency is always to relate to a situation or to an object as if it is only outside of oneself. Whereas elsewhere, [...] one often learns to “know the world inwardly,” so that the deeper we go into ourselves, the wider we go into society. For me, this is where the challenge lies in terms of materializing a reality, because the personal is not naturally political, and every personal story is not necessarily political. In talking about the personal, it is always difficult to draw that fine line between what is merely individualistic and what may be relevant to a wider number of people. Nothing is given in the process of understanding the “social” of our daily lives. So every single work I come up with is yet another attempt to inscribe this constant flow from the inside out and outside in.”

Nancy N. Chen (1992, 1), *“Speaking Nearby:” A Conversation with Trinh T. Minh-Ha*.

Part I. Knowledge in the making

Chapter 1. How does research contribute to knowledge(s) of organic agriculture?

1.1 Introduction

This dissertation draws on anthropology and Science and Technology Studies (STS) to explore the politics of knowledge of organic agriculture in Yogyakarta, Indonesia, as a contribution to a critique of transdisciplinarity. My interest on the hierarchization of different knowledges is inspired by the work of anthropologists of knowledge (Fabian 2012; Borofsky 1994; Borofsky 1990) and recent conceptualizations of transdisciplinarity as a reflexive process (Fritz and Binder 2020; Schikowitz 2020). Fabian (2012) argues that anthropological investigation should be open to epistemological enquiry into the object of knowledge (knowledge of what) and the subject of knowledge (whose knowledge). Borofsky (1990) formulates these epistemological questions by inviting anthropologists to investigate how the communities they study construct knowledge and how they themselves construct knowledge about these communities. The transdisciplinary approach is broadly understood as a form of knowledge production that involves scientific and extra-scientific actors. Since transdisciplinary knowledge is co-produced by science and society and reflects their embedded power relations, transdisciplinary research needs to be open to different interpretations, and reflexive towards the unequal distribution of resources, accountability, and responsibility (Fritz and Binder 2020; Schikowitz 2020).

By linking these two lines of thought, I examine the making of knowledges through reflexive transdisciplinary work (Fritz and Binder 2020; Schikowitz 2020). I reflect on how “epistemic living space” (Felt 2009) and “co-presence” (Chua 2015) affect research and shape the politics of knowledge of organic agriculture in Yogyakarta, Indonesia. By underlining the “living” aspect of research, I show how research practice is intertwined with “epistemic practices, institutional rationales, individual biographical decisions, and political and broader societal frameworks” (Felt et al. 2013, 513). In addition, since research is founded on “intersubjective experience”, insights from a particular fieldwork engagement “must be understood as deriving from a peculiar confluence of circumstances, relations, and consequences” (Chua 2015, 654), which in my case are constituted by my positionalities as a PhD student at Passau University and a field researcher in Indonesia. I situate the politics of knowledge of organic agriculture within the contexts of the institutionalization of organic agriculture in Indonesia (Laksmana and Padmanabhan 2021) and the output orientation of academic work embedded in the ideology of New Public Management (Felt et al. 2016).

Organic agriculture in Java, Indonesia, has been historically intertwined with social movements that struggled for more economically, ecologically, culturally, and socially sustainable agriculture (Utomo 2005). The Bina Sarana Bakti (BSB) Foundation, with the support of Catholic church, played an important role in establishing philosophical foundation of the organic movement, which values harmonious relationships between human and nature (David and Ardiansyah 2017). While these grassroots movements emerged under an authoritarian government that showed little interest in organic agriculture, the turn of the 21st century saw the rapid involvement of the Indonesian government in supporting, regulating and, arguably, commodifying organic agriculture. As further explained in the following sections, institutionalization triggered diverse responses from competing organic actors, reflecting their different standpoints and knowledges. In this context, a transdisciplinary approach is deemed suitable to provide context-specific insights into organic agriculture. The abovementioned actors, including organic farmers and formal institutions, have played significant roles in the making of transdisciplinary knowledge about organic agriculture.

This cumulative dissertation provides insights into organic agriculture from multiple perspectives by synthesizing three academic articles I have individually and jointly written as a doctoral student within the IndORGANIC transdisciplinary research project. It does so by reinterpreting these publications according to what I call “knowledge in the making”. IndORGANIC is a German–Indonesian research consortium that aims to examine the environmental, economic, and social potential of organic agriculture in Indonesia, with a particular focus on Java. My publications demonstrate how different ways of knowing, characterized by different methodologies and conceptual foundations, underpin different aspects of organic agriculture.

My approach to knowledge in the making is, first, based on the notion of “knowledge as process” (Desai 2006) that expands Borofsky’s (1994, 338) analysis of “the conditions that structure knowing into knowledge” by looking at the actual practice of research, which is situated within particular social institutions and their embedded power relations (Asdal, Brenna, and Moser 2007). Following this conceptualization of knowledge, I elaborate on how my experiences as a PhD researcher in a transdisciplinary project were translated into journal publications and used to construct different knowledges of organic agriculture. Second, in accordance with Fabian’s (2012, 442) argument that “epistemological critique is not cumulative” in that “there are no such things as lasting epistemological foundations on which we can rest”, each publication needs to be understood contextually. Taken as a whole, the meandering, rather than linear process of my doctoral study reflects the influence of different intellectual agendas and traditions, including the sociology of organic agriculture, environmental anthropology, transdisciplinarity, sociology of scientific knowledge, and sustainability studies. Third, I do not propose one overarching theoretical framework that coherently links and explains the findings of my publications. My approach to writing a synthesis is influenced by Akhil Gupta’s (1998, 30) ethnographic writings on Indian farmers’ indigenous knowledge, where he explains that, since “[...] different discourses are juxtaposed on one another instead of being synthesized into a new, overarching system of meaning, I do not present an analytic frame that unifies the argument. [...] I do not present an analytic mastery over the data, sealing off all the loose ends into one coherent, authoritative explanation.” In my dissertation, “excess” that resists a “unifying explanation” leading to “analytic closure”, as Gupta (ibid.) puts it, is elaborated through the different writing contexts and my own critical reflections on each publication.

In summary, knowledge in the making refers to an approach towards a synthesis that is based on the actual practice of research, avoids analytical closure on what organic agriculture is, underlines the implications of its different conceptualizations, and highlights the temporal dimension of research practice, where different research agendas and intellectual traditions are drawn upon at different stages of research.

Building on the above epistemological discussion, I interrogate the normative stance of transdisciplinarity, which promotes co-production of knowledge and assumes that it provides “better” insights than disciplinary and interdisciplinary enquiry into how to transition towards organic agriculture, by situating this process within the politics of knowledge. However, the existing literature on transdisciplinarity tends to disentangle the analysts from the power dynamics affecting the subjects of their analysis, thereby perpetuating the process of “othering” in knowledge production. In other words, this literature has yet to account for the ways intersubjective experiences between researchers and their interlocutors shape the knowledge they (co-)produce. In addition, existing research about organic agriculture has yet to examine the politics involved in synthesizing the conceptualizations of organic agriculture employed by different actors into one overarching narrative, such as sustainable agriculture or alternative agriculture.

In light of the above problem statement, I propose the following research questions:

1. How, and to what extent, has the development of organic agriculture been supported and/or undermined by the social networks of civil society, government, and the private sector?
2. What are the roles of formal institutions in the policy arena of organic agriculture?
3. What are the implications of viewing alternative agriculture, such as organic agriculture and Integrated Pest Management (IPM), through the lens of farmers' embodied knowledge?

These research questions are taken from the publications that became the basis of this dissertation. Based on my theoretical standpoint, influenced by practice theory and the concepts of “epistemic living space”, “co-presence”, and “ethnographic moment” (Ortner 2006; Felt 2009; Chua 2015; Strathern 1999), I critically reflect on how exploration of these research questions provides insights into politics of knowledge in the making. I argue that the hierarchization of different knowledges of organic agriculture was intertwined with my shifting positionalities, as a field researcher in Indonesia and PhD student at Passau University, as I moved between these two different “field sites”.

This dissertation is divided into two parts. In Part I, “Knowledge in the making”, I present my contributions towards transdisciplinary knowledge production and politics of knowledge of organic agriculture. The first contribution is my formulation of the notion of knowledge in the making. The second is my exploration of the ways that reflexive transdisciplinary work, and living and intersubjective experience in research shape knowledge in the making. The third is my demonstration of how an understanding of knowledge in the making sheds lights on the politics of knowledge of organic agriculture. My final contribution is the notion of transdisciplinary moments, a conceptualization of transdisciplinary research practice that accounts for the politics of knowledge in which both scientific and extra-scientific actors are embedded. The concept serves as a methodological pointer, enabling identification of when critical self-reflection and collective reflection need to take place in the context of a transdisciplinary collaboration.

Part II, “Publications”, comprises the three stand-alone papers. The remainder of [Chapter 1](#) presents debates in transdisciplinarity and identifies a research gap in the existing literature. I then provide background information on organic agriculture in Indonesia, with a particular emphasis on Java. The next section presents a discussion on the politics of knowledge in research practice, drawing on the work of Sherry Ortner (2006) on practice theory, Ulrike Felt (2009) on epistemic living space, and Liana Chua (2015) on co-presence. This conceptual discussion provides the foundation for the methodological reflection on my positionality as a field researcher and doctoral candidate within the IndORGANIC project while being based in a German academic institution.

Chapters 2 until 4 are based on my publications. Rooted in the concepts of co-presence and epistemic living space, these chapters revisit the three publications, starting with the context of their writing, and moving on to discuss methodologies, conceptualizations of organic agriculture, findings, and finally to self-reflection. [Chapter 2](#) elaborates on societal debates and institutional contexts that inform the dynamic process of transitioning towards organic agriculture as a form of sustainable agriculture. This chapter is adapted from an article titled [“Strategic engagement in institutions of organic farming in Indonesia”](#), which was co-written with my PhD supervisor. This chapter shows how different perspectives and aspirations of scientific and extra-scientific actors with regard to transdisciplinary collaboration shape transdisciplinary knowledge co-production. [Chapter 3](#) presents insights on the potentials and challenges of transitioning towards organic agriculture in Java. Adopting a transdisciplinary approach, these insights are informed by disciplines of anthropology, development economics, sociology, and knowledge of practice partners. This chapter is adapted from an article titled [“Turning Indonesia organic: Insights from transdisciplinary research on the challenges of a societal transformation”](#), which was co-written with the IndORGANIC team. This chapter problematizes the production of transformation knowledge, envisioned as a synthesis of the

results of transdisciplinary research, when this fails to take account how different scientific disciplines are valued and evaluated by societies and communities of practice. [Chapter 4](#) analyses the politics of knowledge in alternative agriculture with reference to Integrated Pest Management (IPM) and organic agriculture. This chapter is adapted from an article titled [“Farmers’ creativity and cultivated senses: the immediacy of embodied knowledge in alternative agriculture.”](#) Based on the notion of knowledge as process, this chapter examines the actual practice of research and, specifically, how my experiences as a PhD researcher in a transdisciplinary project were translated into journal publications to construct different knowledges of organic agriculture.

In [Chapter 5](#), I introduce the concept of “transdisciplinary moments”, as a proposal to move towards a transdisciplinary research practice that accounts for politics of knowledge in which both scientific and extra-scientific actors are embedded. This methodological proposition could become the basis of individual and collective critical reflection that sheds lights on the politics involved in, for example, the selection of research agendas, and may facilitate the reorientation of initial assumptions as the research proceeds. In conclusion, in [Chapter 6](#), I share the lessons learned from pursuing a PhD as a cumulative dissertation in an unstructured setting within a German–Indonesian research project on Indonesian organic agriculture. Finally, I identify bodies of literature and strands of thinking for future engagement within transdisciplinary research and discuss their potential to contribute to radical change in the institutional and value structures of contemporary academia.

1.2 The transdisciplinary approach to knowledge production

This section introduces transdisciplinarity within a German-speaking context, which informed the approach adopted by the IndORGANIC project, to highlight its programmatic association with “sustainability science” and the production of “socially relevant knowledge”. Over the past two decades, I suggest, two strands of enquiry emerged. The first emphasizes transdisciplinarity as norms, while the second conceptualizes transdisciplinarity as practice. The latter has pushed transdisciplinarity scholarship from reflections on its ideal principles towards a more actor-oriented approach that showcases how transdisciplinarity is interpreted and practiced in research. Despite this progress, some aspects of the politics of knowledge are still left unaddressed, such as how positionalities shape knowledge claims and under what conditions the transdisciplinary mode of knowledge production takes place. I situate this theoretical discussion within the intertwinement between New Public Management ideologies in academia that is used to justify the output orientation of scientific work (Felt et al. 2016), and the institutionalization of organic agriculture in Indonesia (Laksmana and Padmanabhan 2021).

1.2.1 A brief history of transdisciplinarity

The term “transdisciplinarity” was initially debated by psychologists, including human behavioural scientists, and mathematicians at a university seminar on interdisciplinarity in France in the 1970s (Bernstein 2015; Nicolescu 2010). Despite their different disciplinary backgrounds, participants had a common interest in the problem of disciplinary boundaries, or knowledge compartmentalization, and in the possibility that transdisciplinarity offered for a new synthesis of disciplines in higher education and science (Bernstein 2015). In other words, the issue at hand was how to envision a different form of knowledge production. However, the term transdisciplinarity first became prevalent in the 1990s, when sustainability discourse gained more attention in the context of debates on global environmental governance, during and after the Rio conference in 1992 (Klein 2001). At this point, the discussion on transdisciplinarity shifted from philosophical aspects to a more research-oriented approach, with the introduction of the term “Mode 2 knowledge production” (Gibbons et al. 1994). This term underlines the need for collaboration between experts from academia and actors in broader society, including government agencies, industry, and civil society groups, to produce context-specific and problem-focused knowledge (ibid.).

In German-speaking countries, transdisciplinary research in sustainability studies is often associated with the “Zurich definition” of transdisciplinarity. According to this definition, transdisciplinarity is an engagement of “multidisciplinary or interdisciplinary research process” with societal debates (Scholz and Steiner 2015, 531 cited in Padmanabhan 2018a). Furthermore, transdisciplinarity considers the knowledge that science produces as a public good and promotes “socially relevant orientations”, understood as mutual learning between science and society to address sustainability transitions (Scholz 2017). In general, the term “sustainability” refers to feedback loops between biophysical environment and society, where one affects the other in dynamic ways (Nightingale 2019). However, as elaborated in Chapters 2 and 3, as a concept it is political in that it is contested, and historical in that it emerges from a particular context. In addition, societal experts, often called practice partners (*Praxispartners*), are expected to benefit from applying knowledge produced in transdisciplinary research (Bergmann et al. 2012).

The questions of participation, i.e. who participates in defining problems and developing solutions, and the legitimacy of science-driven propositions, frame discussion of these relations between science and society and motivate calls to open up the scientific process to the public (Felt et al. 2016.). Thus, transdisciplinarity promotes the democratization of knowledge and for this reason is suggested as a suitable approach to address sustainability challenges characterized by complex relations between social and ecological systems (Padmanabhan 2018a). As “wicked problems”, sustainability challenges can be appropriately addressed through multi-stakeholder engagement in transdisciplinary knowledge production that engages with the particularity of socio-political, cultural, and economic contexts of decision making (Brown et al. 2010; Scholz 2017). The “co-production of knowledge” has become shorthand for this perspective and one of the central pillars of transdisciplinary research (Pohl 2008).

The funding that national governments in German-speaking countries, such as Germany and Austria, have provided since the 2000s (Padmanabhan 2018a) demonstrates their interest in sustainability-focused transdisciplinary research. For example, The German Federal Ministry of Food and Agriculture explicitly requires “inter- and transdisciplinary research approaches” in their recent funding call “Innovative Sustainable Production Systems” (Federal Ministry of Food and Agriculture 2022, 2). Transdisciplinarity has continued to influence global environmental governance initiatives, as demonstrated by the creation of Future Earth, an international research project aiming to identify pathways towards future sustainability by integrating social and natural sciences, in the Earth Summit 2012 (Mauser et al. 2013). For the past two decades, transdisciplinary research agendas have been pursued in diverse cases, spanning air pollution (Tönisson et al. 2020), organic agriculture (Fritz et al. 2021), epidemiology (Ciesielski et al. 2016), environmental management (Kruijf et al. 2022), and agroecology (Méndez, Bacon, and Cohen 2013). Nevertheless, knowledge integration, which involves at least three stages of research, namely design, production, and dissemination, remains a challenge in transdisciplinarity (Mauser et al. 2013). The difficulty of knowledge integration is the result of the often unaddressed power dynamics in transdisciplinarity, whose aspiration to social relevance requires researchers to pay attention to different epistemologies as well as the values, subjectivity, and positionality of involved actors (Padmanabhan 2018a).

Furthermore, the transdisciplinary perspective recognizes that societal transformation towards sustainable agriculture is context-specific and multifaceted, and requires the convergence of societal and scientific concerns; hence collaboration between scientific and extra-scientific actors is a necessity (Osinski 2021). In organic agriculture, the adoption of a transdisciplinary approach was a response to the dominance of research in natural science and economics in influencing policies (Aeberhard and Rist 2009). Given that the recent emergence of organic agriculture in Indonesia as a form of sustainable agriculture intersects with the competing standpoints and knowledges of

multiple actors, the transdisciplinary approach is a useful methodology for exploring these multiple perspectives.

1.2.2 Transdisciplinarity as norms and practice

The above exposition shows that transdisciplinarity debates have moved from what transdisciplinarity is to how to do it. In other words, research interests in transdisciplinarity have shifted from conceptual discussions to more methodological and empirical ones. The methodological literature typically derives principles or criteria from conceptual literature that discusses what transdisciplinarity is and prescribes these principles as a methodology for conducting transdisciplinary research. This literature also discusses the challenges of meeting these criteria and evaluates the extent to which they are fulfilled by specific research projects (see Schikowitz 2020). For example, Pohl, Krütli, and Stauffacher (2017) propose ten steps for doing societally relevant research and use them to structure a workshop for transdisciplinary researchers. These authors distinguish between societal knowledge production, which refers to how actors understand and solve a particular societal problem, and scientific knowledge production, which refers to how researchers design and research societal problems (ibid.). Based on these distinctions, they develop sensitizing questions for transdisciplinary researchers (ibid.). A similar analytical approach is taken by Lang and colleagues (2012), who evaluate the challenges of following what they called “design principles” of transdisciplinarity by analysing scientific publications on transdisciplinary research projects.

The shortcomings of these works and other similar works include that the analysis is limited to the project level (Lang et al. 2012), sensitizing questions only target researchers/scientific actors (Pohl, Krütli, and Stauffacher 2017), and the “researcher” is treated as a uniform category (Polk 2015). Furthermore, as pointed out by Schikowitz (2020), these studies do not analyse how researchers’ different interpretations of transdisciplinarity influence their research practice. These studies assume that the co-production of knowledge between science and society in transdisciplinarity is better for solving societal problems, i.e. addressing sustainability challenges. However, less attention is given to the fact that while co-produced knowledge might be “useful” (Kruijff et al. 2021), this does not guarantee that it will be produced or applied by the relevant scientific and societal actors (Polk 2015). As researchers on the political sociology of science (Hess 2016; Frickel et al. 2010) have argued, the selection of research agenda is a political process, where diverse and sometimes competing actors struggle over the construction and implementation of research priorities. Consequently, the production of policy recommendations through transdisciplinary research should not be equated with their implementation, as the two processes may involve different decision makers and constituencies. In addition, the proliferation of project- and output-orientated research poses a challenge, since it discourages continuous engagement with issues and research collaborators (Felt et al. 2016), and calls into question the accountability of researchers.

In contrast to the previous research orientation, recent practice-oriented or actor-oriented transdisciplinary research focuses on the processes through which researchers make sense of transdisciplinarity (Schikowitz 2020). This research explores how researchers and societal actors interpret transdisciplinarity and translate their interpretations into research practice, and on their interactions in transdisciplinary projects (ibid.). In other words, it focuses on how the agency of scientific and extra-scientific actors is manifested in their diverse strategies. Another substantial difference is that whereas earlier transdisciplinary research starts from a separation between science and society, the practice-oriented approach begins from the intertwinement between the two, or in STS terms, the “co-production” of science and society (Jasanoff 2004). The former adopts to an additive approach to problem-solving in transdisciplinarity, whereas the latter views it as entangled (Vilsmäier 2021 cited in Baptista and Vilsmäier 2021, 4). In the additive approach, a collaboration between scientific and extra-scientific actors is deemed to produce better research. In contrast, in

the entangled approach, collaboration leads to deeper interrogation of the epistemological differences and institutional discourses that shape research practice (Baptista and Vilsmaier 2021). The latter resonates with the “practice-changing practice” of Critical Participatory Action Research (Kemmis, McTaggart, and Nixon 2014). The term co-production encapsulates the idea that scientific knowledge is not simply a reflection of reality, but “embeds and is embedded in social practices, identities, norms, conventions, [and] institutions” (Jasanoff 2004, 3). In other words, by conceiving science as co-constitutive of society, this approach rejects natural and social determinism (ibid.).

Building on the co-constitution of science and society, Felt and colleagues (2013) investigate how the transdisciplinary approach influences the practice of scientific knowledge production by coining the term “transdisciplinary knowledge regime”. This term underscores the potential of transdisciplinarity to interrogate not only what knowledges are produced, but also, in a more all-encompassing way, to explore how these knowledges are part of the assemblages of people, visions, imaginaries, shared beliefs, and practices of producing and validating knowledge (ibid.). In other words, this concept relates knowledge production to knowledge validation and its arbiters. This approach can also be used to analyse interactions among researchers with different career aspirations and levels of vulnerability and risk aversion, and at different stages on the academic career ladder (Felt et al. 2016; Schikowitz 2020). Such studies highlight the complex practice of transdisciplinary knowledge production by offering a fine-grain analysis of the differentiated conditions of researchers, rather than seeing the “researcher” as a uniform category. Overall, the previous examples highlight how transdisciplinary knowledge production integrates exploration of epistemological, social, ideological, and institutional issues.

The practice approach is also applied to investigate how knowledge in a knowledge–policy relationship is produced in a non-linear way. For example, West, van Kerkhoff, and Wagenaar (2019) argue that instead of knowledge being “applied to” action (in other words, knowledge precedes action), policymakers derive, produce, and use knowledge in a particular situation. They argue that this approach is better suited to understanding how policies address sustainability challenges, which are “wicked problems”, as previously mentioned (ibid.). Complementing these discussions, the most recent studies turn their attention to temporal regimes, a term which refers to the changing institutions and contexts that serve as time generators in academic life and in which transdisciplinarity is commonly embedded (Felt 2022). Time has significant effects on the questions that researchers can ask or want to pursue, because of constraints and opportunities linked to disciplinary evaluations, career paths, and reward mechanisms (ibid.). This study, thus, addresses the gap in the existing literature, that simply argues transdisciplinary work requires more time without reflecting sufficiently on broader temporal conditions.

The practice approach to transdisciplinarity is often combined with an analysis of (historically formed) power dynamics embedded in the co-production of knowledge. For example, Fritz and Binder (2020) scrutinize the notion of participation, a fundamental element in a transdisciplinary approach, through a power lens. Their analysis demonstrates how different forms of power, namely instrumental, structural, and discursive power, are exercised by scholars and practice partners as strategies to cope with various tensions embedded in transdisciplinary participation (ibid.). Another study focusing on power relations examines the challenges of practicing a more horizontal knowledge production in an academic culture rooted in asymmetric power relations that, in the study context, were the product of colonial dynamics (Manuel-Navarrete, Buzinde, and Swanson 2021). This study argues that more experienced and established scholars are more adept at coping with the uncertainty and different power configurations that are part of the co-production of knowledges (ibid.). Baptista and Vilsmaier (2021) explore linkages between transdisciplinarity and education, and specifically the tensions that emerge during the process of institutionalization of

transdisciplinarity in universities, when a transdisciplinary approach is incorporated to study programs, research initiatives, or general educational activities. Another study focuses on the different experiences of doing transdisciplinarity of two groups of early career researchers; the first group was part of a structured transdisciplinary doctoral school, while the second was not (Felt et al. 2013). The adoption of power analysis in the above examples contributes to the literature by identifying transdisciplinarity as a reflexive process that needs to consider the unequal distribution of resources, accountability, and responsibility and the different material conditions and aspirations of scientific and extra-scientific actors (Fritz and Binder 2020; Schikowitz 2020; Felt et al. 2013; Felt et al. 2016).

1.2.3 Research gap in transdisciplinary research

Of the above two streams of research in transdisciplinarity, the approach of transdisciplinarity as a practice is more relevant for this dissertation as it addresses the conceptual shortcomings of the first stream by acknowledging the messy process and lived experience of knowledge in the making. Such an approach incorporates crucial, yet often neglected, elements of how science is evaluated and how material conditions enable the translation of societal relevance into scientific relevance (Felt 2022). Furthermore, transdisciplinary knowledge regimes are analytically useful in understanding the relations between the imaginaries and values embedded in knowledge production and for translating transdisciplinary principles into research practices (Felt et al. 2013).

Despite the conceptual and methodological contributions made by this body of literature, I argue that a fundamental problem remains, in that these studies reflect on the transdisciplinary experience of the “others”, while lacking analysis of one’s own positionalities. These studies (Felt et al. 2013; Felt et al. 2016; Fritz and Binder 2020; Schikowitz 2020; Manuel-Navarrete, Buzinde, and Swanson 2021; Baptista and Vilsmaier 2021) do not capture the messy everyday realities experienced by researchers who are part of ongoing transdisciplinary projects since they are predominantly based on interviews with researchers and observations of project meetings and workshops; that is, on limited observations of specific stages of transdisciplinary projects. It can be argued that insights from both interview-based research methods and participant observation can only provide a snapshot of a particular phenomenon. In practice, research also involves activities and interactions that may not be directly related to research agendas, yet influence the researchers’ interpretation of their experiences. In addition, interviewees might be constrained in what they say about the projects where they work, since being overly outspoken or critical could have repercussions on their position as project members. The neglect of authors’ positionalities in the analysis of their interviewees’ reflections compromises their results and upholds the hierarchical distinction between analysts and interlocutors. For example, while Felt and colleagues (2013) analyse how the career stage of researchers shapes transdisciplinary research, they do not consider how their own different career stages influence their analysis. Therefore, while these studies make conceptual contributions to transdisciplinary literature by analysing the reflections of other transdisciplinary researchers and practice partners, whether their research can be considered transdisciplinary warrants further investigation.

In contrast, this dissertation, by combining a general theory of practice (Ortner 2006), the STS concept of epistemic living spaces (Felt 2009), and the anthropological concept of co-presence (Chua 2015), reflects on my own experience of being a PhD candidate in a transdisciplinary project. By examining my role within the IndORGANIC project, that investigates social transformations towards organic agriculture in Indonesia, I offer accounts of the day-to-day practice of such a project. In the following section, I particularly highlight the tensions that arise from being a member of a transdisciplinary project as a PhD student, and from my experience of growing into an academia whose values and institutional structures do not, I argue, accommodate transdisciplinary knowledge

production. My accounts of these tensions also underline the intertwinement between my intersubjective experiences that are the basis of what I know about organic agriculture and the evaluations of different scientific disciplines. These accounts are commonly obscured in the outcomes of transdisciplinary projects, though they arguably shape transdisciplinary knowledge production as “the social” is an important element in scientific knowledge (Asdal, Brenna, and Moser 2007).

The following self-reflection does not intend to discredit the work that has been done by IndORGANIC. On the contrary, insights gained from my work on the project underpin my proposal for a different way of doing transdisciplinary work. In the context of my PhD, it is based on a recognition that knowledge is continuously in the making, based on an understanding of knowledge as process, the temporal dimension of the research, and acceptance of analytical “excess” that avoids overarching narratives to explain different conceptualizations of organic agriculture. However, I recognize the limits of reflexivity in that it is contingent on a particular situation with its embedded power dynamic (Milora, Maimunah, and Still 2020). In this sense, reflexivity needs to be understood not principally as a means of knowledge production but as an ethical commitment to relational research (*ibid.*). This understanding influences my choice of experiences to critically reflect upon.

This dissertation, therefore, problematizes a call to see transdisciplinarity as a reflexive process (Fritz and Binder 2020), by asking: Who reflects on whose experiences? For what ends is this reflexive gesture performed? And under which conditions is reflection possible? This approach is influenced by what Smith (2005) conceives as “problematic”, where individual experiences become an entry point to investigate the social organizations that originate from outside local settings but shape them. It is my response to the contradictory nature of doing transdisciplinary-PhD-research. As a transdisciplinary researcher, I was expected to produce different outputs and participate in project-related activities. In contrast, as a PhD candidate, my cumulative dissertation is solely evaluated based on scientific publications.

In response, I propose the concept of transdisciplinary moments, which looks at the politics of knowledge in transdisciplinary research (Kunze and Padmanabhan 2014) through the lens of practice theory (Ortner 2006), as a counterpoint to the overly instrumentalist and contradictory view of knowledge in a “knowledge society” dominated by New Public Management, where scholars are demanded to produce more with less. As practice theory suggests that social categories and social relations can be transformed and reproduced through practice, I propose the notion of transdisciplinary moments to understand the change that can happen in everyday research practice, while recognising the broader structural conditions. The concept underlines that co-production of knowledge between scientific and extra-scientific actors is saturated with power, affecting both the selection of research agenda and the validation and hierarchization of different knowledges, which are mediated through institutional mechanisms within and outside of academia and the intersubjective experiences of scientific and extra-scientific actors. These processes shape the making of different knowledges of organic agriculture. However, the embodied encounters between scientific and extra-scientific actors also open up the possibility of questioning underlying assumptions of transdisciplinary research. Therefore, starting out from a reflexive stance towards politics of knowledge, I argue that transdisciplinarity’s knowledge claim on organic agriculture needs to be interrogated with respect to what and whose knowledges count, and the research practice that shapes them.

1.3 Organic agriculture in Indonesia

This section presents a brief history of organic agriculture in Indonesia, focusing on Java. The following account demonstrates the complexity of societal transformation towards sustainable

agriculture, due to the involvement of multiple actors with competing interests, visions, and knowledges. As further explained in Chapters 2 to 4, the implementation of organic agriculture policy follows a combination of human and technological development paradigms, though its orientation toward the market and productivity, leading to its incoherence in practice. In addition, the long-term and massive impacts of the Green Revolution, ongoing since the 1960s, pose significant challenges to the efforts of the government and farmers to implement organic agriculture.

The emergence of the organic movement in Java was signalled by the active involvement of the BSB foundation, which worked to empower farmers, and the Ganjuran Declaration in the 1990s, which called for the development of agriculture based on ecological, economic, cultural, and social sustainability (David and Ardiansyah 2017; Utomo 2005). This declaration coincided with the global discussion on sustainable development at the Rio conference in 1992. The active promotion of sustainable agriculture by civil society actors was preceded by a decline in food production due to pest outbreaks in some of the leading food production areas in Indonesia. These events, together with the continuous decline of soil health and fertility and increasing social and economic inequality in farming regions, highlighted the problems with intensive agriculture, which had proliferated since its introduction during the Green Revolution (Thorburn 2014; Pincus 1996).

Against this backdrop, the Food and Agriculture Organization (FAO) and scientists in Indonesia pushed the government to implement an IPM program (Sawit and Manwan 1991). As a result, farmers began to learn to apply chemical pesticides in a more measured way by following agroecosystem analysis (Winarto 2004). This new paradigm of agriculture was disseminated to farmers through farmer field schools (FFS), a learning platform that reconfigured the interactions between farmers and government officials, particularly agricultural trainers. In contrast to the distribution of new technology, large-scale construction of infrastructure, and top-down governance that characterized the Green Revolution, this program aimed to improve farmers' decision-making about their own agricultural practices. This was done through the adoption of experiential learning, which incorporated new scientific knowledge into farmers' existing agricultural knowledge (Winarto 2004).

A body of research on organic agriculture in Indonesia has emerged in the past ten years, following the issuance of national organic farming policies and organic standards, which together led to the creation of the organic farming sector (Jahroh 2010). Some studies investigate the economic performance and market potential of organic agriculture compared to its conventional counterpart (Hidayat and Lesmana 2011; Mayrowani 2016). Others analyse discourses, such as food sovereignty and food security discourse, produced by state and non-state actors involved in organic agriculture (Schreer and Padmanabhan 2019). Another important theme is the evolving interplay between grassroots initiatives in the organic movement and government-led programs (Reuter and Macrae 2019; Tamtomo 2021). These studies investigate how non-state actors adapt, articulate, and strategize in response to the government's efforts to institutionalize organic agriculture through regulations, which, by responding to market imperatives, have arguably led to its conventionalization. These studies highlight the context-specific development of organic agriculture in Indonesia while speaking to broader debates on its transformation, institutionalization, and conventionalization in other countries.

This dissertation takes a different approach in that it investigates how transdisciplinary knowledge co-production and "living" and "intersubjective experience" in research practice shape different ways of knowing organic agriculture in Indonesia. In the following sections, I elaborate on different insights into organic agriculture which were (co-)produced from my field research with organic farmers and extension workers ([Chapter 4](#)), co-produced from the results of a transdisciplinary workshop ([Chapter 2](#)), and by a transdisciplinary project ([Chapter 3](#)). In each chapter, I critically reflect on these

findings and reinterpret them, adopting a “knowledge in the making” approach to synthesis (see [Chapter 1](#)). The following section elaborates on the conceptual underpinnings of such an approach and their implications for the politics of knowledge in transdisciplinary knowledge production, with reference to literature from STS and anthropology.

1.4 Methodological reflection on doing a PhD work in a transdisciplinary context

This section begins with a discussion on the general practice theory and how it shapes my understanding of the concepts of epistemic living space and of co-presence, all of which inform my methodological reflection on my PhD research carried out between 2017 and 2023. Next, I provide a summary description of IndORGANIC, the transdisciplinary research project I was part of. It is essential to describe the setup of the project since it shaped my positionality as a field researcher and doctoral candidate based in a German academic institution. Then I discuss a conceptualization of “field sites” in empirical field research to explore the links between my research in Yogyakarta, Indonesia, and my doctoral studies at Passau University, Germany. I end this section with an outline of the different phases of my fieldwork.

1.4.1 Epistemic living space and co-presence as foundations of PhD research practice

To investigate the politics of knowledge and, specifically, what and whose knowledges matter in organic agriculture and how those knowledges are constructed through research (Fabian 2012; Borofsky 1990), I refer to a range of STS literature on knowledge production in academic institutions and to anthropological knowledge production in fieldwork encounters. In particular, I draw on Sherry Ortner’s (2006) practice theory, Ulrike Felt’s (2009) “epistemic living space”, and Liana Chua’s (2015) “co-presence” to highlight how the interplays of knowledges of organic agriculture are configured through the shifting terrains of power relations between “fields” of field workers. In accordance with the concept of the co-production of science and society (Jasanoff 2004), knowledge-informed practice and, conversely, practice-informed knowledge drive the making and unmaking of the world.

By politics of knowledge, I mean the hierarchization of heterogeneous knowledges that structures interactions between social subjects and the broader conditions in which they take place (Nygren 1999). This issue is contingent on the role of regulatory institutions (Brown 2015), the processes of “scientization” which enables documentation or cataloguing of knowledges (Agrawal 2002), “epistemization” or the valuing of knowledge according to a rigid cognitive system (Desai 2006), and the enactment of expertise that involves the ordering of value that legitimates certain ways of knowing (Carr 2010). I build on work in STS literature that focuses on the social practice of knowledge production in different contexts, for instance in academic and scientific institutions (Asdal, Brenna, and Moser 2007). In other words, this work is interested in knowledge in a dynamic, rather than a static sense. Discussion on the politics of knowledge, thus, cannot be separated from the institutional mechanisms that produce it and through which it circulates (Jeon 2019; Heath 2007; Myers 2008). Institutions are not neutral but are places wherein power relations are reproduced, and value is assigned to different ways of knowing and consequently different areas of expertise (Newnham, McKellar, and Pincombe 2017; Carr 2010). I also refer to anthropology literature on how (anthropological) knowledge is produced through contingent, dynamic, and often unequal interactions between researchers and their interlocutors (Faier and Rofel 2014). Such knowledge is often further developed in contexts that are very different from where it is produced, intellectually, socially, and culturally, and disseminated to audiences different from the research subjects (Borofsky 1990). The above discussion conceptualizes knowledge as a social practice in which social subjects and power relations are embedded. Before moving the discussion on to knowledge in research practice, it is essential to provide a general outline of practice theory.

Sherry Ortner (2006, 16), an American anthropologist who specializes in social and cultural theory, outlines and elaborates on her version of practice theory in her seminal book *“Anthropology and social theory: Culture, power, and the acting subject”* as a “general theory of the production of social subjects through practice in the world, and of the production of the world itself through practice”. Her central thesis is that both power, or, more specifically, historical regimes of power, and the practice of acting subjects are central to social production, reproduction, and transformation. Therefore, the practice of social actors is the foundation of material and discursive processes that form social categories and relations.

In her formulation of practice theory, Ortner (2006) builds on the conceptualization of power according to Jean Comaroff and John Comaroff (1992), who are both American historical anthropologists, and the notion of “hegemony” according to Raymond Williams (1977), who was a Welsh Marxist literary theorist. Comaroff and Comaroff (1992) differentiate between agentive and non-agentive power. The former refers to people's ability to control others' lives by shaping their subjectivities and realities. The latter is subtler as it directs our attention and perception in our everyday lives and defines what is supposedly “natural” and “universal” (ibid., 28). The non-agentive mode of power often refers to hegemony, convention, and value (ibid.). Influenced by Raymond Williams's (1977) discussion on hegemony, Ortner (2006), considers that both agentive and non-agentive forms of power are never total, but more often full of contradictions and ambiguities, and are not external to acting subjects as mere structure but exist (and are resisted) through practice. Since social reproduction is unstable in the face of unequal power, practice is central to social transformation in which institutions and cultural formation are rearranged (ibid., 16).

Based on the above proposition, practice theory conceptualizes the relation between actions and structures as dialectic rather than oppositional (Ortner 2006, 2). For example, Ortner (ibid., 14–15) views culture both as an enabler, which is how cultural construction of agency becomes the basis of resistance and transformation, and as a constraint, which is how subjectivities are formed under a specific historical regime of power. In the analysis, these two aspects of culture are grounded in actual people doing things that reflect their agency and subjectivity. Subjectivity is broadly conceived as the cultural and historical consciousness of the modes of perception, desire, thought, and affect of acting subjects (ibid., 62, 110). According to this formulation, subjectivity shapes the multiple life projects they are engaged in. Life projects are “culturally constituted projects” that situate multiply positioned subjects in multiple power relations (ibid., 142, 144). In the context of research and the lives of researchers, this general theory is fleshed out more succinctly in the concept of epistemic living space.

Ulrike Felt (2009), an Austrian social scientist who works primarily on public engagement with science, coined the term “epistemic living spaces” to highlight the intertwinement of “the personal, the institutional, the epistemic, the symbolic and the political” in research practice (ibid., 19). Researchers' individual or collective perceptions and narratives on research, thus, are parts of “the multi-dimensional structures – symbolic, social, intellectual, temporal and material – which mould, guide and delimit in more or less subtle ways researchers' (inter-) actions, what they aim to know, the degrees of agency they have and how they can produce knowledge” (ibid.).

Felt (2008) presented this concept in a German article titled *Epistemische Lebensräume: Multiple Artikulationen von Wissen, Institutionen und Geschlecht – Ein erster Reisebericht aus Epistemien* in 2008. This concept entered English-speaking academia when it was taken up as a conceptual framework in an edited book *“Knowing and living in academic research: Convergences and heterogeneity in research cultures in the European context”* (Felt 2009). This book is a product of the European project “KNOWING: Knowledge, Institutions, and Gender” that “gathered researchers from five European countries to investigate the complex and multi-layered relationships between

researchers, knowledge production and institutional contexts under changing research conditions” (ibid., 18). This research project interrogates the conditions under which researchers choose their disciplinary expertise, identify problems to solve, pursue different types of collaborations, and plan their career pathways, all of which are part of knowledge in the making in academic and research institutions. In a European context, the “research conditions” refer to the “New Public Management” ideologies that mandate researchers to collaborate across disciplines and with societal actors and to produce tangible outputs, which are measured according to conventional indicators, such as peer-reviewed publications, prestigious funding, number of citations, h-index, etc., and are vital for establishing a career in academia (Felt et al. 2013).

The concept of epistemic living spaces is rooted in a co-productionist approach in that it stresses “the ways in which we know and represent the world (both nature and society) are inseparable from the ways in which we choose to live in it” (Jasanoff 2004, 2). According to this formulation, scientific knowledge is not simply a reflection of reality, but rather “embeds and is embedded in social practices, identities, norms, conventions, [and] institutions” (Jasanoff 2004, 3). The concept of epistemic living spaces draws attention to the strategic interplay between researchers’ epistemic practices and their social manoeuvring, manifested as the interdependence of “epistemic practices, institutional rationales, individual biographical decisions, and political and broader societal frameworks” (Felt et al. 2013, 513). In other words, adopting an approach from the sociology of scientific knowledge (SSK), it focuses on researchers’ lived experiences. Through highlighting aspects of living in research, this concept directs attention not only to the formal rules and norms in research and institutional structures, but also to dimensions such as “feeling intellectually and socially ‘at home’, holding an understanding of the non-codified sets of values, [...] a repertoire of practices to address knowledge questions, adapting to specific often complex funding arrangements and many more” (Felt 2009, 19). The above discussion suggests that the structural conditions and lived experience of research form a particular temporality for researchers at different stages of their careers. For example, a decision on a dissertation topic is not merely defined by the content of ongoing doctoral studies but also by what future career paths and disciplinary contributions doctoral candidates aspire to.

Felt and colleagues (2013) applied this concept to transdisciplinarity to examine and delimit the potential of contemporary research structures to accommodate the alternative way of producing knowledge embodied in a transdisciplinary approach. Their conclusions suggest that a transdisciplinary researcher’s reflection on “the tendency to overburden oneself [that] seems an unavoidable component of transdisciplinary approaches” (Padmanabhan 2018a, xix) is not an afterthought. On the contrary, as I further elaborate below, the notion of living in research serves as a point of departure for necessary critical reflection on the kind of knowledge production envisioned in transdisciplinary approach.

Informed by the perspective of epistemic living space, I propose the following conundrum: Is PhD research that is done in a transdisciplinary context compatible with the ideal of transdisciplinarity or must it inevitably backfire, since, ultimately, dissertation-by-publication is evaluated based on the number of scientific publications, narrowly defined as journal articles and book chapters (University of Passau 2013)? The major challenge I faced as a PhD student who grew into transdisciplinary research was the constant sense of being lost. While being “lost” is certainly not that uncommon among doctoral students (see Zocchi 2021), in my case the lack of a firm intellectual standpoint due to my interdisciplinary background, compounded by the unstructured PhD environment typical of German academia, where the cumulative dissertation format is a rather new phenomenon (at least in qualitative social sciences), posed significant challenges to practicing transdisciplinary work.

In these situations, my feeling of not having any solid grip on any classical discipline could be associated with transdisciplinarity's reputation as a research borderland in terms of funding, career, and publication (Felt et al. 2013), despite its growing importance in Europe. My experience as an early-stage researcher corresponds to those of other researchers in similar positions who perceive transdisciplinary work as an 'in-between space'. By being embedded in transdisciplinary projects, these researchers perceived themselves as being disconnected from mainstream academia at the social, epistemological, and institutional level (Felt et al. 2013, 518). It is also important to highlight that researchers' coping strategies differ significantly depending on their academic training and academic career stage. As Felt and colleagues (2013, 522) argue, based on their research on PhD students involved in transdisciplinary research with different institutional arrangements:

“[...] for supervisors accompanying the PhDs: most of them had a disciplinary core from which they could make 'excursions' into transdisciplinarity, and leave again if the territory proved unfriendly. The PhD students were not in this position. For them, inhabiting the borderland did not seem all too comfortable as it appeared to be a place full of contradictions and multiple, seemingly incompatible, expectations. Additionally, there was the constant fear that moving to the core academic disciplines could become rather difficult once one had settled down in transdisciplinary territory.”

Tensions between disciplinary and transdisciplinary work are also observed in "tandems", a methodological innovation that aims to facilitate co-production of knowledge by bringing together two researchers from different disciplinary and cultural backgrounds (Padmanabhan 2018b).

In the context of a cumulative dissertation, the basic stipulations on what this form should or could look like require me as an early-stage researcher to navigate two major interrelated tasks which demand different writing approaches, because I am writing for different audiences, who perceive me (as an author) differently. The first task is to publish scientific articles, where journal editors and external reviewers outside my faculty are the gatekeepers who decide on the validity of my work. For this form of writing, my arguments need to be understandable to a broader audience, including particular communities of practice, as my contribution will be perceived as the work of a peer scholar. The second is to write the dissertation, for evaluation by my supervisors. For this form of writing, a more extensive justification of the choice of methodology, theory, and research problem is expected, to demonstrate my knowledge as a PhD candidate. These two tasks are not necessarily carried out independently of each other. Since the social sciences encompass methodologies, debates, and schools of thoughts rooted in different intellectual agendas and traditions, it is not uncommon for social scientists to combine multiple perspectives to generate novel insights that differ from the work of their intellectual predecessors. This is to be expected in PhD work. The significant differences between the two tasks are who decides on the validity of my work and whether I am seen as a peer scholar or an early career researcher who is still growing into academia.

Because of the above conditions, in addition to the time-intensive transdisciplinary work and time-sensitive doctoral work, I certainly felt I was contributing more to meeting institutional demands, namely completing my PhD, which was evaluated solely based on the publication of scientific articles and the complex process of synthesizing them (the University of Passau 2013), when I was disentangled from the project; for example when I did not have to write policy papers, organize workshops, coordinate field trips, or participate in project meetings. However, these are, from my understanding, what transdisciplinary research is in practice. In a broader context, the challenges of doing transdisciplinary work for early career researchers can also be explained as arising from the tension between the desire to do more collaborative and integrated transdisciplinary work and the requirement to comply with dominant research ideology of New Public Management, which demands academics to produce more with less, as mentioned before (Felt et al. 2013). Criticisms of

the value structures of academia are also expressed by leaders of transdisciplinary projects, who complain that essential skills for practicing transdisciplinary work, such as project coordination, intercultural communication, and team management, are often perceived as extra-curricular activities by funding agencies and academic institutions (Padmanabhan 2018a, 299).

In the context of my transdisciplinary research on organic agriculture, it is important to reflect not only on the institutional context of my being a PhD student, but also on my fieldwork experience in Yogyakarta. The notion of “co-presence” helps me to think about what form of knowledge production is possible and how to practice it. This process is fundamentally built on relations between social subjects, rather than solely on the individual endeavours of researchers situated within an institutional context. Knowledge production through field research also continuously occurs even when fieldworkers move across different “fields”.

In her article *“Troubled landscapes, troubling anthropology: co-presence, necessity, and the making of ethnographic knowledge,”* Liana Chua (2015, 646), an anthropologist whose regional expertise is Borneo, formulates the notion of co-presence to highlight how the effects and implications of anthropological knowledge often exceed the ethnographer’s competence and control.

Anthropological knowledge refers to knowledge produced through enquiry that interrogates how people live and make sense of their worlds. Such knowledge is pursued through reflexive scholarly work, while remaining mindful of positionality and unequal power dynamics in encounters between researchers and interlocutors. According to Chua (2015, 655), “our insights are often less the products of what anthropologists want than of what they are able to pull off (or not) in particular circumstances.” She (ibid., 654) further argues that insights from a particular fieldwork engagement “must be understood as deriving from a peculiar confluence of circumstances, relations, and consequences.” Therefore, this concept disentangles the hegemonic image of lone scholars or scientists whose (individual) heightened wisdom and reflexivity produce knowledge of a particular community (cf. Padmanabhan 2022).

This concept was introduced as a response to the “ontological turn” in anthropology that, Chua (656) argues, despite its radical premises, is still preoccupied with “simply using ethnographic revelations to rework existing concepts and theories.” She uses the concept of co-presence, that highlights the messy relations between researchers and interlocutors in knowledge production, to argue for “new modes of intellectual exchange [...] that transcends the limitations of seminars, monographs, and journal articles” (ibid., 656), which resonates with the research agenda of transdisciplinarity. However, as I elaborate in the above discussion on epistemic living spaces, her claim to promote “new modes of intellectual exchange” needs to be situated within contemporary academia’s values and institutional structures.

I combine this anthropological concept with the STS concept “epistemic living spaces” to underline how knowledge production takes place continually, from conventional “fieldwork” to completion of doctoral studies at an academic institution. Therefore, understanding what I was “[...] able to pull off (or not) in particular circumstances” (Chua 2015, 655) was inseparable from my multiple encounters with organic farmers, activists, and government officials in Indonesia, but also from my experience of doing a transdisciplinary work as a PhD student. Referring to a PhD requirement that “the dissertation must demonstrate the author’s ability to conduct ... independent scientific work [...]” (the University of Passau 2013, 6), I contend that this requirement for “independent” work does not necessarily mean disentangling oneself from conditions under which scientific enquiries take place. On the contrary, my experience of living in research and the multiple relations that I have been part of are essentially the cornerstones of knowledge (co-)production. These multiple relations include my encounters with organic farmers who shared their life experiences and agricultural knowledge, daily conversations at my department in Germany, the approach and research agenda of

IndORGANIC, the funding agency's imaginary of science and society, my career aspirations, my conceptual orientation informed by STS and anthropology, funding availability, precarity in academia, changes in my life situation, and regulations for obtaining a PhD degree of the awarding institution.

1.4.2 IndORGANIC as a transdisciplinary project

IndORGANIC is coordinated by the University of Passau in collaboration with two Indonesian universities, Atma Jaya Yogyakarta University (UAJY) and Bogor Agricultural Institute (IPB), and the non-profit organization Indonesia Organic Alliance (AOI) as a practice partner. Following an interdisciplinary approach, the research project combines insights from sociology, anthropology, and development economics to produce knowledge on opportunities and challenges in transforming farming towards organic agriculture. Based on a transdisciplinary approach, each discipline contributes to three different knowledge types: “system knowledge”, “target knowledge”, and “transformation knowledge”, all of which aim to achieve change in a particular problem or situation (Hirsch Hadorn et al. 2008). These three knowledge types are co-produced by scientific and extra-scientific actors. According to Hirsch Hadorn and colleagues (2008), system knowledge refers to knowledge of a current state of a problem or situation. Target knowledge refers to actors' desired goals that inform needed changes. Transformation knowledge refers to knowledge of changes that can move society from the current state to the desired goals. Following this transdisciplinary approach, IndORGANIC (Padmanabhan n.d., 2) aims at “[...] analyzing the current state and potential of organic farming to improve food sustainability of Indonesia in the long run. We furthermore propose organic farming as a necessary transition of the food systems as a subsystem of the ecosystem and as a possible answer to the eminent societal changes after energy supplies based on petroleum will decline and get increasingly costly.”

Central to the project's transdisciplinary approach, and my thinking and fieldwork, are the three transdisciplinary workshops that took place between 2017 and 2020. The main aim of these workshops was to facilitate knowledge co-production with the partner organizations and actors who were not formally part of the project but have stakes and goals linked to the topic of our research. The workshops were organized according to the abovementioned three knowledge types.

I co-organized the first IndORGANIC transdisciplinary workshop with research counterparts at UAJY in Yogyakarta in 2017. This workshop invited practitioners to share their insights on the current state of organic agriculture in Indonesia, in other words, system knowledge. In addition, we conducted a Net-Map exercise as a participatory method. This workshop became the basis of my joint paper on organic institutions ([Chapter 2](#)).

The purpose of the second transdisciplinary workshop, which was co-organized with partners from IPB in 2018, was to share the preliminary findings of the research team, particularly concerning the target knowledge of the stakeholders we engaged with in our respective field research. In this workshop, the IndORGANIC team presented these preliminary findings in the form of briefing notes. I presented preliminary analysis of the governance of organic agriculture and social networks of actors in organic farming based on results of the first transdisciplinary workshop.

As per AOI's recommendation, the third transdisciplinary workshop in February 2020 was co-organized with IPB, Atma Jaya Yogyakarta University, and the Indonesian Institute of Science (LIPI). The motivation for establishing this cooperation was to influence policy making at the national and provincial levels. The timing also coincided with the production by the National Development Planning Agency (Bappenas) of the final draft of the National Development plan 2020–2024. This workshop focused on transformation knowledge. As part of the third transdisciplinary workshop, we presented our policy recommendations, which were made available in both English and Indonesian, to policymakers and civil society actors at IPB, LIPI, and UAJY. We also presented the policy

recommendations on organic farming institutions and local agricultural knowledge to Partnership for Agriculture and Sustainable Livelihoods (PASAL), a community of researchers and activists concerned with agrarian issues, in Yogyakarta. The project's website provides detailed information about the transdisciplinary workshops and the project outputs (IndORGANIC n.d.).

1.4.3 Inhabiting different “field sites”

Initially, I understood my fieldwork as consisting of nine months research in Yogyakarta between 2017 and 2020. The process of renaming the Chair, from Comparative Development and Cultural Studies – Southeast Asia to Critical Development Studies Southeast Asia (Padmanabhan et al. 2022), which involved continuous discussions among the Chair members on critical theories between 2020 and 2022, including feminist work on the situatedness and partiality of knowledge (see Sultana 2021; Nightingale 2003), sparked my reflections on the implication of writing about organic agriculture and the experiences of organic farmers in Indonesia while situated as a doctoral student at a German university. This reflexive gesture was also influenced by STS literature that discusses science as practice (see Asdal, Brenna, and Moser 2007), which guided me towards situating my work as being produced from a particular academic institution. Based on Marilyn Strathern’s (1999) contemplation on contemporary fieldwork and discussion of the socialising process of growing into academia (Felt et al. 2013), I expand the notion of “field site” to include the University of Passau in Germany where I wrote my dissertation between 2020 and 2023 as a “field”. The methodological consequence of this shift of thinking is that I include an analysis of the PhD guidelines of the University of Passau (*Promotionsordnung für die Philosophische Fakultät der Universität Passau*), which represents what Dorothy Smith (2005) called an “institutional ruling” that organizes knowledge production by doctoral candidates.

1.4.3.1 Indonesia as a site for growing into field research

Between 2017 and 2019, I spent around nine months doing fieldwork in the Sleman and Kulon Progo Regencies in the Special Region of Yogyakarta, on the island of Java, Indonesia. In total, the nine-month period comprised four phases of fieldwork. These different phases of my fieldwork were planned around the three transdisciplinary workshops and to accommodate teaching obligations that came with my employment as a research assistant. The workshops and teaching obligations served as a temporal regime that, according to Felt (2022, 206), is akin to “[...] an invisible infrastructure that frames ways in which researchers can know and define the kinds of academic lives that they can live.” Following the transdisciplinary approach, it is important to highlight that these fieldwork phases were not limited to data collection per se but also involved maintaining and establishing connections with practice partners on the ground (Padmanabhan 2018a).

My first trip to Bogor and Yogyakarta was for an explorative study or scoping mission in April 2017. I co-organised this trip with project partners in Indonesia who helped me to organize visits to organic farmers and meetings with our counterparts in AOI, IPB, and UAJY. The first trip helped clarify the roles and interests of each project partner and establish the project’s working culture. Organic farmers and farming groups we visited in Yogyakarta included Tani Organic Merapi (TOM), the snake fruit association in Sleman (a member of AOI), and Bumi Langit Institute. Organic farmers we visited in Bogor and the surrounding area included the Learning Farm, BSB Foundation, and Saga Farm.

My second trip to Indonesia was to present my work on organic farming institutions at the OrgaTrop organic farming conference held at Gadjah Mada University (UGM) in August 2017. At the conference, I presented the initial idea for my PhD research and learned about important people and organizations in Indonesian organic agriculture. I extended the stay into a two-month trip to understand my field sites better and build connections on the ground. During this stay, I visited several organic farmers, activists, and government officials to introduce them to my research interests and fieldwork plan in Yogyakarta for the next few years. To establish my field sites in

Sleman and Kulon Progo Regencies, a research assistant from UAJY assisted me by informing the offices of the Department of Agriculture in the two areas and issuing formal letters confirming the cooperation between Passau University and UAJY. Because I was able to get approval for the research from government officials at this early stage, I faced minimal problems organizing interviews with the heads of the agricultural departments and extension workers in the two study regions.

The third fieldwork phase lasted from December 2017 until April 2018. During the immersion phase, I stayed with an organic farmer family in Sleman and a family of organic coconut tappers in Kulon Progo. As is further explained in [Chapter 2](#), I co-organized the first transdisciplinary workshop and the Net-Map exercise with a research assistant at UAJY. The insights from the first transdisciplinary workshop contribute to “system knowledge”, as described in [Chapter 3](#). During this stay, I conducted a participant observation by helping my host family in the garden and on a communal farm belonging to a women farmer group (KWT). In addition to farming-related activities, I also helped out by doing daily chores at my host families’ houses to fulfil my obligation as an “adopted child” during my stay. Most organic farmers in Sleman grow vegetables and rice, whereas in Kokap, in Kulon Progo, farmers produce organic coconut sugar in combination with home gardening, livestock rearing, and non-farming activities. During this stay, I also conducted in-depth semi-structured and unstructured interviews with organic farmers (both those who have organic certificates and those who self-certify their organic produce), non-organic farmers, government officials from the departments of agriculture of Sleman and Kulon Progo, youth activists, activists, and scholars. The combination of participant observation and interviews helped me to learn about the practices and knowledges of different actors in organic agriculture. The insights from my field research become the basis of [Chapter 4](#).

During the interviews, I simultaneously made annotations in my field notes to document “interesting points”. These interesting points included issues I was unfamiliar with or had not been mentioned in my previous interviews, different insights on familiar events, important names of events, people or organizations, tensions, and other noteworthy information. These field notes and memos informed the analysis of the transcripts and provided an initial interpretation of the interviews. At the end of each day during my fieldwork, I would slightly tidy up the field notes since I sometimes made them in such a hurry that the handwriting was not very readable. I also wrote a field diary to summarize each day’s experience. This form of writing captured the difficulties, challenges, and discomfort I experienced while doing field research. Through reflecting on my field diary and field notes, I concluded that the recurring “negative” emotions throughout my research process stemmed from the tensions that arise from being a member of a transdisciplinary project as a PhD student as previously mentioned. I manually transcribed every interview with the help of paid research assistants who are native Indonesian speakers, and I converted all field notes into digital format. These documents were assembled, and coded using ATLAS.ti, a software for qualitative data analysis.

During the fourth phase of my fieldwork from September 2018 to January 2019, I revisited families, farmers, government officials, and activists I had interacted with to follow up on specific issues I had encountered in the previous phases of my fieldwork. During this field visit, I presented my preliminary fieldwork analysis to the second transdisciplinary workshop in Bogor. The presentation of the IndORGANIC team and the feedback we received from the workshop participants contribute to “target knowledge” in [Chapter 3](#). In addition, I stayed with a family of organic snake fruit farmers in the Sleman region to learn about the implementation of the government’s 1000 Organic Villages program (Plantation General Directorate of the Ministry of Agriculture 2016). A farmer group in the village where I stayed was one of the participants in this national program to promote organic agriculture. During my visit, the farmer group was in the final phase of their participation in the

program. This is a certification phase where inspectors from an organic certification agency visit participating farmers. This stay provided a snapshot of the challenges facing not only organic snake fruit farmers but also government officials of the department of agriculture in seeking to comply with organic certification requirements.

My last visit to Indonesia as part of the IndORGANIC project was in February 2020 to attend the third transdisciplinary workshop co-organized with LIPI. This workshop consisted of a series of meetings at IPB, Bappenas, and UAJY, where the research team presented policy recommendations to policymakers, organic farmers, scholars, and activists. The rationale of having three meetings was to make our recommendations available to all relevant policymakers at regional and national levels. The results of the third transdisciplinary workshop contribute to “transformation knowledge” in [Chapter 3](#).

1.4.3.2 Germany as a field for growing into embodied writing

“[...] well chosen words gather the power to change others’ minds and possibly the conditions of our own lives. At its best, strong writing can direct attention to suffering and injustice, deepen compassion and outrage, elaborate imaginative alternatives, and mobilize energies for action.”

Kirin Narayan (2012, xii), *Alive in the writing: crafting ethnography in the company of Chekhov*

The last phase of my field research, in Germany between 2020 and 2023, was marked by an intense process of discovering my voice through writing. A principal discovery was that my voice is very much a multiple one and related to many other voices, a point that I further elaborate in [Section 4.3](#) dealing with multivoicedness and dialogism (Aveling, Gillespie, and Cornish 2015). Here, I elaborate on my discovery of writing as a way of thinking and not merely a representation or means or product or a way of communication. Therefore, different forms and ways of writing lead to different ways of thinking. In addition, I learned that writing is very much a bodily process. It is important to clarify here that I apply the following writing approach only to this cumulative dissertation and the embodied knowledge paper (Laksmana forthcoming) that is the basis of [Chapter 4](#).

My research experience allows me to reflect on the interplay between enquiry that guides research, and on the writing that guides my response to that enquiry. One of the main challenges in doing research is entextualization, which is the rendering of experience into text (Nielsen and Rapport 2017). This process requires constant motion between details and patterns, general and specific, and concrete and abstract (Lund 2014). These back-and-forth analytical moves often lead to the need for re-ordering of categories, which may lead to a discovery. Consequently, a text is not only a representation but also a mode of thinking and acting. Practicing writing as a mode of thinking means I write without referring to or being bound to the word limit of the kind of text I write. Therefore, while some sentences are deleted from the final form of a text, the ideas remain inside it, or they become a genesis for other texts or ideas. As a way of thinking, writing also involves not only thinking about possibilities but is also a response to these possibilities. Such a response may be present within a text, but it may also go beyond it. This writing approach is akin to how curiosity moves writing (Narayan 2012, 115) in the sense of “[...] writing becomes less an arena in which obstacles must be overcome and more of a space to receive whatever comes.” In addition, writing is imbued with reflexivity and empathy, allowing me to approach and get a glimpse of other people’s multiplicity of experiences and to accept the possibility of these experiences changing my presumptions on what the world is and should be. Therefore, the rendering of my embodied research experience on organic agriculture into this dissertation follows the above writing approach that works through the “excess” (as mentioned in [Chapter 1](#)) of analytical categories I applied in my publications.

Writing also creates a crack or an opening in my taken-for-granted world by allowing me to adjust my sensibility, which is the capacity to direct my senses and to dwell in and dismiss sensations. This interaction with sensations corresponds to my understanding of writing as embodied practice, which draws attention to the immediacy of knowledge production through the arrangement of written words. I bring my past experiences, including the sensations and images of my fieldwork, to the present through writing. This writing approach is akin to Okely's (2012, 123) description of field notes as "mnemonic triggers of a total experience", which involve not only cerebral but also bodily process. Okely (ibid., 124) further argues that the transformation that anthropologists experience as the result of embodied fieldwork takes place throughout the process of knowledge acquisition, analysis, and writing. In this approach, the "presence" of the research subjects and the agency of concepts (cf. Ahearn 2001) in my writing push my understanding during fieldwork further and likewise my observation during the analysis, two processes that lead me to an "ethnographic moment" (Strathern 1999) where the known is surpassed. This process also illustrates the inseparability between discovery and surprise (Narayan 2012, x).

More importantly, the "presence" of my research subjects keeps me grounded and cognizant in relating scientific concepts to concepts they use in their daily lives and not dissolving their existence in theoretical arguments. This way of writing is inspired by what Trinh Minh-ha has articulated as "speaking nearby" in her conversation with Nancy N. Chen (1992, 87), described as "[...] a speaking that does not objectify, does not point to an object as if it is distant from the speaking subject or absent from the speaking place. A speaking that reflects on itself and can come very close to a subject without, however, seizing or claiming it."

The above conceptual and methodological discussions, which bring together the experience of living in research with the circumstantial nature of research and embodied writing, guide my critical reflection on the publications that are the basis of this cumulative dissertation. They guide the contextualization of my publications. By linking general practice theory, the concept of epistemic living space, and co-presence, I consider transdisciplinary research practice, which shapes different ways of knowing organic agriculture, as entangled with intersubjective interactions between myself as a field researcher and as a doctoral candidate, and between myself and other agents involved in my research. In this sense transdisciplinary research practice intersects with the epistemic, personal, institutional, and political. On this basis, the following three chapters adapted from my publications begin with writing context and end with critical reflection on the broader structural conditions that shaped their writing.

Chapter 2. Institutions of organic agriculture and sustainability

2.1 Societal debates on sustainable agriculture in Indonesia

This chapter situates organic agriculture within the global consensus on the need to transform current agricultural systems to be more sustainable (Willett et al. 2019). It has been argued that the implementation and formulation of policies in sustainable agriculture depend on “societal debates and social movements that apply pressure to governments and institutions” (Eyhorn et al. 2019, 254). In addition, analysis of sustainability and sustainable development should address the specificity of these concepts, which are connected to the actors who define them and the subject of the enquiry (Nightingale 2019). Therefore, the concept of sustainability is political in that it is contested and emerges from a particular context. In Indonesia, the government takes a central role in institutionalizing organic agriculture through the formulation of national policies and centralized governance structures. Through these policies and governance structures, the government sets out its normative stance on the “sustainability” of organic agriculture and pathways to sustainable agriculture. However, other actors propose different “meanings” of organic agriculture (Schreer and Padmanabhan 2019), some of which contradict with the government’s interpretation. Differences in the conceptualizations of organic agriculture among different actors create tension, but also areas of cooperation and potential spaces of resolution, all of which contribute to understanding on the transformation toward sustainable agriculture.

In light of the above problem statement, this chapter is guided by the question: How, and to what extent has the development of organic agriculture been supported and/or undermined by the social networks of civil society, government, and the private sector? My answer to this research question draws on an article co-authored with my PhD supervisor (Laksmana and Padmanabhan 2021) on the use of Net-Map as a means of co-creating transdisciplinary knowledge of organic agriculture in Indonesia. Net-Map, as a participatory research method based on social network analysis, enables exploration of the actors’ emic perceptions of the networks that structure their interactions and their positionalities within these networks. In our study, the resulting analysis of the social networks was jointly discussed by researchers and participants.

The published article identifies and characterizes the links among actors in organic agriculture and shows how these are related to their past positionalities, particularly in relation to the government, and actors’ visions of organic agriculture’s sustainability and future development. Recognizing that power relations are embedded in different conceptualizations of organic agriculture, the article analyses the diversity of views on organic agriculture not in order to resolve these differences but rather to bring them to the fore and illustrate how people address the tensions they give rise to (Laksmana and Padmanabhan 2021, 71). We also describe how actors in organic agriculture employ different strategies in negotiations on notions of sustainable agriculture. In this chapter, I summarize this research and its conclusions. Then, in [Section 2.7](#), I link the findings of this institutional analysis of organic agriculture with the politics of knowledge by highlighting transdisciplinary work as a reflexive process. Finally, I reflect on the broader institutional conditions of the transdisciplinary work and my intersubjective experience and how these inform a methodological critique of Net-Map method.

2.2 Professional networking and scientific publication

The research on institutions of organic agriculture and sustainability draws primarily on the results of a Net-Map workshop that I conducted with the other project members during the first IndORGANIC transdisciplinary workshop in Yogyakarta in 2017. I presented an early version of the work at a

workshop titled “*New Institutional Economics and the complexity of transforming relations between agriculture and the environment*” organized by the New Institutional Economics Network (NIÖ-Netzwerk) in Germany. The research was also published in an open-access book published by MDPI, a Swiss-based academic publisher, as part of a series intended to contribute to theoretical and empirical debates on Sustainable Development Goals (SDGs), to commemorate the 5th anniversary of SDGs in 2020. Each edited volume corresponds to one SDG. My joint work on institutions of organic agriculture contributes to the book *Transitioning to Sustainable Life on Land*, which corresponds to SDG 15. The volume explores how societies can manage terrestrial ecosystems sustainably despite their continued deterioration at the global level. The book series was edited by a senior scholar who also attended the NIÖ workshop. My PhD supervisor and I were invited to contribute to the special volume as the insights from IndORGANIC that we presented at the workshop are relevant to the volume’s theme.

2.3 Policy analysis and Net-Map

To investigate the institutions of organic agriculture in Indonesia, I conducted a literature review, an analysis of relevant policy documents, and a Net-Map exercise. The literature review provided information on the context of the study, particularly on the history of conventional agriculture, the links between civil society groups and organic agriculture, and the government’s role in promoting and regulating organic agriculture. In addition, I conducted policy analysis to further investigate the governance of organic agriculture and the government’s approaches to developing it.

Net-Map is an interview-based mapping tool for visualizing networks that can help people understand, discuss, and improve situations in which different actors can influence outcomes (Schiffer 2007). As a participatory research method that builds on social network analysis, Net-Map encourages participants to discuss and interpret the networks among themselves (Schiffer and Hauck 2010). Therefore, this method encourages participants’ active engagement in critically reflecting on and analysing their positionality in relation to other stakeholders in the networks, instead of leaving this analysis to the researchers alone. In our study, the Net-Map method was applied to explore the tensions, areas of cooperation, and potential spaces for problem resolution constructed by actors in organic agriculture, with the active engagement of the actors themselves (Laksmana and Padmanabhan 2021, 77). We implemented Net-Map in the abovementioned transdisciplinary workshop, with 28 participants, mainly from West and Central Java. The participants came from diverse backgrounds, and included academics, government officials, activists, organic farmers, and members of non-governmental organizations (NGOs).

The procedure of the workshop was as follows (Laksmana and Padmanabhan 2021, 78–79). First, two facilitators familiar with the method divided the participants into two equally sized groups. Each group worked on a large table around which they moved freely. Second, we asked participants, “Who are the important players that can influence organic farming?” We asked the participants to list influential actors and assign them, based on their interpretation, to one of four categories: NGO, private sector, government, and community. The actors’ names were written on coloured cards indicating the different categories and placed on the tables. Third, we explained to the participants how to describe the links and the direction of the links between actors. We specified four types of links: information or knowledge, marketing channel, agricultural inputs (fertilizer, pesticide, and financial support), and seeds or animals. Participants drew arrows that indicated the links and the direction of the links using markers of different colours to connect pairs of actors.

2.4 The historical development of organic agriculture in Indonesia

In Indonesia, particularly in Java, organic agriculture emerged as a social movement initiated and spread by non-governmental actors, as mentioned in [Section 1.3](#). In Central Java, communities of

organic markets provide space for the exchange of knowledge and the sale of healthy food and artisan-produced food, where customers accept 'self-certification' of the organic produce based on trust (Widiyanto 2019). These are community-based grassroots movements initiated by individuals with common aspirations and interests. At a national level, the AOI is a long-established organization that has functioned since 2002 as an umbrella organization, connecting different actors involved in organic agriculture, and publishing statistics on organic agriculture in Indonesia (AOI 2018). Organic agriculture is also supported by international development agencies, such as HIVOS and Rikolto Indonesia, which promote sustainable agriculture in Indonesia by providing institutional and technical support to farmers (Rikolto n.d.).

The government's approach to developing organic agriculture is characterized by productivist and market-oriented agendas, exemplified by the following programs and policies (Laksmana and Padmanabhan 2021, 73–74). The first government initiative to support the expansion of organic agriculture was the "Go Organic" program, launched in 2002, which aimed to transform Indonesia into one of the main producers and exporters of organic food products in the world by 2010 (Ditjen BPPHP 2001). This program was supported by the creation of a national standard for organic agriculture, based on third-party certification, within the Indonesian National Standard (SNI) certification system (SNI No. 01-6729-2002) (BSN 2002). The goal of the "Go Organic" program was not achieved, and organic land still accounted for less than 1% of the total agricultural land in 2015 (AOI 2018). Nevertheless, the regulatory and institutional structure it gave rise to remains in place. In 2016, the government of President Jokowi launched the "1000 Organic Villages" program to create 1000 organic-certified villages throughout the country (Plantation General Directorate of the Ministry of Agriculture 2016). This program was part of the strategy to achieve food sovereignty within the government's broader development agenda (KPPN/BPPN 2014). Despite the government's acknowledgment of the importance of local knowledge and resources, this program still emphasizes the top-down transfer of knowledge, agricultural inputs, and financial support from the MoA to organic farmers (Plantation General Directorate of the Ministry of Agriculture 2016).

2.5 Institutional theory

To understand the implementation of organic agriculture, our article combines analysis of the governance and policies of organic agriculture at the national level with social network analysis of stakeholders at the local level (Laksmana and Padmanabhan 2021, 75). This analytical approach follows the theoretical framework of Michelsen and colleagues (2001), which identifies three levels of the institutional environment that constrain decision making by organic farmers: macro-level (rules governing civil society, market, and the state), meso-level (rules governing farming community, agricultural policy, and food market), and micro-level (rules governing interaction among actors). Through a combination of micro- and meso-level institutional analysis, which incorporates analysis of governance and social network of actors in organic agriculture, we highlight different engagements with the state and different notions of "sustainability" in organic agriculture.

Based on the above theoretical framework and methodology, the article proposes categories of actors, i.e. fully engaged, partially engaged, and disengaged, to explain the conditions under which organic actors engage with the government to various degrees. Disengaged actors are not linked to any government actors in sustaining their movement; partially engaged actors strategically adapt to government organic agriculture regulations while maintaining their commitment to the foundational principles of the organic agriculture movement; fully engaged actors pursue organic agriculture wholly within the framework of government regulations (Laksmana and Padmanabhan 2021, 80–86).

2.6 Strategic engagement in institutions of organic agriculture

The disengaged group is characterized by the rejection of interaction with the government. This group is dominated by activists who were inspired by the early pioneers of Indonesian organic agriculture. One example is the local organic market community in Yogyakarta. These activists criticize the dilution of the principles of organic agriculture through standardization and the focus on technical definitions, the realignment of organic agriculture from community building towards market relationships, and justice issues related to the industrialization of organic agriculture, for example, through mechanization and the focus on input substitution. For members of this group, the introduction of organic certification as specified by SNI 01-6729-2002 in 2002 was a decisive moment that altered the aims and the actions of organic agriculture as a social movement (Laksmana and Padmanabhan 2021, 81–82). Actors in this group have to adjust to this development. They must either submit to the demands of the market, setting their sights on organic certification and carving out a niche in the market, or to create an alternative system that focuses on the creation of community. This group is exemplified by the local organic market communities (*komunitas pasar organik lokal*), which are connected to private sector organizations (traders and distributors of organic products), NGOs, and other communities in the network. The term ‘local organic market community’ reflects the dual purpose of these organizations. As Joko, who was one of the initiators of the local organic market community in Central Java, explains:

Actually this [local organic market community] can be considered as a community. It’s called a market because it’s a place where they [people] meet. I try to define them [local organic market community] so that there is an encounter [where people meet to exchange ideas]. (Interview, December 9, 2017)

In the discussions at the workshop, members of this group expressed the view that the prohibitive cost of organic certificates perpetuates the injustice that prevails in conventional agriculture. This view is aligned with another study that argues for the democratization of third-party certification (Konefal and Hatanaka 2011). The actors in the disengaged group, including Joko, are also concerned that the development of organic farming seems to be following the blueprint of conventional farming towards greater engagement with agri-business (Laksmana and Padmanabhan 2021, 81):

So I think it is important to be aware of the State’s interpretation of organic farming, when we talk about Go Organic 2010 program. In the end the aim [of the government] is to develop organic fertilizer industry. (Interview, December 9, 2017)

They believe that in all these respects, the government’s approach to organic agriculture perpetuates the existing shortcomings of conventional agriculture. These limitations restrict farmers’ initiatives when selecting which farming practices to adopt. In addition, they increase the dependency of organic farmers on the state and on policies adapted to the needs of industrialized agriculture — even though almost two-thirds of farmers in Indonesia are smallholders (Aji, Wangsit, and Ningrum 2019; BPS 2018). Therefore, actors in this group consider that the notion of sustainability in organic agriculture should incorporate a justice dimension, whereby means of production are controlled by those directly involved in farming, and farmers have more independence in deciding how and what to grow and where to sell. However, actors in the disengaged group do not express their criticisms by advocating for policy changes, as does the Soil Association in the UK, for example (Conford 2001). Instead, they adapt to the policy environment by engaging with retailers directly, while maintaining connections with the NGOs that pioneered organic agriculture in Indonesia to uphold the organic movement’s foundational principles.

The second group identified in the study is the partially engaged group, which is connected both to the organic agriculture movement and the conventional agricultural sector, and strategically adapts

to the ongoing changes in government policies by maintaining links with state actors. One example is the World Food Day Secretariat for Farmers and Fishermen (SPTN-HPS), which is one of the pioneers of organic agriculture in Central Java and was originally supported by the Catholic Church (Laksmana and Padmanabhan 2021, 83–84). In the social network, they still maintain this connection with religious institutions, with whom they exchange information on the philosophy and technical aspects of organic agriculture. They also support government-sponsored organic agriculture projects, for instance, by offering advice and training to farmers and village governors. The role of SPTN-HPS in promoting organic agriculture in government projects might also reflect its credibility among government actors, derived from its status as a pioneer of the organic movement.

One issue on which SPTN-HPS and other members of the partially engaged group, for instance, Sekti Muda and Mursyidul Hadi Islamic boarding school, take a firm stance is food sovereignty, particularly seed sovereignty, defined as farmers' rights to access, reproduce, and save seeds (Kloppenburger 2010). There is insufficient clarity in organic farming regulations on what constitutes organic seeds (BSN 2016), while Law No. 12/1992, on the Plant Cultivation System in Indonesia, makes it illegal for farmers to use non-state-registered seeds (President of the Republic of Indonesia 1992). Thus, organic farmers are liable to be prosecuted for attempting to become more independent by storing and using their own seeds, even though the state simultaneously encourages the use of local resources in organic agriculture (BSN 2016). According to members of this group, similarly to the actors in the disengaged group, the justice aspect in organic agriculture is paramount for the sustainability of organic agriculture (Laksmana and Padmanabhan 2021, 88–89). To address this problem, actors who belong to the partially engaged group consider organic agriculture as an entry point for engaging in critical discussion of the current agricultural system with the young people. They also attempt to take advantage of existing decentralized governance structures, using village funds as a resource for developing organic agriculture from the bottom up in a way that engages with the aspirations of farmers. Totok, who is a former extension worker and is a representative of Indonesian Peasant Union (SPI) in Central Java, further explains (Laksmana and Padmanabhan 2021, 83):

The Village government is more important [than the provincial government]; especially after the Village Law was passed, they can use village funds to empower [the villagers]. I have observed several places where organic farming was developed together with the village governments, because they can take decisions on their own. In this situation the position of village government is more important than the district government. (Interview, December 9, 2017)

Some actors use the legal framework for organic agriculture (i.e., third-party certification and organic agriculture standards) as an entry point into the organic market, but do not consider themselves part of the organic movement (Laksmana and Padmanabhan 2021, 84–86). These actors belong to what we identify as the fully engaged group. In principle, their notion of sustainability is similar to the national government's: organic agriculture is seen as providing better economic opportunities for farmers in the future. Unlike the partially engaged group and disengaged group, members of the fully engaged group, such as the farmers' association Gapoktan, do not consider organic agriculture as being opposed to conventional farming, and maintain their dependence on government support for both the production and marketing of organic food products. Totok, a former extension worker, explains the difference between farmer group and Gapoktan (Laksmana and Padmanabhan 2021, 85):

So usually farmer groups [in hamlets] focus more on the technical aspect on the field. Meanwhile, Gapoktan focuses more on administrative issues, for example in connecting

them [farmers in farmer groups] with the government which is one administrative level above [hamlet]. (Interview, December 9, 2017)

Overall, institutional analysis at the meso-level that focuses on the governance of organic agriculture highlights the contradiction between centralized governance structures in the agricultural sector and the government's stance that organic agriculture should prioritize the use of locally available resources and knowledge (Laksmana and Padmanabhan 2021, 90). Institutional analysis at the micro level that focuses on the social networks of organic actors reveals the multiplicity of perceptions, positionalities, and rationales enacted by different actors. In the context of the pervasive influence of the Indonesian state through its regulation of organic agriculture, our analysis identifies different strategies based on different degrees and types of interactions between non-government and governmental actors. According to this two-level analysis, different notions of sustainability of organic agriculture are enacted by different actors. Narratives may refer to either the justice aspect of sustainability promoted by activists, which focuses on access to and control over organic agricultural practices, or the ecological modernization promoted by the state. Given the influence of non-governmental actors in the networks, the social justice narrative cannot simply be subsumed under the market creation and technological fix narratives. Therefore, the institutionalization of organic agriculture in Indonesia, illustrated by the creation of organic agriculture policies and standards as described above, does not completely push the practices and views of organic agriculture as a social movement to the margin, as also pointed out by Edwards (2013).

2.7 Different perspectives and aspirations on transdisciplinary work

In this section, I link the above different perspectives on organic agriculture that shape the interactions between societal and government actors with the politics of knowledge by highlighting transdisciplinary work as a reflexive process. In addition, my reflection on the broader institutional conditions of the transdisciplinary work and my intersubjective experience informs a methodological critique of Net-Map method. As a reflexive process, transdisciplinary work needs to consider the different interpretations of transdisciplinarity and varied aspirations from transdisciplinary collaboration (Schikowitz 2020). From the perspective of the IndORGANIC project, the purpose of the first transdisciplinary workshop was to learn about the insights of practice partners on the current state of organic agriculture. The Net-Map method was intended to provide a space for participatory analysis of social networks of organic actors, so that the knowledge from the workshop was jointly co-produced. It was expected that this knowledge would contribute to the formulation of transformation knowledge, that in turn would underpin policy recommendations on how to turn Indonesian agriculture organic, to be disseminated by the research team in the fourth year of the project.

However, based on the field research that I conducted after the workshop, the perspectives of the participants on the transdisciplinary participation were quite different. Some participants explained the benefit of the workshop in terms of networking with other activists. Some organic farmers also mentioned that they found new consumers for their organic rice as the result the workshop. From this perspective, the transdisciplinary workshop was a networking event that helped to strengthen existing links and establish new ones among organic actors. In addition, some of the participants had short-term expectations from the project and hoped to access additional resources by taking part in the workshop, since it was organized by a German research team, which was assumed to be wealthy. Participants also expressed an interest in organizing more meetings with the research team so that knowledge co-production could continue after the workshop. However, there was a lack of continuous engagement from the project on these issues, even though, as argued by Fritz and Binder (2020), transdisciplinary knowledge production needs to entail measures to counter the unequal distribution of resources and ensure accountability. The above discussion highlights that while the

project aimed for knowledge co-production with practice partners, researchers still made the final decision when prioritizing societal concerns and selecting the research agenda. In other words, researchers decided which societal concerns should be responded to without having to justify their decisions to the research partners. Therefore, power relations in transdisciplinary knowledge production influence which societal issues are deemed to merit further investigation.

These reflections identify methodological issues in using Net-Map for transdisciplinary research. As a critical reflection, the article on Net-Map was my first academic publication. The generally positive response that I received from the audience of the NIÖ workshop, the book editor, and peer reviewers served as encouragement. Nevertheless, I did not feel “intellectually and socially at home” in the epistemic living space I occupied while undertaking this work. This feeling was primarily related to a methodological decision to confine our analysis to the Net-Map workshop, even though I undertook part of the writing and data analysis during my fieldwork in Indonesia. Given the contextual nature of meaning, a lot of background knowledge of the participants was needed to understand what they discussed in the workshop. In addition, reflecting on the setup (for example, the workshop’s venue, context, etc.) with how the participants engaged in discussion could have informed a richer interpretation.

The contradiction in this work lies in the fact that while my intersubjective experience in my fieldwork informed my analysis, the published article does not make explicit connections between the Net-Map exercise and the fieldwork, due to the space limitation and our decision on the scope of the study. The methodological consequence of this shortcoming is that the article does not display a systematic understanding of what such a participatory method does to the participants; for example, how Net-Map method affects the participants’ understanding of organic agriculture and strategies. Given the normative aspiration of transdisciplinarity to inform change and the centrality of subjectivity and agency as the basis of change (Ortner 2006), it would be beneficial to complement Net-Map analysis with fieldwork with the same participants. Transdisciplinary research that applies these methods could ask, for example, to what extent does the involvement of practice partners in transdisciplinary knowledge co-production through Net-Map shape their agency and subjectivity.

Chapter 3. Transdisciplinary perspective on societal transformation

3.1 Societal transformation towards sustainable agriculture

This chapter situates organic agriculture in the context of the urgent need to transform food production, to make it more sustainable in response to climate change, the increasing demand for food, and the continuous depletion of natural resources (Fritz et al. 2021, 100). The global decline of biodiversity, the human-induced climate crisis, soil degradation, and inequality can all be linked to intensive agriculture (FAO 2019; IPBES 2019). However, agriculture depends on biodiversity to maintain genetic diversity, cultural identity, and essential ecosystem services, such as pollination, nutrient cycling, and natural pest and disease control. In this context, organic agriculture offers the potential to regenerate agricultural land and counteract biodiversity loss by abstaining from using chemical inputs and promoting practices such as crop rotation and vegetative buffer zones (Fritz et al. 2021, 100). Nevertheless, organic agriculture remains a marginal activity. Approximately 1.4 percent of total farmland worldwide is farmed organically, despite the increasing number of initiatives that promote such practices.

The co-authored article on which this chapter is based argues that transforming to organic agriculture requires addressing interconnected elements of access to information and technology and socio-cultural and political challenges, while taking account of institutional contexts (Fritz et al. 2021, 100). Based on this understanding, the IndORGANIC team adopted a transdisciplinary approach to identify possible pathways toward organic agriculture, based on an analysis of farmers' knowledge and barriers to adoption, and of their values and belief systems. The transdisciplinary work of the project synthesizes multiple perspectives, such as development economics, anthropology, and sociology, on the potentials and challenges of transforming agriculture on Java towards organic. The published research is the outcome of negotiations and compromises among researchers on incorporating the different disciplinary backgrounds of the project members.

This work contributes to understanding of how to apply a transdisciplinary approach to a real-world research project. This approach differs from the literature that focuses on transdisciplinarity at the conceptual level and gives less attention to the context, even though it is this that determines the possibility of societal transformation towards sustainability. In contrast, this work responds to the need to tailor research to the geographical and temporal context, applying a definition of sustainability that can be translated into context-specific objectives that are relevant to local actors. This chapter focuses on institutional structures, including policies and regulations which are based on a particular knowledge of organic agriculture.

To identify pathways toward organic agriculture, this chapter is guided by the question: What are the roles of formal institutions in the policy arena of organic agriculture? The findings are presented according to 'system knowledge', 'target knowledge', and 'transformation knowledge' and incorporate insights from academics and practitioners (Hirsch Hadorn et al. 2008). The findings on the three knowledge types are the result of the three transdisciplinary workshops and of the work of individual researchers in their respective academic disciplines. In addition, the analysis draws on individual interviews with stakeholders, participant observation, and a document analysis. A key insight of this research is that Indonesia does not lack initiatives towards organic farming, but that these various initiatives have different motivations, goals, and strategies (Fritz et al. 2021, 112). This misalignment detracts from the transformational potential of organic agriculture and is responsible for the limited success of the organic transition. Therefore, there is a need for policy action at

multiple levels, guided by an inclusive strategy that is drawn up in a participatory manner that accounts for the perspectives of different actors.

To research formal institutions, I combined two common sampling methods: purposive and snowball. To ensure coverage of the institutional environment of organic farming in the interviews, respondents included representatives of both the Indonesian government and civil society groups (Fritz et al. 2021, 105). While the Ministry of Agriculture (MoA) provided a sufficient sample of government officials, policies, and regulations, snowball sampling was instrumental in identifying networks of farmers, activists, and other influential civil society actors. I conducted semi-structured interviews with 176 respondents, including organic farmers, activists, NGO members, and governmental officials, particularly from the Department of Agriculture. I documented the interviews and other interactions with respondents in verbatim transcripts, field notes, and a research diary (see [Section 1.4.3](#)). To further investigate decision-making processes and aims among government agencies and NGOs concerning organic agriculture, I conducted an in-depth analysis of relevant academic literature and policy documents and carried out a content analysis of NGO publications and their internal documents. These activities were complemented by transdisciplinary workshops as mentioned in [Section 2.3](#).

The knowledge classification scheme developed by Hirsch Hadorn and colleagues (2008) was used to synthesize these insights. System knowledge contributes to a multidimensional understanding of the current state. Target knowledge responds to the need for change by identifying the goals of important stakeholders, relating not only to technical aspects of sustainability, but also to corresponding belief systems and institutions. Since the goals of different stakeholders may conflict with each other, trade-offs are a natural part of the process of identifying target knowledge. Finally, transformation knowledge identifies the changes that will be required to attain these goals, while seeking a consensus among contrasting interests.

The critical reflection in [Section 3.3](#) outlines my critique of the conceptual framework of this transdisciplinary research. My principal criticism is that it failed to account for the hierarchization of different knowledges in policy making. In the context of organic agriculture, as I explain in the following sections, policy makers focus on quantitative measures of organic agricultural development, such as market share and productivity, and less on qualitative evaluation of, for example, the coherence between policy and its implementation. In other words, the conceptual approach of this work does not consider how society evaluates different academic disciplines, particularly in relation to the different valuation of evidence to support policy recommendations.

3.2 Three knowledge types of institutional structures

3.2.1 System knowledge

In terms of system knowledge, the current institutional environment for organic farming is framed by the Indonesian government's national standards, regulations, and agencies dating from the early 2000s (Fritz et al. 2021, 106). The MoA implements government policy on organic agriculture, supported by the Competent Authority for Organic Food (OKPO) and third-party certification bodies regulated by the National Accreditation Committee (KAN). The design of the latest national organic program '1000 Organic Agriculture Villages' comprises three components: 1) provision of technological packages and other inputs in the form of organic fertilizers, pesticides, and livestock for producing manure, 2) financial assistance for organic certification, and 3) knowledge transmission through farmer field schools (using externally recruited trainers in some project implementation areas). The principal function of the MoA at a national level is to distribute financial resources to ministry offices at provincial and district levels. At the district level, ministry offices select farmer groups that could potentially obtain organic certification by the end of the program, taking account

of the management capacity of the farmer groups, the history of land use in the area, and biophysical conditions such as water availability and climate. Only those farmers who are officially registered as farmers and farmer group members can take part in the program. Nevertheless, the scope of the program implementation is still unclear since there are still considerable knowledge gaps on organic agriculture among farmers.

Alongside the MoA, civil society groups play various roles, contributing to knowledge sharing, marketing, and networking (Fritz et al. 2021, 106–107). The BSB Foundation, one of the early pioneers, was recently divided into two organizations: a training centre for knowledge sharing and a commercial branch that focuses on producing and marketing organic products through a vegetable box distribution program. SPTN-HPS mainly focuses on providing organic agriculture training and setting up pilot projects in cooperation with village governors. Recently, this organization also set up a participatory guarantee scheme in Yogyakarta as part of its marketing strategy. While these two organizations operate primarily at the regional level (though BSB also provides training throughout the country), AOI is an umbrella organization that connects organic practitioners, private sector actors, and government agencies across the country. In addition, AOI has a networking function and actively engages in advocacy work to influence policies and regulations on organic agriculture.

3.2.2 Target knowledge

To elucidate target knowledge, we analysed the aims of state actors and compared them to those of civil society actors (Fritz et al. 2021, 108). According to the SNI, organic agriculture aims to contribute to biodiversity conservation and environmental protection, taking account of agriculture's social, economic, and ethical dimensions. While this wording expresses a holistic understanding of organic agriculture, in practice, government initiatives such as the '1000 Organic Agriculture Villages' program follow a productivist and market-oriented agenda with top-down decision making under a decentralized government. Furthermore, as set out in the National Development Plan 2020–2024, the development of organic agriculture is measured by the growth in the market share of organic products. Between 2020 and 2024, the government aims to increase the market share of organic products from 5 to 20% of the total food market. This figure was mentioned during the third transdisciplinary workshop at the Bappenas in Jakarta. However, in our research, we also met government officials from the Department of Agriculture with a more nuanced view of organic agriculture, who identified the health of soils, the environment, and people as the key priorities.

Civil society groups exhibited diverse orientations (Fritz et al. 2021, 108). The community-based organizations associated with the organic movement tend to focus on grassroots activities, such as farmers' markets and knowledge sharing, guided by holistic principles of organic agriculture and community building. The main aims of these actors are to empower organic farmers to have greater control over organic agricultural inputs, by encouraging and teaching the use of locally available materials for production of organic pesticides and fertilizers. Some NGOs also aim to improve the livelihoods of smallholder farmers, by strengthening their organizational and networking capacities to make it easier to access potential markets and government support. Since the early 2000s, the private sector has tended to see existing institutions in organic agriculture as providing a legal framework that enables access to markets for premium agricultural products. Therefore, these private sector actors adhere to national and international organic standards to create national and international channels for marketing organic products.

3.2.3 Transformation knowledge

Concerning transformation knowledge, from an institutional perspective, strategies are required to enable a coherent development of organic agriculture that takes account of the diverse views of state actors and civil society groups (Fritz et al. 2021, 109). An overarching strategic framework is needed to provide space for constructive negotiations and debates among different actors and

accommodate the cultural and ecological diversity of farming communities across Indonesia. The decentralized structure of the Indonesian state provides a framework for decision-making processes informed by the aspirations of farmers, NGOs, and the private sector. Rather than seeking to reconcile the goals and motivations of different actors, the aim should be to create an institutional space that fosters dialogue and inclusive development. Individual actors often frame organic agriculture in either in economic terms or in terms of farmer sovereignty or social justice, while excluding other potential framings. In a functioning democracy, decentralization can offer space for negotiation among these differing aspirations and views and accommodate multiple trajectories in developing organic agriculture.

The diversity of goals in organic agriculture raises a series of challenges that cannot be solved by the MoA alone (Fritz et al. 2021, 109–110). The development of organic agriculture raises environmental, trade, and logistical issues that require collaboration among government ministries at the national and regional levels to formulate an ‘organic agenda’ and a plan for its implementation. This process should involve civil society organizations at each step and be open to public scrutiny. Finally, organic agriculture depends on local conditions and local knowledge. Although this important principle is stated in government regulations, it has been largely neglected by government policy. We propose the creation of context-based organic farming guidelines that provide a framework for integrating local ecological conditions and knowledge. These guidelines, which should be drawn up jointly by the government and other actors, could facilitate the implementation of organic agriculture in different contexts and enhance mutual learning among actors (see Laksmana 2020a; Laksmana 2020b).

3.3 Synthesizing epistemological and methodological plurality in transdisciplinarity?

The conceptual contributions of this research on transdisciplinary merit critical evaluation. This work demonstrates how a transdisciplinary approach incorporating discipline-specific research and workshops involving policymakers, academics, and civil society sheds light on the multiple challenges involved in developing organic agriculture. In terms of its scientific contribution, I would argue that this work resembles an analytical choreography, where the authors, from the perspective of their respective academic disciplines, jointly incorporate practitioners’ insights and synthesize them according to the three types of knowledge. At the same time, each author tries not to overstep the mark and stray into others’ disciplines. This approach is evident in how the Results and Discussion sections are organized (see Fritz et al. 2021, 106–112). More importantly, this approach to knowledge synthesis can be observed in the sub-research questions, which were formulated by researchers from distinct disciplines and then addressed by researchers from the same disciplines that formulated them (see Lu and Nepal 2009 for a similarly formulated argument in the context of interdisciplinarity). By putting them side by side under overarching research questions, the assumption is that each discipline understands the overarching questions in more or less the same way (see Fritz et al. 2021, 102–103). However, given the aim of transdisciplinary research is to produce transformation knowledge, its analysis needs to also consider how society evaluates different academic disciplines. One example is the hierarchization of different knowledges in policy making. As previously explained, in the context of organic agriculture, government policy is mostly focused on quantitative measures and less on qualitative evaluation of organic agriculture development.

At a conceptual level, the lack of attention paid to the politics of knowledge in this transdisciplinary work is the result of a theoretical framework that, I argue, not only homogenizes methodological and epistemological plurality, but also excludes consideration of power dynamics in transdisciplinarity research, and researchers’ values, subjectivity, and positionality (Padmanabhan 2018a). As Herberg and Vilsmaier (2020) point out, in transdisciplinary settings, researchers often retain epistemic control; it is they who determine research agendas and forms of analysis. This influences the kind of

knowledge that is produced. The transdisciplinary approach adopted in the research resonates with the additive approach to problem-solving (Vilsmaier 2021) discussed in [Section 1.2.2](#).

A closer look into the methodology reveals a fundamental difference between qualitative and quantitative methods applied in this research. Researchers who work with qualitative methods, such as participant observation and semi-structured interviews, value research subjects in their “natural environment”, whereas those who work with quantitative methods, such as randomized controlled field experiments, seek insights from their research subjects in a “controlled environment” (Flick 2011) by dividing farmers into control and treatment groups (Fritz et al. 2021, 105). The lack of critical reflection on this methodological difference in the paper is arguably the result of failure to follow the advice of Linda Martin Alcoff (2022), a philosopher of knowledge, “to put everything on the table” in collaboration between different epistemologies. However, rather than seeing the above features as a limitation, the gap between data sets may offer an opportunity to explore the partiality of knowledge produced in different theoretical and methodological contexts (Nightingale 2003), which is a fundamental concern of transdisciplinary work. Alcoff (2022) further argues that this process allows for the revision of the initial definition. This is akin to the entangled approach to problem solving in a transdisciplinary setting (Vilsmaier 2021) mentioned in [Section 1.2.2](#). I further discuss the methodological issue of practicing transdisciplinary in the context of epistemological and methodological plurality in my presentation and discussion of transdisciplinary moments in [Chapter 5](#).

Chapter 4. The embodiment of agricultural knowledge

4.1 Hierarchization of agricultural knowledge in alternative agriculture

This chapter situates agricultural knowledge within the context of two forms of alternative agriculture, Integrated Pest Management (IPM) and organic agriculture. IPM was introduced in Indonesia to address an environmental problem, in the form of pest outbreak caused by conventional agriculture. As mentioned in [Section 1.3](#), the focus of IPM was judicious application of chemical pesticides by farmers. Organic agriculture was introduced in Indonesia as a response to environmental degradation and the need to improve farmers' livelihoods. As mentioned in the previous chapters, organic agriculture focuses on the creation of organic commodities through regulations that ban the use of chemical inputs in agriculture. I describe both approaches as 'alternative agriculture' since both are examples of a shift towards a human-centred orientation in agricultural development and away from the Green Revolution paradigm, characterized by productivity orientation and top-down governance (Laksmana forthcoming, 122). Despite the implementation of alternative agriculture in over four decades, divergences between academics' and farmers' understanding of agriculture still persist (*ibid.*, 117). As pointed out by Totok, a leading figure in the organic agriculture movement in Indonesia (*ibid.*, 117–118):

Symbolic language is not understood by technical university students and university students do not understand technical issues ... especially this [understanding of agriculture as science and culture] is important on the ground. At a university, it might be difficult to find the appropriate language, but this is not the case when we meet friends (farmers) on the ground because they practice what we disseminate. (Totok, an organic farmer and trainer)

In light of the dichotomies mentioned above, i.e. symbolic–material and science–culture, this chapter responds to the question: What are the implications of viewing alternative agriculture, such as organic agriculture and IPM, through the lens of farmers' embodied knowledge? Drawing on an article that applies a dialogical analysis (Gillespie and Cornish 2014) of my empirical fieldwork on organic agriculture and of Yunita Winarto's (2004) book on IPM *Seeds of Knowledge*, I show how a historical continuity of the hierarchization of agricultural knowledge based on (dis)embodiment can be observed in alternative agriculture. A closer look into the implementation of IPM and organic agriculture shows how knowledge intermediation, shaped by regulatory institutions and interactions between farmers and agricultural trainers, influences the outcomes of these alternative forms of agriculture. This insight contributes to transdisciplinary knowledge in the making by showing how intersubjective experiences and practice of diverse actors in alternative agriculture shape politics of knowledge, and vice versa.

4.2 Epistemic living space in (academic) experimental writing

The writing of the research on alternative agriculture took place in what I consider "the experimental phase" of my PhD process. As mentioned in [Section 1.4.3.2](#), this coincided with the last phase of my fieldwork, in Germany between 2020, when IndORGANIC officially ended, and 2023. During this phase, I focused on the entextualization of my intersubjective experiences from my fieldwork with farmers, activists, and government officials in Yogyakarta. The dialogical analysis I further elaborate on in [Section 4.3](#) is my attempt at "speaking nearby", as advocated by Chen (1992, 87). The methodology and theoretical framework are intended to show the messy and power-saturated realities in which I, as a researcher, and the research subjects are entangled in knowledge in the making.

The fact that the IndORGANIC project ended in 2020 and a period of isolation in Passau due to the pandemic affected my writing process. During the experimental phase, my epistemic living space, i.e.

the institutional, epistemic, and social conditions of my research practice (Felt 2009), was marked by constant pressure, immobility, and experimentation. Firstly, I no longer received funding for my work as my job contract with IndORGANIC had ended. However, since the funding for my research had been in the form of an employment contract, which is normal for PhD students in Germany, I could secure continued financial support in the form of unemployment benefits (*Arbeitslosengeld*). This financial condition put pressure on me to be pragmatic, as I came to an embodied realization that both the intellectual and material conditions for intellectual work need to be met. Therefore, it is important to highlight how the funding situation and the additional financial resources that a particular type funding type may facilitate, or limit, make (PhD) research a time-sensitive process (see Felt et al. 2013).

Secondly, I felt the freedom to think less about the overall project and the deliverables the project expected, and to invest my time in following my own interests. Contrary to the previous research phases that were marked by the constant shuttling between Indonesia and Germany and frequent traveling to conferences, during this period, I mainly concentrated on analysing my fieldwork materials and exploring my new intellectual interest in STS. This interest was mainly sparked by my fascination and puzzlement with farmers' knowledge of microorganisms in the soil, as described by anthropological studies of microorganisms (see, for example, Helmreich 2009; Paxson 2013; Herrera 2018). I started work on a paper on natural farming and microorganisms, where I tried to argue that the distinction between natureculture and the nature-culture binary is ephemeral; however, after a few months of research, I realized that I did not have sufficient empirical materials to develop my argument. Initially, this "failure", where I was unable to properly construct my argument due to insufficient empirical material, threw me into a panic, since this work had occupied the last few months of my scholarship.

However, the personal learning from this experience led to the decision to locate my third publication in the STS field, despite my lack of formal training in STS. Based on career aspirations, I decided to write the paper on embodied knowledge to create "evidence" of my knowledge as an STS scholar. For the same reason, I wanted to learn how to be an anthropologist who contributes to debates on science and society. Therefore, I decided to start my paper with an ethnographic puzzle and use this puzzle as the main thread of my article. In addition to the professional consideration, my work on alternative agriculture was also motivated by my interest in understanding the work of the environmental anthropologist who became the second supervisor of my PhD supervision in early 2020. I felt that to better understand her feedback I needed to familiarize myself with her work. Given the significant time I had spent doing experimental work, it was for reasons of practicality that I decided to turn my "dialogue" with my supervisor into a publishable article. The experimental nature of my research continued as I analysed my fieldwork on organic agriculture in dialogue with my supervisor's ethnography on IPM. This methodological approach follows dialogical analysis, which initially came from literary analysis and was later formalized into a social science method (Aveling, Gillespie, and Cornish 2015; Gillespie and Cornish 2014).

4.3 Dialogical analysis of a book and a fieldwork

A dialogical approach in interpretive social science underscores the contextual, social, and unfinished nature of meaning. Therefore, context is essential in interpreting the meaning of an utterance (meaning is contextual) and an utterance is stated with an audience in mind (meaning is addressive) (Gillespie and Cornish 2014). The context of my fieldwork is the institutionalization of organic agriculture. The responses I received during my fieldwork in Yogyakarta were addressed to me as an Indonesian researcher who was part of a German research project and interested in learning about what organic farmers do and know. It is also important to keep in mind the assumptions that the

speakers might have when speaking to me. I also made similar considerations when analysing the abovementioned book.

In addition, the dialogical approach builds on the multivoicedness of Self, which is constituted by a multiplicity of interacting voices (Aveling, Gillespie, and Cornish 2015). I use this method to approach my fieldwork with organic farmers and the ethnographic analysis in *Seeds of Knowledge* (Winarto 2004). The voices that are interacting include my own, i.e. voices of I-positions (I as a field researcher from a German University and I as a PhD student), those of inner-Others (i.e. 'real individuals', such as my [pseudonymous] research participants), and those of generalized Others (such as extension workers, agricultural scientists, etc). I describe the interaction between voices of I-positions and those of inner-Others and analyse the book in the same way. Thus, the multiple voices of my fieldwork and the book interact, or engage in a "dialogue" that explores the contextual, addressive, and temporal aspects of meaning. The dialogical analysis sheds light on the focus of the research, which is the politics of knowledge in alternative agriculture. Specifically, I look at the (dis)embodiment of agricultural knowledge and institutional mechanisms that produce it and through which it circulates.

4.4 New ways of managing pests and the creation of organic commodities

The implementation of IPM in Indonesia introduced new ways of managing pests. As a global initiative promoted by the Food and Agriculture Organization (FAO) in the early 1970s, IPM aimed to solve the growing problem of pest outbreaks in the Global South through a combination of biological and cultural control of pests and the judicious application of chemical pesticides (Sawit and Manwan 1991). In Indonesia, the implementation of Integrated Pest Management Farmer Field Schools (IPM FFS) marks a broader shift in the government's strategy for agricultural development, from technology distribution to human development, giving farmers a central role as agents in the development process (Winarto 1995).

Against this backdrop, *Seeds of Knowledge* documents the incorporation of scientific knowledge into farmers' knowledge, a dynamic process intertwined with a paradigm shift in entomology and the subsequent formulation of new regulations (Winarto 2004). This book highlights how entomological investigation links recurrent brown planthopper (BPH) infestations with the injudicious spraying of pesticides on rice crops (ibid., 22). In addition, the government's aim was "to support farmers' creativity instead of forcing them to implement technological packages" (ibid., 24). As a result of the government's change of tone in agricultural development, entomology and adult learning formed the basis of the IPM curriculum in the nationwide training program for pest observers set up by the Directorate of Food Crop Protection and Agricultural Extension in 1989 (ibid., 25–27). Nevertheless, this program was informed by science that upholds the dichotomy between "knowing" and "doing", as evidenced by the selection and authority of pest observers and IPM trainers. Pest observers who were trained in entomology had the power to decide on the application of pesticides in specific situations, including the dosage and types (President of the Republic of Indonesia 1986).

In contrast to IPM, the institutionalization of organic agriculture arguably leads to the creation of organic commodities. The market orientation of organic agriculture is apparent in the first national program in organic agriculture, "Go Organic 2010", whose aim was "... to accelerate the agribusiness development with environmental orientation as a way to improve the welfare of people, especially farmers" (Ditjen BPPHP 2001, 3). The launch of this program in the early 2000s was followed by the creation of the regulatory agency OKPO, whose role was to oversee the work of newly created organic certification bodies (Ministry of Agriculture 2003). In the "Go Organic 2010" program, environmental concerns associated with conventional agriculture are vaguely formulated as the negative impacts of synthetic chemicals on human health and environment (Ditjen BPPHP 2001). In

the SNI 01-6729-2002 for the Organic Food System, the links between agriculture and environment are specified, particularly with reference to biodiversity conservation, soil fertility, and nutrient recycling (BSN 2002, v). In my fieldwork, I observed how the long-term and continuous application of chemical inputs, particularly fertilisers, causes soil degradation and compaction. Furthermore, the decline in soil carbon content, nutrient content, and biodiversity was aggravated by the shift from polyculture to monoculture driven by the Green Revolution (Amelia et al. 2018). Organic farmers and extension workers often discuss these effects in terms of “soil quality”; farmers’ embodied knowledge conceptualizes these issues quite differently, as I describe in the next section.

Alongside this market orientation, the latest organic standard SNI 6769:2016 defines organic agriculture as “based on minimum use of external inputs and without the use of synthetic fertilizers and pesticides” (BSN 2016, iii). This definition of organic agriculture focuses on substituting organic inputs for chemical inputs. The same standard also includes lists of banned and permitted substances (ibid., 27–37). Therefore, I argue, this approach to organic agriculture requires both knowledge to define the thresholds of chemicals in organic commodities and agroecosystems, and technology to detect and measure their presence (Laksmana forthcoming, 128). This characterization of organic agriculture as technoscience is linked to the use of certification mechanisms, highlighting the interdependency among agricultural research, agricultural commodities, and regulatory bodies. This institutionalization of organic agriculture underpins the creation of social categories (e.g. organic farmers and organic inspectors) with differentiated epistemic authority (Winickoff and Bushey 2010). Dynamic interplays among the state, organic farmers, activists, and other civil society actors can also be observed in the different meanings these actors assign to organic agriculture (Schreer and Padmanabhan 2019). It is worth noting that the Indonesian organic standard incorporates culturally specific values in addition to science-based arguments. For example, the use of human excrement and pig faeces as fertilizers is strictly forbidden (BSN 2016, 31), whereas they are permitted in some global guidelines for organic agriculture (FAO 1999). Since Indonesia is a Muslim-majority country, this regulation is most likely related to *halal*, a rule in Islam prohibiting pig product consumption.

4.5 Embodiment of knowledge as a critique to politics of knowledge

As a theoretical framework, I refer to the conceptualization of the embodiment of knowledge by recent studies in cognitive sociology, which demonstrate a shift from amodal towards embodied theories of knowledge due to the former’s inadequacy in explaining the subjective and bodily experience of knowledge (Ignatow 2007). Knowledge as embodied means bodily sensations of experiences are partially stored as conceptual and perceptual representations instead of being transduced into mental representations that are independent of perception and sensation as amodal theories suggest (Barsalou et al. 2005). In addition, I refer to STS debates on embodied knowledge, which argue for its centrality in challenging the uneven terrain of knowledge-making in institutions. Fundamentally, these works (Gundermann 2017; Murphy 2017; Heath 2007; Myers 2008) attempt to revise the notion of disembodied scientific knowledge by challenging the dichotomy between “knowing” and “doing” in knowledge-making and knowledge acquisition in (technology-mediated) sciences. Building on them, I examine the politics of knowledge in alternative agriculture during the transformation of agricultural knowledge from embodied to disembodied as it circulates among farming practice, agricultural science, and regulatory institutions. This transformation is shaped by technoscientific regimes of power, which is a political process that justifies the validity of different knowledges in agriculture and its governance, through which scientization of agriculture takes place. Regulatory institutions, which are understood as the codification of decisions based on science that have origins in and/or implications for politics (Brown 2015), constitute this regime of power.

I highlight the “immediacy” of farmers’ embodied knowledge as knowledge that emerges from and is manifested through their creativity (Winarto 1995) and cultivated senses (Paxson 2013). By

“immediacy”, I mean a conscious engagement in an instance of a particular situation, while reflecting on the past and anticipating the future (Laksmana forthcoming, 123). Therefore, this conceptualization adopts a practice-oriented approach to knowledge that foregrounds the temporality and subjectivity of embodied knowledge. My argument critiques the notion of expertise, which is a crucial step towards envisioning an epistemological shift in alternative agriculture. In the following section I show how regulatory institutions as technoscientific regimes of power is not total (see Ortner 2006). Through the subjectivity of their embodied knowledge, farmers reconfigure the relations among science, society, and regulation (Laksmana forthcoming, 131).

4.6 The partiality of regulatory institutions as technoscientific regimes of power

The first insight concerning the politics of knowledge in alternative agriculture is that regulatory institutions of IPM and organic agriculture are rooted in the disembodiment of agricultural knowledge. This approach is shaped by the dominant paradigm in high-modernist agriculture that radically simplifies agriculture by promoting uniformity (Scott 1999). In IPM, this is demonstrated by the role assigned to trainers with specialized knowledge of insect ecology, but with minimum experience of growing rice and general agriculture (Laksmana forthcoming, 130–131). Likewise, organic farmers suggest that the standardization of organic agriculture, defined by the absence of banned chemical compounds, is one of the principal reasons for their decisions to use organic inputs as a primary strategy to manage pests. Consequently, the success of IPM in introducing comprehensive methods of controlling pests to organic farmers is limited, because IPM and organic agriculture were introduced by the government for different purposes.

The second insight is that farmers’ creativity, that gives rise to their embodied knowledge, limits the power of the technoscientific regulatory institutions. Technoscientific practices and knowledge-making in IPM and organic agriculture contribute to wider social and cultural processes in which subjects and objects are made (see Asdal, Brenna, and Moser 2007, 13, 27). Farmers were central subjects of agricultural development in IPM, not objects, as envisaged in its institutions. This is illustrated by the interactions between IPM trainers and farmers concerning the economic threshold level, whose outcome was to render the relation between white stem borer’s life cycle and that of its pest-predator visible to farmers (Laksmana forthcoming, 134). In addition, farmers’ shared experience of damage to dykes on organic fields due to loose soil structure illuminates a dimension of soil quality that soil scientists do not commonly discuss, yet has significant impacts on farming, as Samin explained to me (*ibid.*, 132):

In the 90s, I grew chili peppers in that field of more than 2 hectares. The dykes were seldom damaged. After we used a lot of organic fertilizers (since 2003), used liquid organic fertilizers, then the [rice] straws were frequently returned to the field, the soil became *gembur* (loose), but the dykes sometimes got damaged ... so every planting season [they] have to be repaired. ... You can try to ask Faris (another organic farmer in his farmer group) if is it true that the dykes often get damaged because it (the soil) has become loose. [His] answer will be the same. On average. However, people seldom observe this. In the end, because the soil starts to become good, to be loose, the dykes are frequently damaged, it is *wajar* (reasonable). Because loose soil is *empuk* (soft). Just imagine it, [when] the soil was hard like in the 80s, 90s I seldom saw damaged dykes. Now, it is more common ... Unless there was a flood, then they were damaged.

Therefore, the reformulation of disembodied agricultural knowledge is shaped by knowledge intermediation and farmers’ embodied knowledge, which is subjective, intuitive, yet transmittable. Furthermore, the epistemological basis of scientists’ and farmers’ agricultural knowledge is open to change. However, it should be noted that this dynamic interaction still exists within regulatory

institutions that perpetuate an uneven terrain of knowledge-making, as over three decades of alternative agriculture in Indonesia have shown.

The third insight is that the politics of knowledge in alternative agriculture is contingent on existing regulatory institutions, broader cultural contexts, and interpersonal interactions (Laksmana forthcoming, 144). The involvement of different actors in IPM and organic agriculture is assumed to facilitate achieving the “best” solutions in technical and social terms. However, multi-stakeholder participation does not necessarily address inequalities in people’s capacity to participate in knowledge-making (Pestre 2008). In terms of validity and authority, the hierarchies of agricultural knowledge can be explained through the interactions between disembodied and embodied knowledge. In both IPM and organic agriculture, the broader institutional context influences how farmers accept experts’ knowledge as authoritative, though not necessarily valid (Laksmana forthcoming, 144). In the case of IPM, influencing factors are cultural norms and the Presidential Decree that gave a mandate to the government officials and entomologists involved in implementing IPM.

In organic agriculture, the recruitment of model farmers from the local area facilitated the intermediation of disembodied scientific knowledge taught to organic trainers and farmers’ embodied knowledge. This was illustrated by my conversations with Eka, an organic snake fruit farmer from the area, who was hired by the Department of Agriculture in his province as an organic trainer at the start of the “1000 Organic Villages” program in 2015 (Laksmana forthcoming, 141). When I asked about his involvement in the program, he explained: “So *dinas* (the Department of Agriculture) chooses people with known backgrounds ... who have already been involved in organic activities. Then they are selected to become organic trainers.” He further explained that most trainers are organic farmers in the area, and some even volunteer as independent extension workers. He also added that from the perspective of *dinas*, he was perceived as “experienced” in organic agriculture, due to his past experience of successfully applying for organic certification for his farmer group. Qualified trainers are expected to have the requisite technical and administrative knowledge to help farmers to obtain third-party certification, which is both political and science based, and relies on a particular epistemology (Konefal and Hatanaka 2011). Therefore, the scientization problem and the need for new knowledge of administration and record-keeping that comes with the creation of organic commodities could potentially introduce new arenas and objects of politics in alternative agriculture (Laksmana forthcoming, 141).

4.7 Knowledge as process – linking PhD research and journal publication

As a critical reflection on my research on embodied knowledge, I refer to my approach to knowledge in the making, which looks at the actual practice of research; that is, how my experiences as a PhD researcher in a transdisciplinary project are translated into journal publications that are used to construct different knowledges about organic agriculture ([Section 1.1](#)). The overall supportive and constructive reviews of this article that I received, suggest a possibility of producing academic work, which combines personal and intellectual interests under conditions of uncertainty and precarity, that is even in a “challenging” epistemic living space (Felt 2009). In this case, the writing process differed from work on the Net-Map article, where professional networking made an important contribution to its publication. While I do not deny the importance of professional networking in publication, a tendency to overemphasize it seems to mask the underlying inequality in the material conditions of scholars that is perpetuated by the global publication industry (Borras 2021), while downplaying responsibility of senior scholars for guiding early-stage scholars as they grow into academia (Felt et al. 2013).

In addition, my research experience highlights the temporal aspect of the fundamental issue of dissertation-by-publication, as mentioned in [Section 1.4](#), specifically, the time required to master a range of different writing approaches, to comply with the requirement for “several scientific works published in relevant journals/book series [...] to be agreed upon between the doctoral candidate and the supervisor” (the University of Passau 2013, 6). In my case, the published articles, plus those under revision, fulfil this requirement. However, from the perspective of a PhD candidate with minimum scientific publication experience and reputation in academia, aware of the role of journal editors as gatekeepers, there is pressure to complete the publication process on time, which may lead to the time for writing the dissertation being compromised. Therefore, I argue that a cumulative dissertation needs to be evaluated according to the aforementioned condition, which is different from a monograph-based PhD.

In relation to politics of knowledge on organic agriculture, the dialogical analysis highlights the historical continuity of a particular epistemology on agriculture that shapes hegemonic government approaches to (alternative) agriculture. Drawing on practice theory (Ortner 2006), I have highlighted the agency and subjectivity of agricultural scientists, extension workers, and farmers, expressed through their interactions. Therefore, the persistent disconnect between academics’ and farmers’ understanding of agriculture mentioned in [Section 4.1](#) is the result of the hierarchical relation between disembodied and embodied agricultural knowledge mediated by regulatory institutions.

Chapter 5. Transdisciplinary moments as an entangled approach to transdisciplinary collaboration

The analysis in this dissertation of the politics of knowledge of organic agriculture in Yogyakarta, Indonesia is shaped by reflexive transdisciplinary work and research that is informed by the concepts of epistemic living space and co-presence. In relation to transdisciplinary knowledge co-production using the Net-Map method, [Section 2.7](#) shows how different perspectives and aspirations that actors have regarding transdisciplinarity structure knowledge co-production. These differences are related to the temporal dimension, particularly the frequency of knowledge co-production and timescale of different activities in transdisciplinary research. In the examples I presented in [Section 2.7](#), researchers from the Passau University made the final decision on priorities in the research agenda. Researchers also decided which societal concerns should be addressed without having to explain their justifications to the research partners, which include those who were not formally part of the IndORGANIC project but whose knowledges were important. This highlights the importance of the issue of accountability in transdisciplinarity raised by Fritz and Binder (2020). When researchers define the scope of research on institutions of organic agriculture within a transdisciplinary workshop, this arguably reflects an understanding of transdisciplinarity that has yet to account for the politics of knowledge.

A characteristic of the transdisciplinary work conducted within the IndORGANIC project was an approach to synthesis that homogenizes epistemological and methodological differences among the different academic disciplines which co-produce knowledge with practice partners. Thus, the application of transformation knowledge for the formulation of policy recommendations did not sufficiently reflect the different valuing of evidence used by academic disciplines to support policy recommendations. As previously explained, the official policy targets of organic agriculture are similar to those of conventional agriculture, reflecting the prioritization by government of quantitative measures of the development of organic agriculture, for example market share and yield. A transdisciplinary approach that treats the plurality of epistemologies and methodologies as “equally different” has yet to account for the way that scientific knowledge “embeds and is embedded in social practices, identities, norms, conventions, [and] institutions” (Jasanoff 2004, 3), which are saturated with power. In addition, at the stage of constructing knowledge on organic agriculture through journal publications, this form of transdisciplinary synthesis involves a delicate avoidance of border-crossing into the disciplines of other researchers. This approach to transdisciplinarity resonates with the additive approach to problem solving (Vilsmaier 2021).

In contrast to the above work on institutions of organic agriculture and transdisciplinary production of transformation knowledge, the politics of knowledge is a central tenet of my research on alternative agriculture. This work shows how regulatory institutions of alternative agriculture reinforce the disembodiment of agricultural knowledge, which in turn radically simplifies it (see Scott 1999). In addition, following practice theory (Ortner 2006), I show how the agency and subjectivity of agricultural scientists, extension workers, and farmers are expressed through their interactions with insects and soil. These interactions demonstrate the ways that agricultural knowledge is transformed, challenged, acquired, reinforced, and constructed, mediated by institutional mechanisms. In addition, drawing on the notion of knowledge as process (Desai 2006), I analyse the construction of knowledge on agriculture through the production of a journal article, expressing a combination of personal and intellectual interests, under challenging social conditions and institutional constraints (Felt 2009).

Following my approach to synthesis, the “analytical excess” (Gupta 1998) of different conceptualizations of organic agriculture enables me to reflect on the implications of writing about organic agriculture, particularly the experiences of organic farmers, in Indonesia while being a doctoral student at a German university. I describe these experiences of critical self-reflection during work on my PhD as “transdisciplinary moments”.

Through the notion of transdisciplinary moments, I propose a way towards a transdisciplinary research practice that takes account of the politics of knowledge in which both scientific and extra-scientific actors are embedded; a consideration which is often lacking in current transdisciplinary research, as I explain in the previous chapters. This concept is informed by practice theory (Ortner 2006) as outlined in [Section 1.4.1](#). However, I extend the concept in that, unlike general practice theory, I consider research itself, for example the research that produced this theory, as a practice. Seeing research as a practice means that issues such as power, culture, subjectivity, agency, and acting subject, all of which are of interest of practice theory are relevant to understand the research practice itself that produces scientific knowledge. The term research practice here refers not only to typical empirical field research methods, such as participant observation and interviews, but also the process of selecting research problems and writing up of scientific articles that are used to construct different knowledges. In all these stages of research, as I have illustrated in the previous chapters, intersubjective experience of researchers and the “living” dimension of research are a crucial element of knowledge production. This means that structural change in contemporary academia (Felt et al. 2013), called for in response to the contradictions of transdisciplinarity I have explained in [Section 1.4.1](#) and at the beginning of this chapter, needs to be understood as occurring through a dialectical relation with research practice.

Transdisciplinary moments are conceptualized based on ethnographic moments (Strathern 1999) and relate to the creation of embodied knowledge in the course of transdisciplinary work, as elaborated in the previous chapters with reference to the concepts of epistemic living space and co-presence. However, unlike the ethnographic moment that focuses on the experience of the fieldworker, the transdisciplinary moment encompasses the experiences of all scientific and extra-scientific actors who are involved in transdisciplinary work.

In her essay *“The ethnographic effect I”*, Marilyn Strathern (1999), a renowned anthropologist and a theorist of the discipline, discusses the concept of the ethnographic moment based on her observation of how anthropologists today, and fieldworkers in general, are confronted with two “fields” that are separated in time rather than space. The first refers to the traditional definition of “the field” which is often referred to as a place different from where the fieldworkers inhabit. This “field” is where fieldworkers collect the data that becomes the basis of their analysis. The second “field” refers to the space where anthropologists are mainly preoccupied with writing for audiences who are different from people they encounter in the first field (Strathern 1999). In most cases, these audiences are scholars whose work is predominantly to do research and produce scientific knowledge. In other instances, the audience includes funders and policymakers. Strathern (1999, 2) further elaborates how the relationship between the two fields is complex, in that one can partially inhabit the other, but cannot fully encompass it, and the two have different trajectories. In other words, she argues that as fieldworkers, we approach our field sites with specific questions that are theoretically driven. Field experience often presents us with unexpected flows of events and ideas, which should only partially take over the initial reason for being there (ibid.).

The concept of the ethnographic moment refers to ways of engaging with these two fields that are related in a complex way, as explained above. Strathern (1999, 1) argues that an ethnographic moment is a moment of immersion “that is simultaneously total and partial, a totalizing activity which is not the only activity in which the person is engaged”. She further explains, “the

ethnographic moment works as an example of a relation which joins the understood, which refers to what is analysed at the moment of observation, with the need to understand, which refers to what is observed at the moment of analysis" (ibid., 6). Going back to her initial argument that the two fields are delineated through time rather than space, ethnographic moments can happen in either of the two fields, the traditional field site and the field where the fieldworker is predominantly occupied with the need to understand, which usually happens in the process of writing.

To build the concept of "transdisciplinary moments", I complement Strathern's work with the concepts of epistemic living space (Felt 2009) and co-presence (Chua 2015), since both time and space delineate my field sites in Yogyakarta and Passau, where my entangled relations with organic farmers, activists, policymakers, colleagues and the academic institution shape knowledge production in an embodied way. Therefore, knowledge production in PhD process is not confined to the timeframe of a scholarship, or the project or education I have been part of, but it is also related to the question of what kind of researcher I want to become. As George Marcus (2008, 3) observed on the state of the discipline of anthropology, "what's left to do, then, is to follow events, to engage ethnographically with history unfolding in the present, or to anticipate what is emerging. The great majority of projects of anthropology are pursued in this defining kind of temporality [that] has become much more important than traditional spatial tropes of "being there" in situating ethnography in time-space." In my context, the events to be followed were related to the need to understand the politics of knowledge, specifically the knowledge of organic agriculture that I transported back from my fieldwork in Yogyakarta to Passau University. However, differently from the ethnographic moment, the transdisciplinary moment is a bodily and affective process. It touches upon the conceptual and perceptual underpinning of knowing and affect. As argued by Stodulka, Dinkelaker, and Thajib (2019), the importance of emotion shapes and arises from social relations and thus can be considered an epistemic dimension. The concept also intersects with what I consider as the "immediacy" of embodied knowledge, by which I mean "a conscious engagement in an instance of a particular situation, while reflecting on the past and anticipating the future" (Laksmana forthcoming, 123).

Therefore, during the whole PhD process, transdisciplinary moments were marked by questions that captured my attention and sparked intense and prolonged sensation. These moments were also signified by the tensions between my understanding of research as influenced by anthropology and STS scholarship and the power of institutional discourses shaped by transdisciplinarity and PhD procedures. One example of such a question is: What are the implications of writing about organic agriculture in Indonesia, particularly the experiences of organic farmers, while being situated as a doctoral student at a German university? While dwelling into this question during my PhD, I constantly thought about in what ways I could incorporate it into my dissertation, while also reflecting on the past experience that sparked this interest, such as the process of renaming the department I worked in (see Section [1.4.3](#)).

I consider the concept of the transdisciplinary moments as the basis of "individual and collective self-critical reflection that actively interrogates the conduct and consequences of participants' practices, their understandings of their practices, and the conditions under which they practice" (Kemmis, McTaggart, and Nixon 2014, 6). Therefore, by examining the question during my encounters with different people and institutional discourses that enable and constrain transdisciplinary knowledge production, my critical self-reflection is guided by the following sensitizing questions: Who reflects on whose experience? For what ends is this reflexive gesture performed? And under which conditions is reflection possible? In addition, I propose the concept as a methodological pointer, which enables identification of *when* critical self- and collective reflection need to take place in a transdisciplinary collaboration. I argue that the above sensitizing questions can be used by both scientific and extra-

scientific actors during transdisciplinary moments to inform the (re)orientation of the research process as it proceeds. During the final stage of my PhD, these sensitizing questions led me to formulate the aim of the current dissertation as being to explore the politics of knowledge of organic agriculture in Yogyakarta, Indonesia. Although the concept of the transdisciplinary moments is informed by the entangled approach of problem-solving transdisciplinarity (Vilsmäier 2021 cited in Baptista and Vilsmäier 2021, 4), it is different in that it considers the embodied and affective dimensions of knowledge of those involved in transdisciplinary work. Furthermore, this concept expands the notion of transdisciplinarity as a reflexive process.

Chapter 6. Conclusion – Embodying transdisciplinary moments as a PhD student

I began this PhD in 2017. Initially, I wanted to understand how organic agriculture is practiced in Indonesia and identify the institutional mechanisms that produce agricultural knowledges and through which they circulate. This research agenda resulted in three academic publications, as well as magazine articles, research briefs, and policy recommendations. The struggles to grow into academia at Passau University, to interpret my fieldwork in Indonesia as part of the IndORGANIC research project, and my growing frustration with contemporary academia over the past six years have compelled me to dig deeper into the disconnect between my embodied experiences of thinking about organic agriculture in Indonesia while living in Germany. In my particular context, this epistemological question is translated into how research shapes different ways of knowing organic agriculture in Indonesia. The long and arduous journey that took me to this question and the subsequent journey that took me to an understanding of knowledge in the making have allowed me to learn some valuable lessons. These lessons are the result of working through the “excesses” (Gupta 1998) among different analytical categories I have used in this dissertation.

First, my PhD experiences highlight tensions between institutional discourse and subjective experience, but also reveals an opening to what I believe are other ways of doing (transdisciplinary) research. In a nutshell, I have learned about the meandering and messy reality of finding and nurturing epistemic living space as a doctoral student with an interdisciplinary background who was part of a transdisciplinary project. The ruptures between institutional discourse and subjects’ experiences result from “ruling” by institutions, particularly through their control over the organization, coordination, and regulation of knowledge (Smith 2005). In my context, I experienced institutional ruling in the form of demands to produce different outputs as part of a transdisciplinary project. Such demands, however, were not accompanied by the establishment of the necessary conditions and support mechanisms to meet them. Therefore, as part of a transdisciplinary research project, the PhD process seemed to focus more on what to produce, and less on how to produce them and the conditions under which such production is enabled.

The second lesson is that, despite the hegemony of New Public Management ideologies that create tensions in PhD education through their measurement of academic work and govern career possibilities in a transdisciplinary context, it is possible to reclaim my agency, while acknowledging my embeddedness in power relations that exist throughout my research. This is done through ways of thinking (a theoretical framework) that shift my perspective on doing empirical fieldwork and on synthesizing the results in a cumulative dissertation. The notion of transdisciplinary moments allows me to experience the change that can happen in everyday research practice, while recognizing the broader structural conditions. This concept allows me to examine my experience as a PhD student who wanted to learn how to be a “proper” scholar while meeting the institutional demands of being a member of a transdisciplinary research project. This concept also underlines that knowledge is made, transformed, refined, and disputed at the different moments of the research process; even after a research project ends, the PhD (and life) continues. Therefore, it highlights what I conceptualized as knowledge in the making in [Chapter 1](#).

The third lesson is related to the risk involved in talking directly to power. Going back to the fundamental premise of practice theory that the world can be made and unmade through practice, change can start from everyday practices in educational or research institutions. On this issue, Padmanabhan (2018a) argues that transdisciplinary researchers tend to be reluctant to confront power relations embedded in culture or academic disciplines. Schikowitz (2020, 232) takes the power

issue further by arguing that “a withdrawal to disciplinary values and practices might not only be the cause for but also a reaction to a lack of more diverse collective coping strategies for dealing with inherent tensions.” In principle, the shift of research from an individualistic to a more collective point of view is arguably important for transdisciplinarity to enact an alternative form of knowledge production. However, in the context of a hierarchical German academic culture and variation in the size and structure of research projects and departments in academic institutions, early-stage researchers need to ask who is the collective and how much can they influence existing institutional and value structures of academia while being deeply entrenched in its power relations (see Zocchi 2021).

The fourth lesson, derived from the critical reflections in Chapters 2 to 4, is that the tight grip of output-oriented discourse shapes experiences of growing into academia, which, in my case, were intertwined with the different conceptualizations of organic agriculture. My reinterpretation of the work of synthesis of the IndORGANIC team reveals a strategy of avoiding border-crossing through analytical choreography, where scholars jointly produce scientific knowledge while avoiding stepping into each other’s disciplines. As I previously argued, this strategy is not simply a response to the risk that is involved in border-crossing work (Felt et al. 2013), but also corresponds to the additive approach to transdisciplinary problem solving that was adopted by the team (Vilsmaier 2021). This strategy was also a compromise to avoid epistemological discussion (Alcoff 2022), that may lead to “impractical” forms of synthesis or knowledge integration in a transdisciplinary project. Knowledge production through scientific publication seems to require that disciplinary boundaries are maintained even when a transdisciplinary approach is adopted. I explained the implications in [Section 3.3](#) and [Chapter 5](#).

The fifth lesson, derived from a critical investigation of the underlying institutional and value structures of contemporary academia, is that academics need to consider how different scientific disciplines are valued and evaluated by societies and communities of practice. While in the discipline I contribute to, reflexive work is valued, this is not necessarily the case in disciplines that value value-free science. For instance, most literature that adopts a critical perspective on transdisciplinarity is written by scholars under the big umbrella of qualitative social sciences, despite the fact that natural scientists and extra-scientific actors are also involved in the transdisciplinary projects they reflect on. Reflecting on the aspect of living in research, this observation may be related to epistemological issues, as well as different ways of valuing and evaluating disciplines among themselves and by societies.

6.1 Potential future engagement of transdisciplinarity with its (perhaps) distant kin

Felt and colleagues (2013) highlight the need for broader change in the institutional and value structures of contemporary academia in order to accommodate transdisciplinary knowledge production. Such a change might be initiated by transdisciplinary researchers taking politics of knowledge as their starting point. This standpoint implies the need for transdisciplinary research to make more reference to decoloniality literature (see Manuel-Navarrete, Buzinde, and Swanson 2021), where alternative ways of knowing imply material change against the background of colonial continuities. In other words, contemporary knowledge production is intertwined with differentiated material conditions and the continuity of oppressive structures (Tuck and Yang 2012). At the same time, an increasing number of funding schemes require a transdisciplinary approach. Therefore, I suggest there is a need for more research that situates transdisciplinarity within a broader political economy of knowledge production by building on work that focuses on agenda-setting processes in research. This work intersects with studies of the moral economy of science (Kohler 1994), structural conditions of funding institutions, including their imaginaries and expectations (Frickel et al. 2010; Felt et al. 2016), and different decision-making and resource distribution arrangements in research

project (Schikowitz 2020). While a recent study (Kruijf et al. 2022) addresses the issue of resources in general, including time, finance and support, in the implementation of transdisciplinary projects, more research on the power that structures the distribution of these resources is needed, as well as on the differentiated material conditions of scientific and extra-scientific actors (for example, Fritz and Binder 2020).

Another line of enquiry would be to consider scholarship or academic work as intergenerational relations. In this sense, practice-oriented transdisciplinarity could benefit from existing literature on intergenerational (knowledge) relations in the more-than-human world (for example, Taylor and Pacini-Ketchabaw 2019). In a time of ecological and societal crises, taking a more-than-human ethical standpoint may help shift intergenerational relations of knowledge production based on fragmentation and exploitation towards relations based on respect, reciprocity, and responsibility (Laksmana n.d.). One epistemological starting point could be Robin Wall Kimmerer's (2003, my emphasis) exposition of Indigenous ways of knowing where knowledge is *received*, rather than *acquired*. One way of rethinking how one does research while starting out from the politics and ethics of knowledge may refer to what Lugones (2003 cited in Icaza Garza 2022, 5) describes as "praxical thinking" where "one doesn't think what one doesn't do."

Publication bibliography

- Aeberhard, Andrea, and Stephan Rist. 2009. "Transdisciplinary Co-Production of Knowledge in the Development of Organic Agriculture in Switzerland." *Ecological Economics* 68 (4): 1171–1181. <https://doi.org/10.1016/j.ecolecon.2008.08.008>.
- Agrawal, Arun. 2002. "Indigenous Knowledge and the Politics of Classification." *International Social Science Journal* 54 (173): 287–297. <https://doi.org/10.1111/1468-2451.00382>.
- Ahearn, Laura M. 2001. "Language and Agency." *Annual Review of Anthropology* 30 (1): 109–137. <https://doi.org/10.1146/annurev.anthro.30.1.109>.
- Aji, Bayu G., Stevanus Wangsit, and Vanda Ningrum. 2019. "Reorientasi kebijakan pertanian organik sesudah "Go Organik 2010" dan program "Seribu Desa Pertanian Organik" di Indonesia." Jakarta: Universitas Bakrie Press. Accessed February 28, 2023. <http://repository.bakrie.ac.id/2304/>.
- Alcoff, Linda Martin. 2022. "A Critique of Extractivist Epistemologies." Online lecture at Epistemic Decolonization Seminar Series, May 19, 2022.
- Amelia, Fatiya, Johan Iskandar, Ruhyat Partasmita, and Nicholas Malone. 2018. "Recognizing Indigenous Knowledge of the Karangwangi Rural Landscape in South Cianjur, Indonesia for Sustainable Land Management." *Biodiversitas* 19 (5): 1722–1729. <https://doi.org/10.13057/biodiv/d190518>.
- AOI. 2018. "Statistik pertanian organik 2016." Bogor: Aliansi Organik Indonesia.
- Asdal, Kristin, Moser Ingunn, and Brita Brenna. 2007. *Technoscience: The Politics of Interventions*. Oslo: Oslo University Press, Unipub.
- Aveling, Emma-Louise, Alex Gillespie, and Flora Cornish. 2015. "A qualitative method for analysing multivoicedness." *Qualitative Research* 15 (6): 670–687.
- Baptista, Bianca Vienni, and Ulli Vilsmaier. 2021. "Models of Transdisciplinary Knowledge Production at Universities: A Romanian Case Study." *Higher Education Research & Development*, 1–16. <https://doi.org/10.1080/07294360.2021.1910208>.
- Barsalou, Lawrence W., Aron K. Barbey, W. Kyle Simmons, and Ava Santos. 2005. "Embodiment in Religious Knowledge." *Journal of Cognition and Culture* (5): 14–57. <https://doi.org/10.1163/1568537054068624>.
- Bergmann, Matthias, Thomas Jahn, Tobias Knobloch, Wolfgang Krohn, Christian Pohl, and Engelbert Schramm. 2012. *Methods for Transdisciplinary Research: A Primer for Practice*. Frankfurt am Main: Campus.
- Bernstein, Jay Hillel. 2015. "Transdisciplinarity: A Review of Its Origins, Development, and Current Issues." *Journal of Research Practice* 11 (1): R1.
- Borofsky, Robert. 1990. *Making history: Pukapukan and anthropological constructions of knowledge*. Cambridge, UK: Cambridge University Press.
- Borofsky, Robert. 1994. "On the knowledge and knowing of cultural activities." In *Assessing cultural anthropology*, edited by Robert Borofsky, 331–347. New York: McGraw-Hill.
- Borras, Jun. 2021. "Some Notes on Academic Publishing: Issues for Discussion." Online lecture at JPS Writeshop, August 24, 2021.
- BPS. 2018. "Hasil survey pertanian antar sensus sutas 2018." Accessed February 22, 2023. <https://www.bps.go.id/publication/2019/01/02/c7cb1c0a1db444e2cc726708/hasil-survei-pertanian-antar-sensus--sutas--2018.html>.
- Brown, Mark B. 2015. "Politicizing Science: Conceptions of Politics in Science and Technology Studies." *Social Studies of Science* 45 (1): 3–30. <https://doi.org/10.1177/0306312714556694>.
- Brown Valerie A., John Harris, and Jacqueline Russell. 2010. *Tackling wicked problems: Through the transdisciplinary imagination*. London: Earthscan.
- BSN. 2002. "SNI 2002 Sistem Pangan Organik."

- BSN. 2016. "SNI 2016 Sistem Pertanian Organik."
- Carr, E. Summerson. 2010. "Enactments of Expertise." *Annual Review of Anthropology* 39 (1): 17–32. <https://doi.org/10.1146/annurev.anthro.012809.104948>.
- Chen, Nancy N. 1992. "'Speaking Nearby': A Conversation with Trinh T. Minh-ha." *Visual Anthropology Review* 8 (1): 82–91.
- Chua, Liana. 2015. "Troubled Landscapes, Troubling Anthropology: Co-Presence, Necessity, and the Making of Ethnographic Knowledge." *Journal of the Royal Anthropological Institute* 21 (3): 641–659. <https://doi.org/10.1111/1467-9655.12254>.
- Ciesielski, Timothy H., Melinda C. Aldrich, Carmen J. Marsit, Robert A. Hiatt, and Scott M. Williams. 2017. "Transdisciplinary Approaches Enhance the Production of Translational Knowledge." *Translational research* 182: 123–134. <https://doi.org/10.1016/j.trsl.2016.11.002>.
- Comaroff, John, and Jean Comaroff. 1992. *Ethnography and the historical imagination*. New York: Routledge.
- Conford, Phillip. 2001. *The origin of the Organic Movement*. Edinburgh: Floris Books.
- David, Wahyudi, and Ardiansyah. 2017. "Organic Agriculture in Indonesia: Challenges and Opportunities." *Organic Agriculture* 7 (3): 329–38. <https://doi.org/10.1007/s13165-016-0160-8>.
- Desai, Bina. 2006. "Inside Out: Rationalizing Practices and Representations in Agricultural Development Projects." In *Development Brokers and Translators: The Ethnography of Aid and Agencies*, edited by David Lewis and David Mosse, 171–195. Bloomfield, CT: Kumarian Press.
- Ditjen BPPHP. 2001. "4 Tahun Go Organic 2010."
- Edwards, Nicola. 2013. "Values and the institutionalization of Indonesia's organic agriculture movement." In *Social Activism in Southeast Asia*, edited by Michele Ford, 72–88. New York: Routledge.
- Eyhorn, Frank, Adrian Muller, John P. Reganold, Emile Frison, Hans R. Herren, Louise Lutikholt, Alexander Mueller, Jörn Sanders, Nadia El-Hage Scialabba, Verena Seufert, and et al. 2019. "Sustainability in global agriculture driven by organic farming." *Nature Sustainability* 2: 253–255.
- Fabian, Johannes. 2012. "Cultural Anthropology and the Question of Knowledge*." *Journal of the Royal Anthropological Institute* 18 (2): 439–53. <https://doi.org/10.1111/j.1467-9655.2012.01751.x>.
- Faier, Lieba, and Lisa Rofel. 2014. "Ethnographies of Encounter." *Annual Review of Anthropology* 43 (1): 363–77. <https://doi.org/10.1146/annurev-anthro-102313-030210>.
- FAO. 1999. "Guidelines for the Production, Processing, Labelling and Marketing of Organically Produced Foods."
- FAO. 2019. "The State of Food and Agriculture. Moving Forward on Food Loss and Waste Reduction." Accessed February 22, 2023. <https://www.fao.org/3/CA6030EN/CA6030EN.pdf>.
- Federal Ministry of Food and Agriculture. 2022. "Announcement No. 04/22/33 "Innovative Nachhaltige Produktionssysteme" ("Innovative Sustainable Production Systems")." Accessed February 22, 2023. https://www.ble.de/SharedDocs/Downloads/DE/Projektfoerderung/InternationaleForschungszusammenarbeit/Forschungskooperationen_International/2022_Bekanntmachung-Produktionssysteme/Bekanntmachung_Nachhaltige-Produktionssysteme_en.pdf?blob=publicationFile&v=3.
- Felt, Ulrike. 2007. "Epistemische Lebensräume: Multiple Artikulationen von Wissen, Institutionen und Geschlecht – Ein erster Reisebericht aus Epistemien." Paper presented at Essener Kolleg für Geschlechterforschung. Essen, 05.07.2008.

- Felt, Ulrike. 2009. *Knowing and Living in Academic Research: Convergence and Heterogeneity in Research Cultures in the European Context*. Prague: Institute of Sociology of the Academy of Sciences of the Czech Republic.
- Felt, Ulrike. 2022. "Making and Taking Time." In *Institutionalizing Interdisciplinarity and Transdisciplinarity*, edited by Bianca Vienni Baptista and Julie Thompson Klein, 204–217. London: Routledge.
- Felt, Ulrike, Judith Igelsböck, Andrea Schikowitz, and Thomas Völker. 2013. "Growing into What? The (Un-)Disciplined Socialisation of Early Stage Researchers in Transdisciplinary Research." *Higher Education* 65 (4): 511–524. <https://doi.org/10.1007/s10734-012-9560-1>.
- Felt, Ulrike, Judith Igelsböck, Andrea Schikowitz, and Thomas Völker. 2016. "Transdisciplinary Sustainability Research in Practice." *Science, Technology, & Human Values* 41 (4): 732–761. <https://doi.org/10.1177/0162243915626989>.
- Flick, Uwe. 2011. *An Introduction to Qualitative Research*. Los Angeles: Sage.
- Frickel, Scott, Sahra Gibbon, Jeff Howard, Joanna Kempner, Gwen Ottinger, and David J. Hess. 2010. "Undone Science: Charting Social Movement and Civil Society Challenges to Research Agenda Setting." *Science, Technology, & Human Values* 35 (4): 444–473. <https://doi.org/10.1177/0162243909345836>.
- Fritz, Livia, and Claudia R. Binder. 2020. "Whose Knowledge, Whose Values? An Empirical Analysis of Power in Transdisciplinary Sustainability Research." *European Journal of Futures Research* 8 (1): 1–21. <https://doi.org/10.1186/s40309-020-0161-4>.
- Fritz, Manuela, Michael Grimm, Patrick Keilbart, Dimas Dwi Laksana, Nathalie Luck, Martina Padmanabhan, Nurcahyaningtyas Subandi, and Kristian Tamtomo. 2021. "Turning Indonesia Organic: Insights from Transdisciplinary Research on the Challenges of a Societal Transformation." *Sustainability* 13 (23): 13011. <https://doi.org/10.3390/su132313011>.
- Gibbons, Michael, Camille Limoges, Helga Nowotny, Simon Schwartzman, Peter Scott, and Martin Trow. 1994. *The New Production of Knowledge: The Dynamics of Science and Research in Contemporary Societies*. London: Sage.
- Gillespie, Alex, and Flora Cornish. 2014. "Sensitizing Questions: A Method to Facilitate Analyzing the Meaning of an Utterance." *Integrative Psychological & Behavioral Science* 48 (4): 435–52. <https://doi.org/10.1007/s12124-014-9265-3>.
- Gundermann, Christian. 2017. "Reading Blood Work Is an Art Form: Toward an Embodied Feminist Practice of Veterinary Science and Care." *Catalyst: Feminism, Theory, Technoscience* 3 (2): 1–28. <https://doi.org/10.28968/cftt.v3i2.28841>.
- Gupta, Akhil. 1998. *Postcolonial developments: Agriculture in the making of modern India*. Durham: Duke University Press.
- Heath, Deborah. 2007. "Bodies, Antibodies, and Modest Interventions." In *Technoscience: The Politics of Interventions*, edited by Kristin Asdal, Brita Brenna, and Ingunn Moser, 135–155. Oslo: Oslo University Press, Unipub.
- Helmreich, Stefan. 2009. *Alien Ocean: Anthropological Voyages in Microbial Seas*. Berkeley: University of California Press.
- Herberg, Jeremias, and Ulli Vilsmaier. 2020. "Social and Epistemic Control in Collaborative Research — Reconfiguring the Interplay of Politics and Methodology." *Social Epistemology* 34 (4): 309–318. <https://doi.org/10.1080/02691728.2019.1706115>.
- Herrera, César E Giraldo. 2018. *Microbes and Other Shamanic Beings*. Cham: Springer International Publishing.
- Hess, David J. 2016. *Undone science: Social movements, mobilized publics, and industrial transitions*. Cambridge: MIT Press.

- Hidayat, A. S., and S. Lesmana. 2011. "The Development of Organic Rice Farming in Indonesia." *Review of Indonesian Economic and Business Studies* 2: 71–87. <https://jurnalekonomi.lipi.go.id/riebs/issue/view/13/14>.
- Hirsch Hadorn, Gertrude, Holger Hoffmann-Riem, Susette Biber-Klemm, Walter Grossenbacher-Mansuy, Dominique Joye, Christian Pohl, Urs Wiesmann, Elisabeth Zemp. 2008. *Handbook of Transdisciplinary Research*. Dordrecht: Springer.
- Icaza Garza, Rosalba. 2022. "Tanteando En La Oscuridad: Decolonial Feminist Horizons." Accessed February 22, 2023. <https://www.narcis.nl/publication/RecordID/oai:pure.eur.nl:publications%2F0e1a34dd-c9cb-47d9-acac-64f955542e59>.
- Ignatow, Gabriel. 2007. "Theories of Embodied Knowledge: New Directions for Cultural and Cognitive Sociology?" *Journal for the Theory of Social Behaviour* 37 (2): 115–35. <https://doi.org/10.1111/j.1468-5914.2007.00328.x>.
- IndORGANIC. n.d. Accessed February 28, 2023. <https://www.uni-passau.de/en/indorganic>.
- IPBES. 2019. "Global Assessment Report on Biodiversity and Ecosystem Services of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services." Accessed February 28, 2023. https://zenodo.org/record/6417333#.Y_9zFHbMJNM.
- Jahroh, S. 2010. "Organic Farming Development in Indonesia: Lessons Learned from Organic Farming in West Java and North Sumatra." <https://hal.archives-ouvertes.fr/hal-00521832>.
- Jasanoff, Sheila. 2004. *States of Knowledge: The Co-Production of Science and Social Order*. London: Routledge.
- Jeon, June. 2019. "Rethinking Scientific Habitus: Toward a Theory of Embodiment, Institutions, and Stratification of Science." *Engaging STS* 5: 160–172. <https://doi.org/10.17351/ests2019.303>.
- Kemmis, Stephen, Robin McTaggart, and Rhonda Nixon. 2014. *The Action Research Planner: Doing Critical Participatory Action Research*. Singapore: Springer.
- Kimmerer, Robin Wall. 2003. *Gathering Moss: A Natural and Cultural History of Mosses*. Corvallis: Oregon State University Press.
- Klein, Julie Thompson. 2001. "The Discourse of Transdisciplinarity: An Expanding Global Field." In *Transdisciplinarity: Joint Problem Solving Among Science, Technology, and Society*, edited by Julie T. Klein, Rudolf Häberli, Roland W. Scholz, Walter Grossenbacher-Mansuy, Alain Bill, and Myrtha Welti, 35–44. Basel: Birkhäuser Basel.
- Kloppenburg, Jack. 2010. "Impeding dispossession, enabling repossession: Biological open source and the recovery of seed sovereignty." *Journal of Agrarian Change* 10: 367–388. <https://doi.org/10.1111/j.1471-0366.2010.00275.x>.
- Kohler, Robert E. 1994. *Lords of the Fly: Drosophila Genetics and the Experimental Life*. Chicago: University of Chicago Press.
- Konefal, Jason, and Maki Hatanaka. 2011. Enacting third-party certification: A case study of science and politics in organic shrimp certification. *Journal of Rural Studies* 27: 125–133. <https://doi.org/10.1016/j.jrurstud.2010.12.001>.
- KPPN/BPPN. 2014. Peraturan Presiden Republik Indonesia Nomor 2 Tahun 2015 tentang rencana pembangunan jangka menengah nasional 2015–2019.
- Kruijff, Joanne Vinke-de, Laura Verbrugge, Barbara Schröter, Robert-Jan Haan, Juliette Cortes Arevalo, Jan Fliervoet, Jennifer Henze, and Christian Albert. 2022. "Knowledge Co-production and Researcher Roles in Transdisciplinary Environmental Management Projects." *Sustainable Development*. <https://doi.org/10.1002/sd.2281>.
- Kunze, Isabelle, and Martina Padmanabhan. 2014. "Discovering Positionalities in the Countryside: Methodological Reflections on Doing Fieldwork in South India." *Erdkunde* 68 (4): 277–88. <https://doi.org/10.3112/erdkunde.2014.04.04>.

- Laksmana, Dimas Dwi. n.d. "The Ethics of Generation in Multispecies Encounters: Syncretic Relations Between Humans and Soil Microorganism in Agriculture." Workshop on Soils as Sites of Emergency and Transformation, Nordic Environmental Social Science Conference (NESS). Presentation at School of Global Studies, the University of Gothenburg, Gothenburg, Sweden, June 7, 2022.
- Laksmana, Dimas Dwi. (forthcoming). "Farmers' Creativity and Cultivated Senses: The Immediacy of Embodied Knowledge in Alternative Agriculture."
- Laksmana, Dimas Dwi. 2020a. "Institution of Organic Farming in Java. IndORGANIC Policy Brief 4." Accessed February 28, 2023. https://www.uni-passau.de/fileadmin/dokumente/fakultaeten/phil/lehrstuehle/padmanabhan/Pdfs/Organic_Visions_%E2%80%93_Policy_recommendations_for_organic_farming_in_Java.pdf.
- Laksmana, Dimas Dwi. 2020b. "Local Agricultural Knowledge in Organic Farming. IndORGANIC Policy Brief 3." Accessed February 28, 2023. https://www.uni-passau.de/fileadmin/dokumente/fakultaeten/phil/lehrstuehle/padmanabhan/Pdfs/Local_agricultural_knowledge_in_organic_farming.pdf.
- Laksmana, Dimas Dwi and Martina Padmanabhan. 2021. "Strategic engagement in institutions of organic farming in Indonesia." In *Transitioning to Sustainable Life on Land*, edited by Volker Beckmann, 381. Switzerland: MDPI.
- Lang, Daniel J., Arnim Wiek, Matthias Bergmann, Michael Stauffacher, Pim Martens, Peter Moll, Mark Swilling, and Christopher J. Thomas. 2012. "Transdisciplinary Research in Sustainability Science: Practice, Principles, and Challenges." *Sustainability Science* 7 (S1): 25–43. <https://doi.org/10.1007/s11625-011-0149-x>.
- Lu, Jiaying, and Sanjay K. Nepal. 2009. "Sustainable Tourism Research: An Analysis of Papers Published in the Journal of Sustainable Tourism." *Journal of Sustainable Tourism* 17 (1): 5–16. <https://doi.org/10.1080/09669580802582480>.
- Lugones, María. 2003. *Pilgrimages/Peregrinajes: Theorizing Coalition Against Multiple Oppressions*. Lanham: Rowman & Littlefield Publishers.
- Lund, Christian. 2014. "Of What Is This a Case? Analytical Movements in Qualitative Social Science Research." *Human Organization* 73 (3): 224–234. <https://doi.org/10.17730/humo.73.3.e35q482014x03314>.
- Manuel-Navarrete, David, Christine N. Buzinde, and Tod Swanson. 2021. "Fostering Horizontal Knowledge Co-Production with Indigenous People by Leveraging Researchers' Transdisciplinary Intentions." *Ecology & Society* 26 (2). <https://doi.org/10.5751/ES-12265-260222>.
- Marcus, George. E. 2008. "The End(s) Of Ethnography: Social/Cultural Anthropology's Signature Form of Producing Knowledge in Transition." *Cultural Anthropology* 23 (1): 1–14. <https://doi.org/10.1111/j.1548-1360.2008.00001.x>.
- Mauser, Wolfram, Gernot Klepper, Martin Rice, Bettina Susanne Schmalzbauer, Heide Hackmann, Rik Leemans, and Howard Moore. 2013. "Transdisciplinary Global Change Research: The Co-Creation of Knowledge for Sustainability." *Current Opinion in Environmental Sustainability* 5 (3-4): 420–431. <https://doi.org/10.1016/j.cosust.2013.07.001>.
- Mayrowani, Henny. 2016. "Pengembangan Pertanian Organik Di Indonesia." *Forum Penelitian Agro Ekonomi* 30 (2): 91–108. <http://repository.pertanian.go.id/bitstream/handle/123456789/7549/3880-8997-1-SM.pdf?sequence=1&isAllowed=y>.
- Méndez, V. Ernesto, Christopher M. Bacon, and Roseann Cohen. 2013. "Agroecology as a Transdisciplinary, Participatory, and Action-Oriented Approach." *Agroecology and Sustainable Food Systems* 37 (1): 3–18.

- Michelsen, Johannes, Kennet Lynggaard, Susanne Padel, and Carolyn Foster. 2001. Organic farming development and agricultural institutions in Europe: A study of six countries. In *Organic Farming in Europe: Economics and Policy 9*, edited by Sabrina Dabbert. Stuttgart-Hohenheim: University of Hohenheim
- Millora, Chris, Siti Maimunah, and Enid Still. 2020. "Reflecting on the Ethics of PhD Research in the Global South: Reciprocity, Reflexivity and Situatedness." *Acta Academica* 52 (1): 10–30. <https://doi.org/10.18820/24150479/aa52i1/SP2>.
- Ministry of Agriculture. 2003. "Keputusan Menteri Pertanian No: 432/Kpts/OT.130/9/2003 Tentang Penunjukan Pusat Standardisasi dan Akreditasi sebagai Otoritas Kompeten Pangan Organik"
- Morales, Aurora Levins. 2019. *Medicine stories: Essays for radicals*. Durham: Duke University Press.
- Murphy, Michelle. 2017. "What Can't a Body Do?" *Catalyst: Feminism, Theory, Technoscience* 3 (1): 1–15. <https://doi.org/10.28968/cftt.v3i1.28791>.
- Myers, Natasha. 2008. Molecular Embodiments and the Body-work of Modeling in Protein Crystallography. *Social Studies of Science* 38 (2): 163–199. <https://doi.org/10.1177/0306312707082969>
- Narayan, Kirin. 2012. *Alive in the Writing: Crafting Ethnography in the Company of Chekhov*. Chicago: University of Chicago Press.
- Newnham, Elizabeth C., Lois V. McKellar, and Jan I. Pincombe. 2017. "Paradox of the Institution: Findings from a Hospital Labour Ward Ethnography." *BMC pregnancy and childbirth* 17 (1): 1–11. <https://doi.org/10.1186/s12884-016-1193-4>.
- Nicolescu, Basarab. 2010. "Methodology of Transdisciplinarity—Levels of Reality, Logic of the Included Middle and Complexity." *The ATLAS Transdisciplinary-Transnational-Transcultural Bi-Annual Meeting* 1-14. <https://doi.org/10.22545/2010/0009>.
- Nielsen, Morten, and Nigel Rapport. 2017. *The Composition of Anthropology: How Anthropological Texts Are Written*. London: Routledge.
- Nightingale, Andrea. 2003. "A feminist in the forest: Situated knowledges and mixing methods in natural resource management." *ACME: An International Journal for Critical Geographies* 2 (1): 77–90.
- Nightingale, Andrea J. 2019. *Environment and Sustainability in a Globalizing World*. New York: Routledge.
- Nygren, Anja. 1999. "Local Knowledge in the Environment—Development Discourse." *Critique of Anthropology* 19 (3): 267–88. <https://doi.org/10.1177/0308275X9901900304>.
- Okely, Judith. 2020. *Anthropological practice: Fieldwork and the ethnographic method*. Oxford: Berg Publishers.
- Ortner, Sherry B. 2006. *Anthropology and Social Theory: Culture, Power, and the Acting Subject*. Durham: Duke University Press.
- Osinski, Agathe. 2021. "Towards a Critical Sustainability Science? Participation of Disadvantaged Actors and Power Relations in Transdisciplinary Research." *Sustainability* 13 (3): 1266. <https://doi.org/10.3390/su13031266>.
- Padmanabhan, Martina. n.d. "Detailed Project Description and Work-plan. IndORGANIC The societal transformation of agriculture into bioeconomy – Turning Indonesia organic?"
- Padmanabhan, Martina. 2018a. *Transdisciplinary Research and Sustainability: Collaboration, Innovation and Transformation*. London: Routledge.
- Padmanabhan, Martina. 2018b. "Dream Team or Evil Twins? Dream Team or Evil Twins? International Tandems in Transdisciplinary Research." In *Transdisciplinary Research and Sustainability: Collaboration, Innovation and Transformation*, edited by Martina Padmanabhan, 191–217. London: Routledge.

- Padmanabhan, Martina. 2022. "Mulai Leave—datang Arrive—pulang Return. Working the Field Together: A Feminist Mother–Son Journey in Yogyakarta, Indonesia." In *Feminist Methodologies: Experiments, Collaborations and Reflections*, edited by Wendy Harcourt, Karijn van den Berg, Constance Dupuis, and Jacqueline Gaybor. Switzerland: Springer Nature.
- Padmanabhan, Martina, Samia Dinkelaker, Mareike Hoffmann, Dimas Laksmana, Siti Maimunah, Elena Rudakova, Enid Still, and Friederike Trotier. 2022. "Principles of Critical Development Studies: A Minifesto." *ASIEN: The German Journal on Contemporary Asia* 160/161: 210–220.
- Paxson, Heather. 2013. *The Life of Cheese: Crafting Food and Value in America*. Berkeley: University of California Press.
- Pestre, Dominique. 2008. "Challenges for the Democratic Management of Technoscience: Governance, Participation and the Political Today." *Science as Culture* 17 (2): 101–19. <https://doi.org/10.1080/09505430802062869>.
- Pincus, Jonathan. 1996. *Class, Power and Agrarian Change: Land and Labour in Rural West Java*. London: Palgrave Macmillan UK.
- Plantation General Directorate of the Ministry of Agriculture. 2016. "Dukungan Perlindungan Perkebunan: Pedoman Teknis Pengembangan Desa Pertanian Organik Berbasis Komoditas Perkebunan Tahun 2016."
- Pohl, Christian. 2008. "From Science to Policy Through Transdisciplinary Research." *Environmental Science & Policy* 11 (1): 46–53. <https://doi.org/10.1016/j.envsci.2007.06.001>.
- Pohl, Christian, Pius Krütli, and Michael Stauffacher. 2017. "Ten Reflective Steps for Rendering Research Societally Relevant." *GAIA - Ecological Perspectives for Science and Society* 26 (1): 43–51. <https://doi.org/10.14512/gaia.26.1.10>.
- Polk, Merritt. 2015. "Transdisciplinary Co-Production: Designing and Testing a Transdisciplinary Research Framework for Societal Problem Solving." *Futures* 65: 110–22. <https://doi.org/10.1016/j.futures.2014.11.001>.
- President of the Republic of Indonesia. 1986. "Instruksi Presiden No. 3/1986 Tentang Peningkatan Pengendalian Hama Wera Coklat pada Tanaman Padi."
- President of the Republic of Indonesia. 1992. Undang-undang no. 12 tahun 1992 tentang: Sistem budidaya tanaman.
- Reuter, Thomas, and Graeme MacRae. 2019. "Regaining Lost Ground: A Social Movement for Sustainable Food Systems in Java, Indonesia." *Anthropology of Food*. <https://journals.openedition.org/aof/10292>.
- Rikolto. n.d. Promoting Sustainable and Inclusive Rice Value Chain in Indonesia. Accessed February 28, 2023. <https://indonesia.rikolto.org/en/project/promoting-sustainable-and-inclusive-rice-value-chain-indonesia#tab-story>.
- Sawit, M. Husein, and Ibrahim Manwan. 1991. "The Beginnings of the New Supra Insus Rice Intensification Program: The Case of the North Coast of West Java and South Sulawesi." *Bulletin of Indonesian Economic Studies* 27 (1): 81–103. <https://doi.org/10.1080/00074919112331335948>.
- Schiffer, Eva. 2007. "Net-Map toolbox: Influence mapping of social networks." Paper presented at the Sunbelt Conference of the International Network of Social Network Analysis, Greece, August 20–24.
- Schiffer, Eva, and Jennifer Hauck. 2010. "Net-Map: Collecting social network data and facilitating network learning through participatory influence network mapping." *Field Methods* 22: 231–49. <https://doi.org/10.1177/1525822X10374798>.
- Schikowitz, Andrea. 2020. "Creating Relevant Knowledge in Transdisciplinary Research Projects - Coping with Inherent Tensions." *Journal of Responsible Innovation* 7 (2): 217–37. <https://doi.org/10.1080/23299460.2019.1653154>.

- Scholz, Roland. 2017. "The Normative Dimension in Transdisciplinarity, Transition Management, and Transformation Sciences: New Roles of Science and Universities in Sustainable Transitioning." *Sustainability* 9 (6): 991. <https://doi.org/10.3390/su9060991>.
- Scholz, Roland W., and Gerald Steiner. 2015. "The Real Type and Ideal Type of Transdisciplinary Processes: Part I—Theoretical Foundations." *Sustainability Science* 10 (4): 527–544. <https://doi.org/10.1007/s11625-015-0326-4>.
- Schreer, Viola, and Martina Padmanabhan. 2020. "The Many Meanings of Organic Farming: Framing Food Security and Food Sovereignty in Indonesia." *Organic Agriculture* 10 (3): 327–38. <https://doi.org/10.1007/s13165-019-00277-z>.
- Scott, James C. 1999. *Seeing Like a State: How Certain Schemes to Improve the Human Condition Have Failed*. New Haven: Yale University Press.
- Smith, Dorothy E. 2005. *Institutional Ethnography: A Sociology for People*. Lanham: AltaMira Press.
- Stodulka, Thomas, Samia Dinkelaker, and Ferdiansyah Thajib. 2019. *Affective dimensions of fieldwork and ethnography*. Switzerland: Springer Nature.
- Strathern, Marilyn. 1999. *Property, Substance and Effect: Anthropological Essays on Persons and Things*. London: Athlone Press.
- Sultana, Farhana. 2021. "Political ecology 1: From margins to center." *Progress in Human Geography* 45 (1): 156–165. <https://doi.org/10.1177/030913252093675>.
- Tamtomo, Kristian. 2021. "Unarticulated Tensions in the Marketization of Organic Agriculture: The Case of Pioneer Organizations in Yogyakarta, Indonesia." *South East Asia Research* 29 (2): 195–213. <https://doi.org/10.1080/0967828x.2021.1931422>.
- Taylor, Affrica, and Veronica Pacini-Ketchabaw. 2020. *The Common Worlds of Children and Animals: Relational Ethics for Entangled Lives*. London: Routledge.
- The University of Passau. 2013. "Promotionsordnung Für Die Philosophische Fakultät Der Universität Passau." Accessed February 28, 2023. https://www.uni-passau.de/fileadmin/dokumente/beschaefigte/Rechtsvorschriften/PromO/PromO_Phil.pdf.
- Thorburn, Craig. 2014. "Empire Strikes Back: The Making and Unmaking of Indonesia's National Integrated Pest Management Program." *Agroecology and Sustainable Food Systems* 38 (1): 3–24. <https://doi.org/10.1080/21683565.2013.825828>.
- Tönisson, Liina, Yvonne Kunz, Simonas Kecorius, Leizel Madueño, Evelyn Gayle Tamayo, Dang Marviluz Casanova, Qi Zhao et al. 2020. "From Transfer to Knowledge Co-Production: A Transdisciplinary Research Approach to Reduce Black Carbon Emissions in Metro Manila, Philippines." *Sustainability* 12 (23): 10043. <https://doi.org/10.3390/su122310043>.
- Tuck, Eve, and K. Wayne Yang. 2012. "Decolonization Is Not a Metaphor." *Decolonization: Indigeneity, Education & Society* 1 (1): 1–40.
- Utomo, Gregorius. 2005. "Kekuatan Dan Kelemahan Dunia Pertanian Dalam Konteks Tata Ekonomi Global, Kerusakan Lingkungan Hidup, Dan Tata Pembangunan Pertanian Dan Pedesaan Lestari." In *Membangun Karakter Petani Organik Sukses Dalam Era Globalisasi*, edited by Y. W. Winangun, 17–31. Yogyakarta: Kanisius.
- Vilsmaier, U. 2021. "Transdisziplinarität." In *Transdisziplinäre Didaktik*, edited by T. Schmohl and T. Philipp, 333–346. Bielefeld: Transcript.
- West, Simon, Lorrae van Kerkhoff, and Hendrik Wagenaar. 2019. "Beyond "Linking Knowledge and Action": Towards a Practice-Based Approach to Transdisciplinary Sustainability Interventions." *Policy Studies* 40 (5): 534–555. <https://doi.org/10.1080/01442872.2019.1618810>.
- Widiyanto, Dodi. 2019. The third wave of Indonesia's food markets. Practices at small community markets in Yogyakarta. *Austrian Journal of South-East Asian Studies* 12: 49–67. <https://doi.org/10.14764/10.ASEAS-0013>.

- Willett, Walter, Johan Rockström, Brent Loken, Marco Springmann, Tim Lang, Sonja Vermeulen, Tara Garnett et al. 2019. "Food in the Anthropocene: The EAT–Lancet Commission on Healthy Diets from Sustainable Food Systems." *The Lancet* 393 (10170): 447–492.
[https://doi.org/10.1016/S0140-6736\(18\)31788-4](https://doi.org/10.1016/S0140-6736(18)31788-4).
- Williams, Raymond. 1977. *Marxism and Literature*. Marxist introductions. Oxford: Oxford University Press.
- Winarto, Yunita T. 1995. "State Intervention and Farmer Creativity: Integrated Pest Management Among Rice Farmers in Subang, West Java." *Agriculture and Human Values* 12 (4): 47–57.
<https://doi.org/10.1007/BF02218566>.
- Winarto, Yunita T. 2004. *Seeds of Knowledge: The Beginning of Integrated Pest Management in Java*. New Haven Connecticut: Yale University Southeast Asia Studies.
- Winickoff, David E., and Douglas M. Bushey. 2010. "Science and Power in Global Food Regulation: The Rise of the Codex Alimentarius." *Science, Technology, & Human Values* 35 (3): 356–381.
<https://doi.org/10.1177/0162243909334242>.
- Zocchi, Benedetta. 2021. "Be Brave but Be Smart—Can PhD Researchers Be Epistemically Disobedient?" *Decolonial Subversions II*.

Part II. Publications

In the following I will present my three publications. All publications have been reviewed in a double-blind peer review process. The publications consist of one single authored journal article, one co-authored journal article, and one co-authored book chapter. All publications, but one, have been published. Main arguments of the articles have been presented at various conferences and colloquia as indicated.

1. Laksana, Dimas Dwi; Padmanabhan, Martina (2021) Strategic engagement in institutions of organic farming in Indonesia. In *Transitioning to Sustainable Life on Land*. Edited by Volker Beckmann. Switzerland: MDPI. <https://doi.org/10.3390/books978-3-03897-879-4>

Dimas D. Laksana is the main and corresponding author.

A similar version has been presented:

Strategic engagement in organic farming institutions in Indonesia. Presented at the IndOrganic Workshop Series „Organic visions – policy recommendations for organic farming on Java“, IPB University, Bogor , Indonesia, 17 February 2020.

Institutional landscape of organic farming in Indonesia: network and missing links. Presented at the NiÖ (New Institutional Economics) workshop, University of Kassel, Germany, 14 – 15 February 2019.

Chapter 1. Strategic Engagement in Institutions of Organic Farming in Indonesia

Dimas D. Laksmana and Martina Padmanabhan

Abstract: Indonesia was one of the then authoritarian states that spearheaded and thoroughly institutionalized the green revolution. The emergence of organic farming (OF), proposed as a strategy for environmental conservation in Indonesia, is embedded in this history. This article uses social network analysis (SNA) to investigate institutional aspects of OF in Indonesia, focusing on the dynamic interactions amongst the actors that drive its development. The Net-Map method was applied as a tool to explore the tensions, areas of cooperation, and potential spaces for resolution that are constructed by OF actors, with the active engagement of the actors themselves. Based on two indices of network centrality—betweenness centrality and degree of centrality—three distinct groups of actors emerged, characterized by different modes of interaction with government actors. Disengaged actors are not linked to any government actors in sustaining their movement; partially engaged actors strategically adapt to government OF regulations while maintaining their commitment to the foundational principles of the OF movement; fully engaged actors pursue OF wholly within the framework of government regulations. Our analysis suggests different notions of sustainability are enacted by these actors. In addition, the current OF institutions highlight the contradiction between centralized governance structures in the agricultural sector and the government's stance that OF should prioritize the use of local resources and knowledge. However, spaces exist for negotiation between the civil society and government, which could lead to the formulation of more coherent OF policies that can accommodate a diversity of goals, strategies, and views on the sustainability of OF.

1. Introduction

This paper analyzes the institutional aspects of organic farming (OF) in Indonesia, focusing on the dynamic interactions among stakeholders in OF social networks and their engagement with OF government initiatives by using the Net-Map method based on social network analysis (SNA). OF has been promoted by the state as a strategy towards nature conservation and environmental protection. Following the global consensus on the need to transform the current agricultural systems to achieve some Sustainable Development Goals (SDGs), in particular, SDG 15, OF is considered as a promising model of sustainable agriculture (Willett et al. 2019). Therefore, this paper specifically questions how 'sustainable' Indonesian OF is from an institutional perspective. Analysis on sustainability and sustainable development, which are considered as two distinct concepts, should address the specificity of these concepts which are connected to the actors who define them and the subject of the enquiry (Nightingale et al. 2019a). Therefore, following this approach, we analytically show the

diversity of views on OF not in order to resolve these differences, but rather to bring these differences to the foreground and to illustrate the various ways people act upon these tensions. We also focus on the ways in which different notions of sustainable agriculture are negotiated through different strategies employed by OF actors. Specifically, we examine how, and to what extent, the development of OF has been supported and/or undermined by the social networks of civil society, government, and the private sector.

Previous studies on SNA and environmental farming practices among cocoa and coffee farmers in Indonesia point out the lack of multi-scale analysis that links local and global social networks (Matous 2015). However, as argued by Neilson and Shonk (2014), a 'value chain approach' to draw linkages between small-holder farmers with global players tends to miss the complexity of micro-level interactions between different stakeholders. With a different take, our paper illustrates the importance of combining analysis on the governance and policies of OF at the national level with the social networks of stakeholders at the local level in understanding the implementation of OF. Therefore, this paper addresses the limited study on OF policies and dynamics between actors in Indonesia (David and Ardiansyah 2016). In addition, the use of Net-Map provides a greater involvement of study participants to interpret the networks they constructed, a feature which reveals insights on their positionality with respect to other actors in the networks. Three research questions were formulated to address the points above:

- (1) Which actors influence the institutions of OF in Indonesia?
- (2) How do these actors interact with one another?
- (3) How do institutional aspects of OF affect the 'sustainability' of OF development?

The paper presents the results of a participatory workshop in Yogyakarta, Indonesia, in 2017 where OF practitioners used Net-Map (Schiffer 2007) to construct the social networks of OF in Indonesia. This research was undertaken as part of the transdisciplinary research project 'IndORGANIC', which explores the environmental, economic, and social potential of OF in Indonesia (IndORGANIC n.d.).

This paper is structured as follows. First, we describe the historical development of conventional farming and OF in Indonesia, with particular emphasis on the interactions between government and civil society. This section identifies the principal OF actors and provides an overview of relevant policies that frame sustainability issues in farming. Second, we review the literature on the application of institutional analysis and SNA for the study of OF in various contexts. Third, we describe how the Net-Map method was used in a participatory workshop to elicit the views of OF practitioners on the current state of OF in Indonesia. Fourth, we analyze the SNA data in the social networks produced by participants in the workshop, and the content of audio recordings made during the workshop. Our interpretation of the data leads us to elaborate different notions of 'sustainability' in OF and to propose three different categories of OF actors, grouped according to their degree of engagement with the government. In the final section, we identify a possible space for negotiation within OF institutions where government and different actors could collaborate in

formulating a more coherent policy for OF development. For future research, we identify a need for further investigation on the potential links between OF development and decentralization.

2. Study Area

This section specifies historical development of conventional farming and OF in Indonesia, specifically in Java. In addition, it links the government's paradigms and the governance structure in agriculture, which provide insights on the characteristics of the interactions between the government and broader civil society.

2.1. *The Historical Development of Conventional Farming in Indonesia*

The productivist paradigm, farmers' dependency on the government, and the top-down transfer of knowledge and agricultural inputs are aspects of governance that still persist in the current government's approach to OF. Following the foundation of independent Indonesia in 1945, the government prioritized the increase of agricultural production and food price stability — of rice in particular — in order to achieve national food security (Arifin 2008). These goals were achieved through agriculture policies inspired by a productivist paradigm, whose key components were the intensification and industrialization of agriculture (*ibid.*). Implementation of these policies involved the creation of top-down bureaucratic institutions that controlled the distribution of agricultural production, managed input subsidies, and claimed to have a monopoly of knowledge on agriculture (Winarto 1995; Sawit and Manwan 1991). In 1960s, as part of the green revolution, the government promoted the use of petroleum-based agricultural inputs and high-yield rice varieties (HYV) in Indonesia. The implementation of these policies in Indonesia is examined in numerous studies, including many that criticize their (intended and unintended) consequences (Fox 1991, 1993; Oka 1997, 2003; Winarto 2004; Winarto 2011; Sawit and Manwan 1991). While the intensification of agriculture enabled the goal of national food self-sufficiency to be achieved in the mid-1980s (Fox 1991 cited in Fox 1993), this success was short lived, undermined by massive outbreaks of the rice pest brown plant-hopper (BPH), which attacked paddy fields throughout the country (Winarto 2011; Fox 1993). Among contributing factors to this agricultural disaster were the bureaucratic inefficiency and centralist control that characterized government during the Soeharto era. All criticism of the government was suppressed, thus, stripping initiative and decision-making power from lower level government officials and civil society (Thorburn 2015). The change of the country's political system from autocracy to democracy during the Reform era in 1998 introduced decentralization, including in agriculture. This important feature of the country's agricultural policy is further elaborated in Section 6. However, overall, the introduction of modern agricultural management during the green revolution period forced farmers to be institutionally, technically, and financially dependent on the government (Winarto 2004, pp. 365–66). This historical background and institutional context influence the characteristics of the networks of OF actors in contemporary Indonesia, as described in Section 7.

2.2. *Civil Society and OF*

OF in Indonesia, particularly in Java, emerged as a social movement initiated and spread by non-governmental actors. The Bina Sarana Bakti¹ (BSB) foundation was established in 1983 in West Java to provide an alternative option for farmers locked into a centralized agricultural system that perpetuated their financial and institutional dependency on the state and continuous environmental degradation (David and Ardiansyah 2016). This organization is recognized as being the first to offer training in OF for farmers in Indonesia (Jahroh 2010). Another milestone in the OF movement occurred in 1990, when the Ganjuran Declaration, issued at the conclusion of an international seminar held in Central Java on soil degradation caused by agricultural intensification, called for sustainable agricultural development based on the principles of ecological, economic, cultural, and social sustainability (Utomo 2005). In subsequent years, the World Food Day Secretariat for Farmers and Fishermen (SPTN-HPS)², which was founded during the same seminar, continued to promote these principles and spread knowledge of sustainable agriculture.

More recently, numerous organizations and initiatives promoting OF at different scales have emerged in Indonesia. In Central Java, communities of organic market provide space for the exchange of knowledge and transactions of healthy and artisanal food, where 'self-certification' of the organic produce is accepted by customers based on trust (Widiyanto 2019). These are community-based grassroots movements initiated by individuals with common aspirations and interests. At a national level, the Indonesia Organic Alliance (AOI)³ is a long-established organization that has functioned since 2002 as an umbrella organization, connecting different actors involved in OF, and publishing statistics on OF in Indonesia (AOI 2018; AOI n.d.). OF is also supported by international development agencies, such as the international NGO, Rikolto Indonesia, which promotes sustainable agriculture in Indonesia by providing institutional and technical support to farmers (Rikolto n.d.).

2.3. *The Indonesian Government and OF*

Government's approach to the development of OF is characterized by productivist and market-oriented agendas, which are exemplified by the following programs and policies. The first government initiative to support the expansion of OF was the "Go Organic" program, launched in 2002, which aimed to transform Indonesia into one of the main producers and exporters of organic food products in the world by 2010 (Ditjen BPPHP 2001). This was supported by the creation of a national standard for OF, based on third-party certification, within the Indonesian National Standard (SNI) certification system (SNI No. 01-6729-2002) (BSN 2002). This SNI and subsequent updated versions of the standard provide guidelines for the regulatory agency OKPO (Competent Authority for Organic Food) and extension workers led by the Ministry

¹ Yayasan Bina Sarana Bakti.

² Sekretariat Petani dan Nelayan Hari Pangan Sedunia

³ Aliansi Organik Indonesia

of Agriculture (MoA) (BSN 2002; Ministry of Agriculture 2003). The main responsibilities of OKPO are to formulate regulatory policies for the monitoring and development of organic food systems, oversee the establishment of organic food certification bodies, and verify the competence of certification bodies and other entities that perform similar functions (Ministry of Agriculture 2003). All the above standards and regulations cover not only agricultural production but also the activities of other private sector organizations involved in the OF sector, such as certification bodies, suppliers, and retailers (BSN 2002, 2016). While the goal of the “Go Organic” program was not achieved, given that the proportion of organic land is less than 1% of the total agricultural land in 2015 (AOI 2018)⁴, the regulatory and institutional structure it gave rise to remains in place. In 2016, the government of President Jokowi launched the “1000 Organic Villages” program with the aim of creating 1000 organic-certified villages throughout the country (Plantation General Directorate of the Ministry of Agriculture 2016). This program was part of the strategy to achieve food sovereignty within the government’s wider development agenda (KPPN/BPPN 2014). Despite the government’s acknowledgement of the importance of local knowledge and resources, this program still emphasizes the transfer of knowledge, agricultural inputs, and financial support from the MoA to organic farmers (Plantation General Directorate of the Ministry of Agriculture 2016). The top-down structure of the program is apparent from Figure 1.

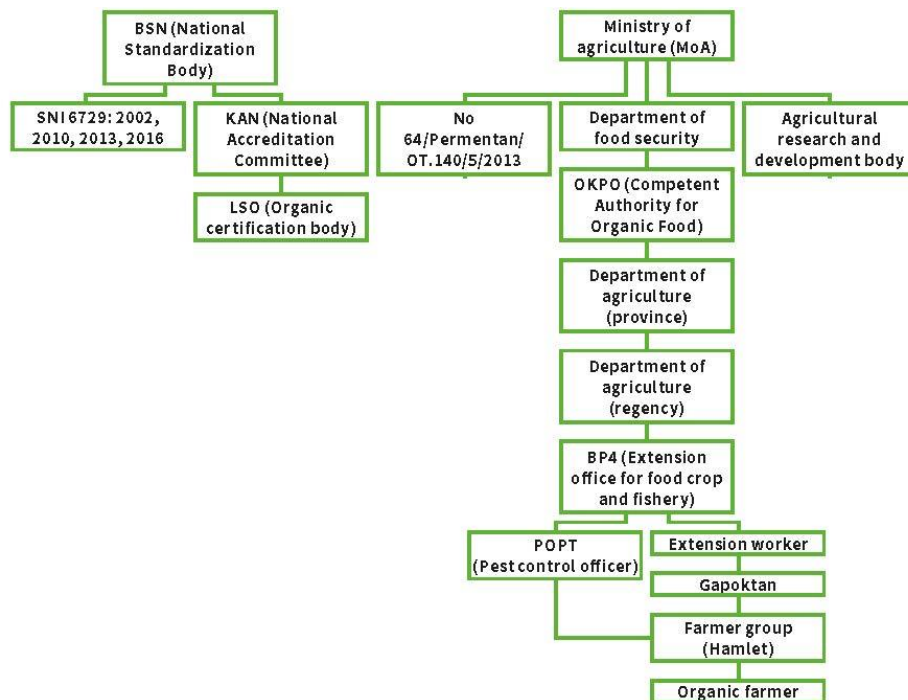


Figure 1. Governance of organic farming (OF) in food crops production in Indonesia (Laksmana and Padmanabhan 2019 based on BSN 2016; Ministry of Agriculture 2003).

⁴ According to these statistics, organic land includes agricultural land of four different groups: the members of AOI who practice OF without having organic certificate, organic-certified farmers, organic farmers who are in the process of being certified, and organic farmers who are certified by PAMOR which is the Participatory Guarantee System (PGS) in Indonesia.

3. Theoretical Framework

3.1. *Institutional Theory*

In this paper, an institution is understood as sets of prescriptions, such as rules and norms, which shape structured and repetitive human interactions. While social interactions are regulated by these rules, the participants and non-participants of these interactions have the possibility to change them (Ostrom 2005, p. 3). Rules in this context are understood in regulatory terms, as something created by an authority (not necessarily conflated with government) that permit or prohibit certain actions (Black 1962, p. 115 cited in Ostrom 2005, p. 17). Conducting institutional analysis is challenging because of the diversity of situations in which preferences are expressed and choices are made, as well as the implicit nature of many of the rules governing their outcomes (Ostrom 2005, pp. 4–5). It is important to select an appropriate level of analysis that gives sufficient information on the specific situation of interest, but at the same time, provides information on outcomes that is generalizable across a range of cases (Ostrom 2005, pp. 5–6). To address these challenges, we follow the theoretical framework by Michelsen et al. (2001) which identifies three levels of the institutional environment that constrain decision-making by organic farmers: macro (rules governing civil society, market, and the state), meso (rules governing farming community, agricultural policy, and food market), and micro (rules governing interaction among actors) level. We analyze Indonesian OF institutions at the micro- and meso-level, with a particular focus on the interactions among actors (individuals and organizations) and the governance of OF. Organizations are associations of individuals who share and participate in the same meaning systems or similar symbolic processes and are subject to common regulatory processes (Scott 1994 cited in Lynggaard 2001). We apply SNA for micro-level analysis to explore the emic perspectives of actors, specifically their perceptions of OF, expectations, and positionality in the networks. Meso-level analysis was conducted by reviewing the literature on the institutions of OF and publications of the relevant governmental agencies. By synthesizing these two levels of analysis, we demonstrate that OF institutions in Indonesia are influenced by the characteristics of the social networks of OF actors that are embedded within the governance of OF. In addition, from the current OF institutions, we draw upon different notions of 'sustainability' enacted by the involved actors. The following sections present the results of the meso-level analysis.

3.2. *The Institutions of OF*

Numerous studies on OF analyze institutions as determining factors in the development of OF, which is measured variously in terms of the number of organic farmers and farms, market size, consumer demand, and the existence of regulations governing OF (Michelsen 2001b; Lynggaard 2001; Bellon and de Abreu 2006; Sanders 2006; Slavova et al. 2017). Studies characterize OF as fundamentally distinct from conventional farming in terms of values and relations among actors (Michelsen 2001a,

2001b). It is suggested that these distinctions arise as a consequence of the origins of OF, particularly in Europe, in social movements that were critical of the environmental and social impacts of conventional farming (Conford 2001; Tomlinson 2008). Historically, the sustainability of OF is variously rooted in environmental protection, health and food safety, and equity issues related to control over means of production in agriculture (Tovey 1997; Tomlinson 2008; Lockie et al. 2006). Tensions arise when the self-regulatory aspect of OF is undermined by the creation of organic standards, thus, diminishing the importance of individual actors in the OF movement and strengthening the position of government agencies (Michelsen 2001a). Michelsen et al. (2001) propose three types of institutional relationships that may exist between OF and the institutions that govern conventional agriculture: pure cooperation, pure competition, and creative conflict. OF institutions in different countries vary, reflecting their specific national contexts. The OF principles coined by the International Federation of Organic Agriculture Movements (IFOAM) are commonly referred to compare the principles of the global OF movement with national-level organic regulations (Michelsen 2001b; Sanders 2006). However, countries that develop their organic sectors for the export market face the challenge of harmonizing organic regulations with international standards (Mutersbaugh 2004). Harmonization not only poses challenges for the traders and activists involved in the OF movement, but it can also have wider transformational effects, by redefining the meanings of “things”, “people”, and “social relations” that make up property regimes (Verdery and Humphrey 2004 cited in Aistara 2018, p. 138).

3.3. The Institutionalization Process in OF

The literature on the institutionalization of OF addresses the challenges involved in developing a regulatory framework for OF that is compatible with international standards. Institutionalization is considered in this study as a process in which OF is transformed from a social movement that positions itself as distinct from conventional farming into a branch of agriculture that is embedded in conventional farming. This happens, for instance, through alignment with institutional support structures that enable conventional farming to persist or the codification of organic principles into sets of legally recognized standards and definitions (Buck et al. 1997; Tomlinson 2008). Early studies of the institutionalization of OF were mainly concerned with the reconceptualization of OF within the framework of state agricultural policy (Lockie et al. 2006; Tovey 1997), while later studies focus more on the codification of the principles of the OF movement into national or supranational organic standards and how this process has affected the goals of the OF movement (Michelsen 2001a; Lynggaard 2001). The institutionalization process entails a process of institutional change within OF that can be manifested by the formulation and adherence to new sets of rules and regulations (Lynggaard 2001). In addition, the emergence of new organizations or mergers of existing organizations can be treated as an approximation to institutional change (ibid.). For example, Kaltoft (1999) argues that the creation of national certification and financial subsidies in Denmark led to the dilution of value-laden principles that had underpinned the development of OF as a social movement,

and their reduction in OF to a set of technical and quantitative definitions and rules. However, Edwards (2013) argues that the formulation of national standards for OF is part of an institutionalization process that does not necessarily undermine the values of OF as a social movement in Indonesia. Within the OF movement, actors have devised different strategies for adapting to regulatory change without abandoning the values that underpin OF as a social movement (*ibid.*). Therefore, the introduction of OF regulations does not predetermine subsequent trajectories in the institutionalization of OF. However, regulations do have consequences, as discussed in Sections 6 and 7.

3.4. Institutional Analysis and SNA

SNA is an analysis based on the dyadic relationships between actors in a network. Numerous studies in OF apply SNA in order to examine the network characteristics associated with phenomena such as the commercialization of OF, the participation of individuals in policy-making, adoption of organic practices, the process of knowledge and information production and circulation among OF actors, and OF policy development (Thiers 2002; Mutersbaugh 2004; Bellon and de Abreu 2006; Tomlinson 2010; Wollni and Andersson 2014; Poerting 2015; Slavova et al. 2017). In our research, we used Data Muse to calculate the values for two indices, degree of centrality and betweenness centrality, in order to analyze the relationships and different kinds of flow among the network of OF actors. The actors with high degree of centrality have more links with other actors in the network, while actors with high values of betweenness centrality facilitate flows in the network (Krebs 2004). From these two indices, we can derive a general understanding on structural determinants of influence, the roles of actors, and how the positions of actors in the network relate to their influence (Schiffer and Hauck 2010).

In the abovementioned studies, SNA is usually based on information obtained in semi-structured interviews and surveys where interviewees describe their interactions with other individuals, while the interpretation of the networks is predominantly conducted by analysts. By contrast, in our study, Net-Map was employed to visualize the networks of OF actors and, as further explained in Section 5, this approach enabled us to explore the actors' emic perceptions of the networks that structure their interactions and their own positionalities within these networks. In Section 7, we highlight the influence of the historical coevolution of civil society and government in the area of conventional farming on current OF institutions. Our analysis identifies and characterizes the links among OF actors and shows how these are related to their past positionalities, particularly in relation to the government, and their visions of the sustainability and future development of OF.

4. Research Methodology and Limitations

This section describes the study participants, Net-Map method, and our reflection on the research methodology's limitation. We implemented Net-Map in a participatory workshop held in Yogyakarta in 2017. Out of the 46 people we invited,

28 participated in the workshop. They were mainly from West and Central Java, which are both the primary agricultural production areas in Indonesia and areas which have played an essential role in the historical development of OF, as mentioned in Section 3. The participants came from diverse backgrounds (Table 1). They were identified based on academic papers and grey literature on Indonesian OF and an explorative study conducted in the two study areas before the workshop. Besides, they were selected based on their various forms of involvement in OF. For example, we invited extension workers and staff of the department of agriculture as they monitor and implement OF programs. We also invited NGOs and activists who conduct OF training, thus, are involved in spreading OF knowledge and values. To understand the trade and marketing aspect of OF, we invited organic traders. These categories are based on self-identification.

Table 1. The participants of the workshop from Central and West Java.

Origin Affiliation	Academic	Government official	Activist	Organic farmer	NGO	Organic traders	Total
Central Java	3	2	3	2	3	2	15
West Java	7	2		1	2	1	13

Net-Map is an interview-based mapping tool for visualizing networks that can help people understand, discuss, and improve situations in which different actors can influence outcomes (Schiffer 2007). This method is based on SNA and was developed to address some of the shortcomings of SNA data collection, particularly the interviewees' lack of learning opportunities (Schiffer and Hauck 2010). The Net-Map method encourages participants in the process to discuss and interpret the networks among themselves (ibid.). This method is suitable for application in a variety of intercultural settings and different purposes because of the use of low-tech and low-cost materials and the discussion on the properties of the networks in concrete terms (Birner et al. 2010; Schiffer and Hauck 2010; Campbell et al. 2013; Schöley and Padmanabhan 2016). However, the limitations of the method are the numbers of links can become unmanageably large when working with a large or not very well-defined group of actors and the influence of more powerful actors is a potential source of bias as actors perceived as non-influential might be excluded from expressing their views (Schiffer and Hauck 2010). To overcome the power dynamics among workshop participants, we assigned two facilitators, who can interfere when some participants dominated the discussion, for each group.

The procedure of the workshop is as follows. First, two facilitators familiar with the method divided the participants into two equally sized groups, each led by. Each group worked on a large table around which they moved freely. Second, we asked participants, "Who are the important players that can influence organic farming?". We asked the participants to list influential actors and assign them, based on their interpretation, to one of four categories of actors: Non-Governmental Organization (NGO), private sector, government, and community. The names of actors were written on colored cards and placed on the tables. The colors of the cards indicate different

categories. Third, we explained to the participants how to describe the links and the direction of the links between actors. We specified four types of links: information or knowledge, marketing channel, agricultural inputs (fertilizer, pesticide, and financial support), and seeds or animals. Participants drew arrows that indicated the links and direction of the links using markers of different colors to connect pairs of actors. Fourth, participants built ‘influence towers’ by placing plastic cups on the card representing each actor. The height of the tower corresponds to the actor’s degree of influence in the networks. Due to time constraints and mental fatigue among the participants, we did not implement the last step of the Net-Map method, which deals with strategizing. In the strategizing step, interviewees are asked to provide actors’ perceived goals, which can assist them in deciding on potential collaborations or conflicts that might arise from interacting with particular actors. Finally, Net-Map visualizations of Figure 2 – 4 were created using Data Muse, open-source software for network visualization and network data analysis⁵. We inputted data for network visualization based on the photographs of the two networks produced at the workshop. The degree of centrality is calculated by Data Muse according to the number of links of an actor divided by the number of links of an actor with the greatest number of links in the network (Freeman 1978). The maximum value is 1, which indicates the greatest number of links an actor has, and the minimum value is 0, which stipulates no link an actor has in a network. Betweenness centrality is calculated according to the sum of the fraction of all-pairs’ shortest paths that pass through a node. The betweenness centrality of a node v , for example, follows this formula:

$$C_B(v) = \sum_{s,t \in V} \frac{\sigma(s,t|v)}{\sigma(s,t)}$$

where V is the set of nodes, $\sigma(s,t)$ is the number of shortest (s,t) -paths, and $\sigma(s,t|v)$ is the number of those paths passing through node v (Brandes 2008). The maximum value is 1, and the minimum value is 0. An actor with the highest degree of betweenness is on the closest links between other actors, so that the actor can control flows in a network. The visualized social networks were supplemented with qualitative analysis of audio recording of the group discussions and information obtained from organizations’ websites, booklets, publications, and policy documents.

The Net-Map method assisted us discover nuanced interpretations of the social networks constructed by the workshop participants, which would otherwise not be revealed by the survey method. For instance, the local organic market community is connected to other actors mostly through knowledge/information transfer, since the term market is not limited to a place for selling organic products but also for exchange of ideas, as one participant explained (Section 5). Despite this advantage, there were some problems and limitations in implementing the research method, out of which are related to the points elaborated by Schiffer and Hauck (2010). First, the way the workshop was organized was a potential source of bias in the results. We selected and

⁵ <https://www.datamuse.io/network/login.php#>

invited the workshop participants based on our judgment of their knowledge of OF and influence in OF. This selection may have favored certain forms of knowledge or opinions and excluded others. Moreover, the two groups were also formed based on self-selection by participants. To the extent that group formation was based on familiarity among the participants, this could have influenced the discussions' dynamic. In any case, it should be borne in mind that the workshop results provide a snapshot of interactions among a selected group of actors at a particular point in time. As elaborated in Section 6, OF situation in Indonesia is not static, and both actors and the institutional framework are changing and evolving.

Some possibly more fundamental limitations of the method were identified by the participants, who did not merely follow the Net-Map instructions but actively engaged in critical discussions and meaning-making as we proceeded. In particular, crucial discussions took place on the notion of "influence", which was considered ambiguous by the participants. They queried whether it was possible to assign values to the actors' influence based on their actions in the network and pointed out that "influence" was a shorthand term for a set of sometimes incomparable characteristics. For example, how could one compare the influence of organic farmers with that of the MoA? Besides, they maintained that a distinction should be made between "positive" and "negative" influence; however, an actor's judgment in this regard would depend on their positionality concerning the presence of other actors in the network. In other words, both the quantity and the quality of influence reflect the normative stances of actors. For instance, extension workers are influential as they provide technical knowledge and information on the government's programs for farmers. However, they may not be equally influential (quantity of influence) across different actors in the network. Moreover, different actors have different opinions about the standard and usefulness (quality of influence) of the advice they provide. This interpretation implies that, from individual actors' perspective, working closely with "influential" actors does not always help them achieve their goals. As mentioned by Schiffer and Hauck (2010), this issue arose from working with a not so well-defined group of participants, where each individual can have conflicting goals.

However, these critical discussions among participants illustrate one of the strengths of Net-Map. They show the advantages of encouraging participants' active engagement in critically reflecting on and analyzing their positionality concerning other stakeholders in the networks, instead of leaving this analysis to the researchers alone.

5. Results—OF Actors and Links

Based on the two social networks produced during the workshop, we propose three categories of OF actors based on their different degree of engagement with the government, their positionalities in the network, and the interactions among them. We call these disengaged, partially engaged, and fully engaged groups.

5.1. The Disengaged Group

The disengaged group is characterized by the rejection of interaction with the government. This group is dominated by activists who were inspired by the early pioneers in Indonesian OF. For members of this group, the introduction of organic certification as specified by SNI 01-6729-2002 in 2002 was a decisive moment that altered the aims and the actions of OF as a social movement. In the discussions at the workshop, they expressed the view that the prohibitive cost of organic certificates perpetuates the injustice that prevails in conventional agriculture. This view is aligned with another study that argues for the democratization of third-party certification (Konefal and Hatanaka 2011). As mentioned in Section 1, OF was promoted by BSB and SPTN-HPS as a means of achieving both greater independence of farmers and environmental sustainability in farming. More recently, the introduction of OF certification, envisaged as a way to protect consumers, has raised awareness within the OF movement of the need to take consumers into account, a viewpoint supported by Joko⁶, an organic activist, in the discussions at the workshop. However, one initial aim of the OF movement, that to a certain extent is still pursued by activists today, was to create a community. Community in this sense can be understood as a group of people with shared causes or interests, where the roles of those who identify with this group can be quite flexible and interchangeable. The actors in the disengaged group, including Joko, are (also) concerned that the development OF that seems to be following the blueprint of conventional farming towards greater engagement with agri-business:

So I think it is important to be aware of the State's interpretation of OF, when we talk about Go Organic 2010 program. In the end the aim [of the government] is to develop organic fertilizer industry. (Interview, December 9, 2017)

According to this group, at first, the OF movement was primarily supported by NGOs, whereas it is now mainly driven by market demand. Actors in this group have to adjust to this recent development. They have to either submit to the demands of the market, setting their sights on organic certification and carving out a niche in the market, or to create an alternative system that focuses on the creation of community. This group is exemplified by the local organic market communities (*komunitas pasar organik lokal*), which are connected to private sector organizations (traders and distributors of organic products), NGOs, and other communities in the network. The term 'local organic market community' reflects the dual purpose of these organizations. As Joko, who was one of the initiators of the local organic market community in Central Java, explains:

Actually this [local organic market community] can be considered as a community. It's called a market because it's a place where they [people] meet. I try to define them [local organic market community] so that there is an

⁶ All names in this paper are pseudonyms

encounter [where people meet to exchange ideas]. (Interview, December 9, 2017)

Figure 2 shows the network connections of the organic market community in Central Java. This actor not only offers a physical space where transactions can take place, for example, as a place where non-corporate farmers (petani non-korporasi) can sell their produce, but also serves as a networking platform for other actors with shared concerns about OF (Figure 2). For instance, this actor shares knowledge on nutrition and healthy lifestyle to local consumers, transmits knowledge about agricultural technology to private sector actors, and participates in OF-related research with NGO actors.

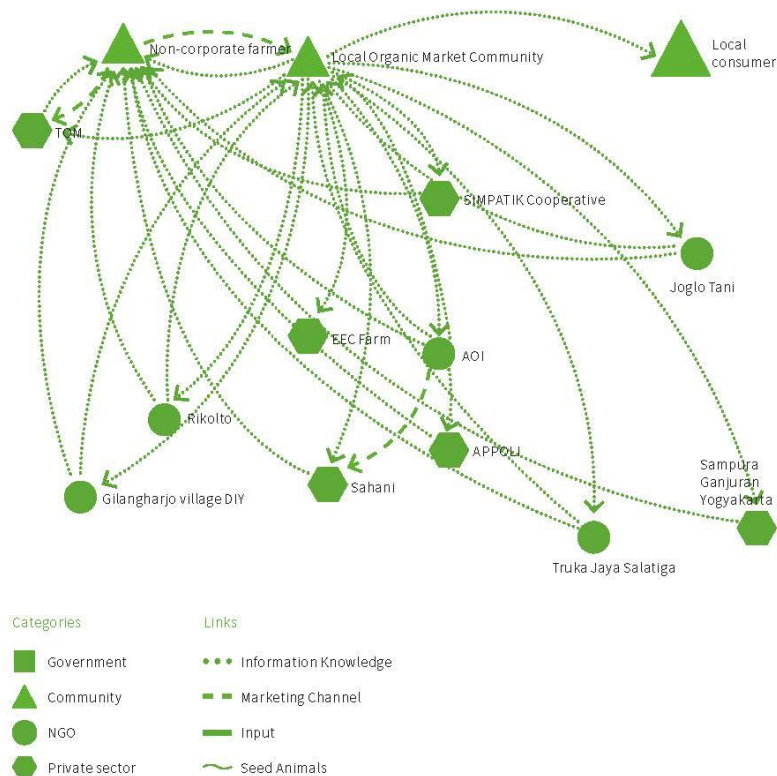


Figure 2. The network of the local organic market community in Central Java. The size of the sphere corresponds to the height of the influence tower (see the text for further explanation). Source: original data by authors.

As shown in Figure 2, this actor has no links with government actors, but numerous links to NGO actors as well as with private sector organizations (degree of centrality score 0.55). In most cases, the links consist of exchanges of information. Apart from providing a market for goods produced by non-corporate farmers, there are no physical exchanges (e.g., of seeds or other inputs) in this network. Another notable feature of the network is the low degree of betweenness centrality (with a score of 0.01); thus, this actor does not facilitate the flow of information between other, otherwise unconnected actors. According to the workshop participants, in this particular network, local consumers have the most influence and non-corporate farmers together with the local organic market community have the least.

5.2. The Partially Engaged Group

The actors who belong to this group are characterized by their strategic adaptation to the government regulations, while retaining certain aspects of OF as a social movement, especially regarding the issue of farmers' independence from the current system of conventional agriculture. They interact with government actors, for example, by accepting government support, as long as this helps them to advance their goals. However, participants at the workshop commented that they are wary of accepting financial support, as this tends to provoke conflict, whereas technological support can be useful. One member of this group, SPTN-HPS, one of the early pioneers of OF in Java (see Section 3), has the degree of centrality score 1.0, with links to all four categories of actors (Figure 3). The majority of links are for knowledge and information transfer, but SPTN-HPS is also connected to other actors through the exchange of agricultural and/or financial inputs and seeds. In these relationships, SPTN-HPS tends to be the provider of information and knowledge to other actors, including other NGOs working on OF-related issues, retailers, village officials, and communities. In addition, SPTN-HPS distributes or sells seeds and animals to both community-based seed banks and distributors of organic products. SPTN-HPS also works directly with village officials to promote the benefits and importance of OF for village development. It, thus, collaborates with government at the level of the administrative units that have direct interactions with farmers as farmlands are predominantly located in rural Indonesia. As a result of decentralization, village governors control significant resources (the so-called village funds) and can influence the direction of agricultural development of the areas they represent. Among the NGOs and communities in Central Java with links to SPTN-HPS are the Young Farmers School (Seki Muda) and Mursyidul Hadi Islamic boarding school. These two platforms are used by some farmer activists, for example, those who are part of the Indonesian Peasant Union (SPI), to promote OF as part of a strategy to develop young activists and as the starting point for building a grassroots agrarian movement. Totok, who is a former extension worker and is a representative of SPI in Central Java, further explains:

The Village government is more important [than provincial government], especially after the Village Law was passed, they can use village funds to empower [the villagers]. I have observed several places where OF was developed together with the village governments, because they can take decisions on their own. In this situation the position of village government is more important than the district government. (Interview, December 9, 2017)

The above statement is illustrated in Figure 3 by the fact that participants in the workshop considered that the village governor had the highest degree of influence in this network. SPTN-HPS has the highest degree of betweenness centrality (score 0.36) in the network, which indicates its important role in the network as a facilitator of information flows between actors that otherwise would not be connected. Due to their influence and centrality in the network, partially engaged actors have the opportunity to disseminate the holistic principles of the OF movement while simultaneously promoting alternative OF systems that are distinct from the government's approach to OF. Therefore, they are able to operate on two fronts, cooperating with government to

promote OF and simultaneously creating an alternative system where they disagree with the government's actions. In this sense, they can influence the government's approach by exchanging information with government actors who share their interest in promoting OF.

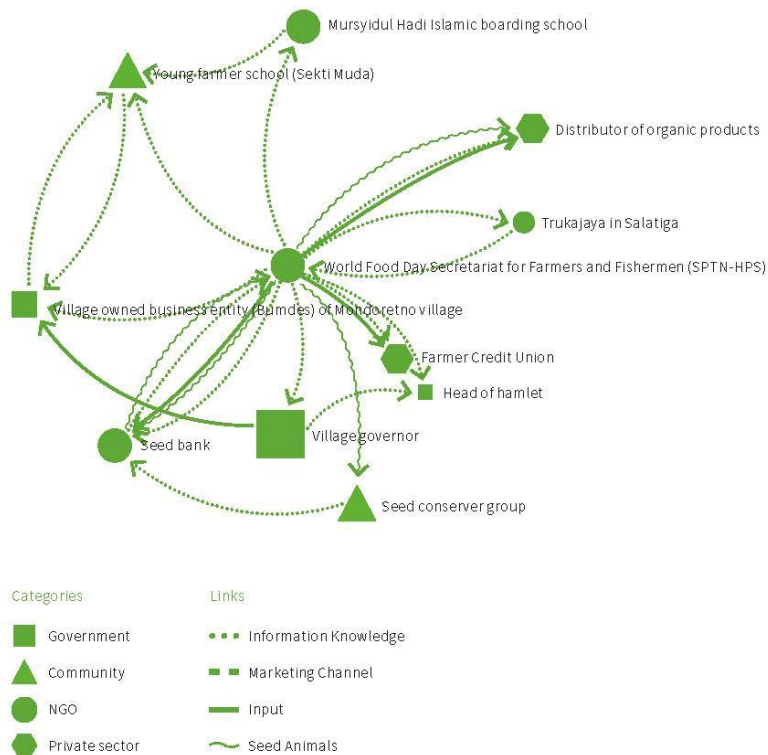


Figure 3. The network of the World Food Day Secretariat for Farmers and Fishermen (SPTN-HPS). The size of the sphere corresponds to the height of the influence tower. Source: original data by authors.

5.3. The Fully Engaged Group

In this group, OF actors are characterized by their adaption to the current OF regulations. They generally have links with government agencies, other communities, and actors in the private sector, but no links with NGO actors. They adhere to the status quo and, to the extent that they are successful, provide a justification for the government approach to OF that focuses on building consumer–producer relationships. The creation of a legal framework for OF, with definitions and standards, has allowed actors who do not necessarily identify themselves as belonging to the organic movement to partake in the OF system. In this context, the OF system can be understood as a mechanism for the trade of organic products as premium agricultural products, which protects both consumers and producers from misinformation or fraud through third-party certification as set out in SNI 2016 (BSN 2016). One example of an actor in this group is the farmers' association Gapoktan (Gabungan Kelompok Tani). This is a federation of farmer groups in hamlets that operates at the village level (see Figure 1). In Indonesian agriculture, farmer groups are an official channel for the distribution and dissemination of agricultural subsidies and technical support. Therefore, only farmers who join farmer groups can access government support, though exceptions might exist.

Gapoktan maintains connections with government agencies and other government-sponsored groups with connections to agriculture. Government officials, for instance, public sector employees, often source organic products from farmers, either through formal channels as part of a policy or informally through personal contacts. In Figure 4, these links are observed in the form of inflows of knowledge and information from government actors, such as the regency-level department of agriculture and MoA extension workers. In addition, Gapoktan has a trading relation with the regency-level department of trade, which acts as a trading channel between farmers and customers. Totok, a former extension worker, explains how this works:

So usually farmer groups [in hamlets] focus more on the technical aspect on the field. Meanwhile, Gapoktan focuses more on administrative issues, for example in connecting them [farmers in farmer groups] with the government which is one administrative level above [hamlet]. (Interview, December 9, 2017)

In the network, Gapoktan is connected to other government-sponsored groups, such as Bumi Lestari which is a women's farmer group (KWT) and a farmers' group of water users (P3A) that is responsible for the construction of irrigation channels and drains in and around agricultural fields. These links take the form of exchange of information about government programs and/or distribution of agricultural inputs and financial support. Gapoktan has the second highest score for the degree of centrality (0.89) and a relatively equal number of outflow and inflow links, reflecting its influence in the OF network. It was perceived as influential in the network by the participants, though with a lower degree of influence than village governor. This is probably an indication of Gapoktan's dependence on support from government agencies, as mentioned above. However, Gapoktan's relatively low value of betweenness centrality (0.14) indicates that it does not play an important role as a bridge between actors which otherwise are not connected.

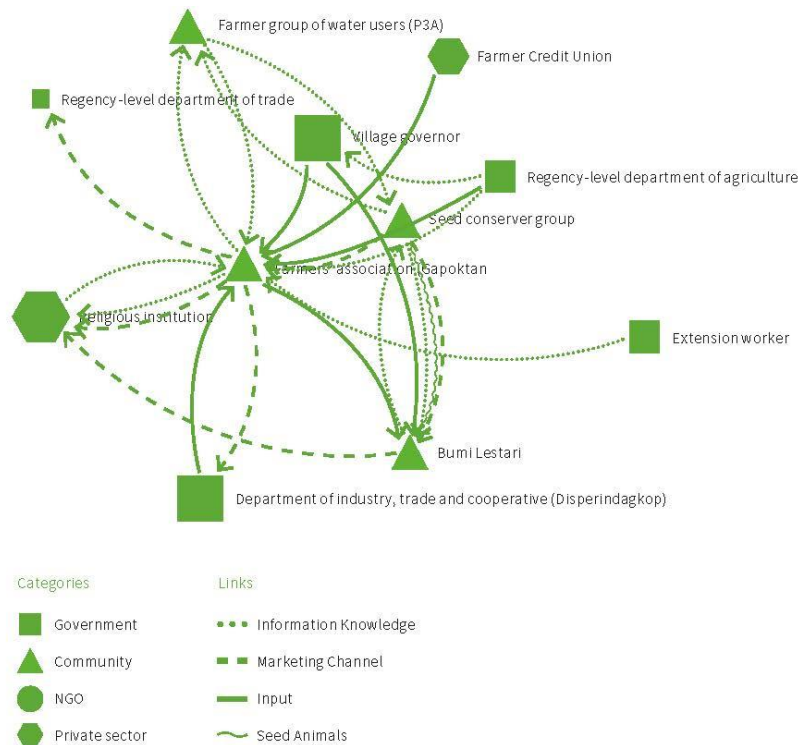


Figure 4. The network of the association of farmers group (Gapoktan). The size of the sphere corresponds to the height of influence tower. Source: original data by authors.

6. Discussion—OF Institutions in Indonesia and Future Implications

In this section, we argue that understanding the emergence of OF institutions, through an analysis of the characteristics of the social networks of OF actors and their relations with the historical development of conventional agriculture, can assist in understanding how the future development and sustainability of OF are perceived and constructed by the related actors. Understanding the interplay between OF as a state policy and as a social movement is crucial for projecting the future trajectory of OF (Michelsen 2001a; Lynggaard 2001).

As mentioned above, since the early 2000s, the MoA has introduced a number of regulations and programs that define, standardize, and set the agenda for Indonesian OF. The Indonesian Standard SNI 6729:2016 on organic farming systems states that one of the aims of OF is to create agriculture that is socially, ecologically, economically, and ethically sustainable (BSN 2016). In addition, organic farming is framed as a strategy for environmental conservation. This approach by the MoA seems to adhere to the OF principles set out by IFOAM and, in Indonesia, the Ganjuran Declaration. Simultaneously, the aim of this national standard to protect consumers and producers of organic products from misinformation (BSN 2016), in a sense, defines OF as a market relationship, distinguishing the different roles of consumers, producers and distributors. This market-based approach has transformed Indonesian OF, which is rooted in the social movements that operated at the grassroots level and emphasized community building. Moreover, closer scrutiny of this policy document reveals that the majority of the information it contains is related to technical aspects in OF, such as the requirement for barriers around organic farms, lists of permitted and prohibited

inputs, the conversion period from conventional to organic farming, and other technical measures (BSN 2002; BSN 2016). Therefore, the state has been developing OF following the narrative of sustainable development as ecological modernization, where the invention of environmentally benign technology in OF goes hand-in-hand with economic growth (Nightingale et al. 2019b). Despite the state's recognition of the importance of social, economic, and ethical aspects in OF, they receive much less attention.

Furthermore, the focus on national programs to promote OF recalls the productivist, top-down approach of policies for conventional agriculture, which leads to farmers' dependence on the state. For instance, the targets of the "1000 Organic Village" program are to be achieved through the top-down distribution of agricultural inputs, knowledge transfer, and financial and institutional support for organic certification (Plantation General Directorate of the Ministry of Agriculture 2016). This program views OF as part of the national food sovereignty agenda that leads to food security, an overarching strategic aim of agricultural policy in Indonesia (Neilson and Wright 2017; Schreer and Padmanabhan 2019). On the one hand, the state's orientation in developing OF is technically measurable, for example, through the number of certified organic farms, size of market share, and consumption and production of organic products. In principal, these indicators can be used to assess the sustainability of OF. On the other hand, the diversity of strategies, values, and goals upheld by various OF actors question the extent in which the state's approach contributes to the future sustainability of OF. Moreover, OF is still embedded within the governance of conventional farming (see Figure 1), whereby government agencies take dual roles in developing both organic and conventional farming. Contrary to the European case, where the EU as a supranational entity pushed for the formulation of national OF policies (Slavova et al. 2017), in Indonesia, OF policies emerged from the dominant role played by a national government that views conventional farming and OF as two systems that are not necessarily contradictory, but should be able to exist in parallel and operate side by side.

The need to respond to these inconsistencies in government policy has led to the emergence of three categories of actors within OF social networks. The disengaged group is characterized by its association with the organic movement and its critical attitude towards the government; members of this group have no links with any government actors, as shown in the example of the local organic market community. In particular, they criticize the dilution of OF principles through the focus on standardization and technical definitions, the realignment of OF from community building towards market relationships, and justice issues related to the industrialization of OF, for example, through mechanization and the focus on input substitution (Goodman et al. 1987). They believe that in all these respects, the government's approach to OF perpetuates the existing shortcomings of conventional agriculture. These limitations restrict farmers' initiatives when selecting which farming practices to adopt. They increase the dependency of organic farmers on the state and on policies adapted to the needs of industrialized agriculture—despite the fact that almost two-thirds of farmers in Indonesia are smallholders (Aji et al. 2019;

BPS 2018). Therefore, actors in this group consider sustainability in OF should constitute a justice dimension where means of production are not controlled by those who are not directly involved in farming, but rather more independence among farmers in deciding how and what to grow and where to sell. However, actors in the disengaged group do not express their criticisms by advocating for policy changes — as does the Soil Association in the UK, for example (Conford 2001). Instead, they adapt to the policy environment by engaging with retailers directly, while maintaining connections with the NGOs that pioneered OF in Indonesia as a way of upholding the foundational principles of the organic movement. The actors in this group operate in a close-knit network characterized by a large number of links with other actors and low values of betweenness centrality. It should be noted that, in the context of national regulations, which were created to facilitate the trade of organic products, these alternative community-based organic markets are, in principal, illegal (Aistara 2015). While at present, this remains largely a technicality, this legal issue might become a serious problem in the near future if the government increases the monitoring of trade in organic products, or if the definition of ‘organic’ is made even stricter.

The second group that we identify is the partially engaged group, which is connected both to the OF movement and the conventional agricultural sector, and strategically adapts to the ongoing changes in state policies by maintaining links with government actors. One example is SPTN-HPS, which is one of the organic pioneers in Central Java and was originally supported by the Catholic Church. In the social network, they still maintain this connection with religious institutions, with whom, they exchange information on the philosophy and technical aspects of OF. They also play a supporting role in government-sponsored OF projects, for instance, by offering advice and training to farmers and village governors. The role of SPTN-HPS in promoting OF in government projects might reflect its credibility among government actors, derived from its status as a pioneer of the organic movement. In the network, SPTN-HPS is a central actor given by its high degree of centrality and its links with all four categories of actors. Nevertheless, after their funding from Catholic social and development organizations ended in 2009, SPTN-HPS has been struggling to adapt to changes in OF, as the priorities of organic farmers have shifted, to a certain extent at least, from building a social movement to obtaining certification and markets for their products (Tamtomo, forthcoming). The challenge that SPTN-HPS has been facing, could be argued, is connected to the radical aspect of the OF movement that insists on the independence of OF practice from the state and market (Tovey 1997).

One issue on which SPTN-HPS and other members of the partially engaged group, for instance, Sekti Muda and Mursyidul Hadi Islamic boarding school, takes a firm stance is food sovereignty, particularly seed sovereignty, which is defined as farmers’ rights to access, reproduce, and save seeds (Kloppenburg 2010). There is insufficient clarity in OF regulations on the issue of what constitutes organic seeds (BSN 2016), while Law No.12/1992, the Plant Cultivation System in Indonesia, makes it illegal for farmers to use non-state-registered seeds (President of the Republic of Indonesia 1992). Thus, organic farmers are liable to be prosecuted for attempting to become more independent by storing and using their own seeds, even though, simultaneously, the

state encourages the use of local resources in OF (BSN 2016). Similar to the actors in the disengaged group, the justice aspect in OF is paramount for the sustainability of OF according to them. To address this problem, actors who belong to the partially engaged group consider OF as an entry point for engaging in the critical discussion of the current agricultural system with the young people. They also attempt to take advantage of current decentralized governance structures, using village funds as a resource for developing OF from the bottom-up in a way that engages with the aspirations of farmers.

Decentralization was a significant milestone in the governance of agriculture following the fall of President Suharto in 1998, as mentioned in Section 2. The shift in political power and control over budgets allowed government officials to pursue regional interests (Nordholt 2012; Mietzner 2013; Nasution 2016). In a conversation with Eka Herdiana, a government official at the department of agriculture of Tasikmalaya regency, on December 8 2017, he stated that the regency of Tasikmalaya in West Java decided to emphasize the production of organic rice and this is reflected in the provincial government's budget and active support provided for marketing. In addition, the enactment of Village Law (No 6/2014) gave villages a voice in how village funds were used, and thereby increasing their participation in influencing agricultural development at the village level (Vel and Bedner 2015). Therefore, village-level governance could be a platform where farmers, local grassroots OF movements, and the government meet. Nevertheless, a large proportion of the village development budget originates and requires approval from the central government, and this limits the autonomy that villages have for bottom-up agricultural development (Green 2005). In addition, continuation in village development priorities could also be an issue, as village head is a political position, so that the agenda between village head candidates might differ. Despite competition between government officials at different administrative levels for the exploitation of natural resources and the cases of funds mismanagement in the decentralization process in Indonesia (Tsing 2003; Fox et al. 2005), according to the actors in the partially engaged group, village governments remain important potential cooperation partners, since agricultural areas are mostly located in rural areas. Therefore, on the one hand, the current technocratic and market-driven government policy restricts local OF initiatives; on the other hand, the decision-making process in decentralization offers OF actors the opportunity to influence policy-making and its implementation at local level.

As described above, the disengaged and partially engaged groups adopt different strategies to reconcile the convictions of OF pioneers with government policies and, it could be argued, to overcome the negative stigma previously attached to OF movements (Lähdesmäki et al. 2019). By contrast, there are some actors who make use of the legal framework for OF (i.e., third-party certification and OF standards) as an entry point into the organic market, but do not consider themselves to be part of the organic movement. These actors belong to what we identify as the fully engaged group. In principal, their notion of sustainability is similar to the national government, where OF provides better economic opportunity for farmers in the future. Within the group, the farmers' association Gapoktan is influential in terms of the number of

network links to other actors, with whom it exchanges information, agricultural inputs, and seeds. However, similar to the local organic market community, Gapoktan exhibits a low degree of betweenness centrality, which suggests limitations to its influence in the network. Unlike many members of the partially engaged group and all members of the disengaged group, members of the fully engaged group do not consider OF as being opposed to conventional farming, and thereby maintain their dependence on government support for both the production and marketing of organic food products.

7. Policy Implications

We agree that sustainability as a concept loses its analytical rigor when it is used uncritically. The explicit accounts on actors who define it and its definition are prerequisites to address the sustainability of OF. Institutional analysis at the meso level that focuses on the governance of OF highlights the contradiction between centralized governance structures in the agricultural sector and the government's stance that OF should prioritize the use of locally available resources and knowledge. This characteristic can compromise the potential of OF to address the shortcomings in the current agricultural sector, as described above. Institutional analysis at the micro level that focuses on the social networks of organic actors elaborates the multiplicity of perceptions, positionalities, and rationales enacted by different actors. In the context of the pervasive influence of the Indonesian state in regulating OF, our analysis showcases the different strategies based on different degrees and types of interactions between non- and governmental actors. According to this two-level analysis, different notions of sustainability of OF are enacted by different actors. Particular narratives refer to either the justice aspect in sustainability related to the access and control over OF practices promoted by OF activists or on the ecological modernization promoted by the state. Given the influence of non-governmental actors in the networks, the social justice narrative cannot simply be subsumed under the market creation and technological fix narratives. Therefore, the institutionalization of OF in Indonesia, which is illustrated by the creation of OF policies and standards as we argued above, does not completely push the practices and views of OF as social movement to the margin as also pointed out by Edwards (2013). Our findings support the argument that to make progress in SDGs, the implementation and formulation of policies in sustainable agriculture depend on "societal debates and social movements that apply pressure to governments and institutions" (Eyhorn et al. 2019, p. 254).

Despite the existing tensions, we argue there are spaces for negotiation between the civil society and government, which could potentially lead to the formulation of more coherent OF policies that can accommodate the diversity of goals and strategies among OF actors. One option would be to explore the alternative decision-making mechanisms available in the context of decentralization. The aim should be, for each type of decision, to identify the appropriate decision-making administrative level, so that decisions take account of the interests and perspectives of individual actors and help them achieve their goals. Secondly, as farmlands are predominantly located in rural Indonesia, cooperation and coordination between the MoA and the Ministry of

Village could help facilitate OF development in a way that captures the aspirations of farmers. Further study of the relation between village governance and OF institutions could contribute to the future development of OF in a form that is not only more inclusive and locally-driven, but also in alignment with current government OF policy, wider sustainable development goals, and the commitment to decentralization.

Supplementary Materials: The two social networks drawn by the workshop participants are included as follows, Figure A1: Net-MapGroup1 and Figure A2: Net-MapGroup2.

Funding: This research was funded by the German Federal Ministry for Research and Education (BMBF), grant number 031B0233, Research for Sustainable Development, funding line “Bioeconomy as societal transformation”.

Acknowledgments: Language editing by Andrew Halliday is highly appreciated. We thank participants at the 1st IndORGANIC Workshop ‘The State of Organic Farming on Java’ Yogyakarta, 8–9 December 2017. Special thanks to Kristian Tamtomo from the University of Atma Jaya for jointly facilitating the Net-Map exercise. We also thank two anonymous reviewers for their constructive feedback and suggestions for improving the overall arguments and structure of the paper.

Conflicts of Interest: The authors declare no conflict of interest. The founding sponsors had no role in the design of the study; in the collection, analyses, or interpretation of data; in the writing of the manuscript, and in the decision to publish the results.

Appendix A:



Figure A1. Net-MapGroup1

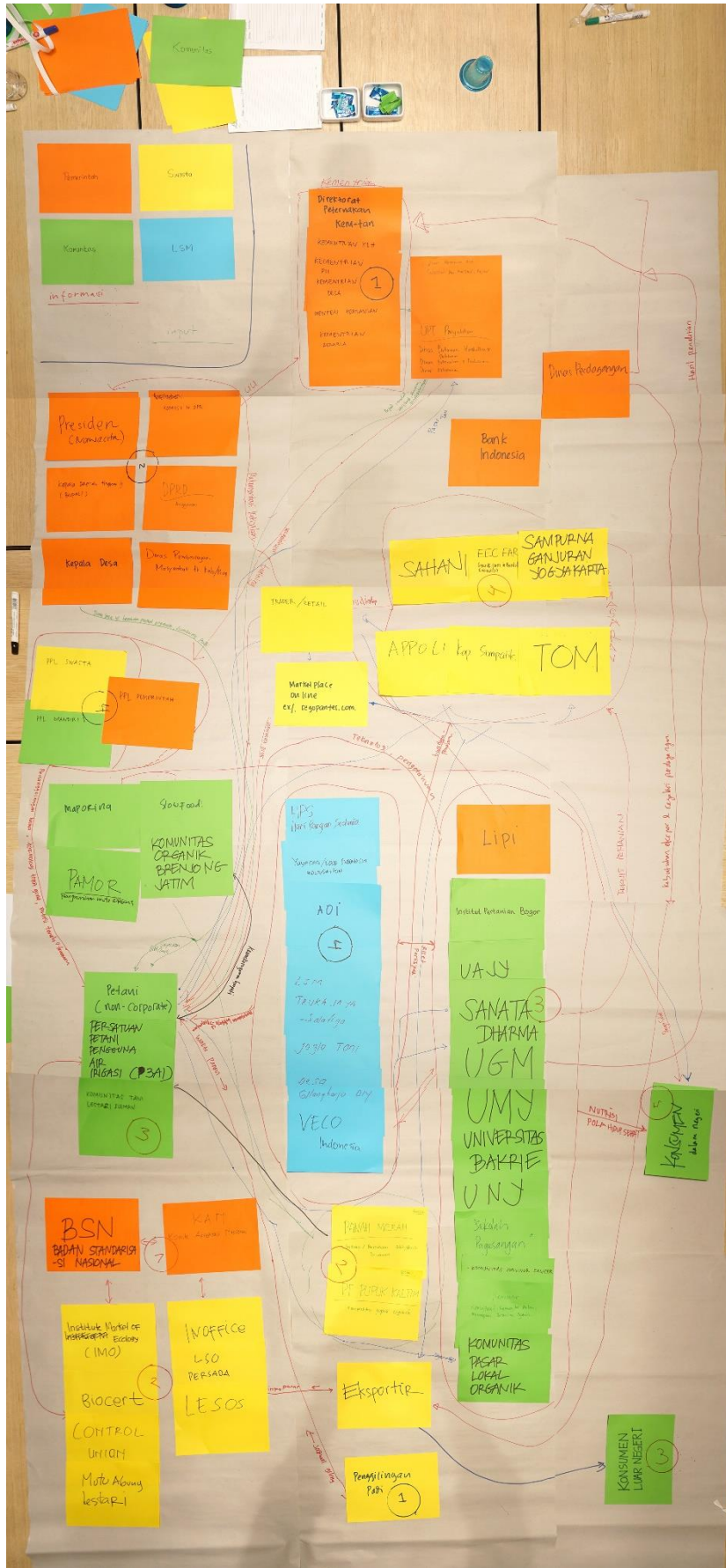


Figure A2. Net-MapGroup2

References

- (Aistara 2015) Aistara, Guntra A. 2015. Good, clean, fair ... and Illegal: Paradoxes of food ethics in post-socialist Latvia. *Journal of Baltic Studies* 46: 283–98.
- (Aistara 2018) Aistara, Guntra A. 2018. *Organic Sovereignties: Struggles over Farming in an Age of Free Trade*. Seattle: The University of Washington Press.
- (Aji et al. 2019) Aji, Bayu G., Stevanus Wangsit, and Vanda Ningrum. 2019. *Reorientasi kebijakan pertanian organik sesudah "Go Organik 2010" dan program "Seribu Desa Pertanian Organik" di Indonesia*. Jakarta: Universitas Bakrie Press. Available online: <http://repository.bakrie.ac.id/2304/> (accessed on 19 September 2019).
- (AOI 2018) AOI. 2018. Statistik pertanian organik 2016. Bogor: Aliansi Organik Indonesia.
- (AOI n.d.) AOI. n.d. Profil AOI. Available online: <https://aoi.ngo> (accessed on 12 April 2018).
- (Arifin 2008) Arifin, Bustanul. 2008. From remarkable success stories to troubling present: the case of BULOG in Indonesia. In *From Parastatals to Private Trade: Lessons from Asian Agriculture*. Edited by Shahidur Rashid, Ashok Gulati and Ralph Wald. Washington, DC: IFPRI, pp. 137–73.
- (Bellon and de Abreu 2006) Bellon, S., and Lucimar Santiago de Abreu. 2006. Rural social development: Small-scale horticulture in Sao Paulo, Brazil. In *Sociological Perspectives of Organic Agriculture*. Edited by Georgina Holt and Matthew Reed. Oxfordshire: CABI, pp. 243–59.
- (Birner et al. 2010) Birner, Regina, Nancy McCarthy, Ricky Robertson, Douglas Waale, and Eva Schiffer. 2010. Increasing access to irrigation: Lessons learned from investing in small reservoirs in Ghana. Paper presented at Workshop on Agricultural Services, Decentralization, and Local Governance, Accra, Ghana, June 3.
- (Black 1962) Black, Max. 1962. *Models and Metaphors*. Ithaca and New York: Cornell University Press.
- (BPS 2018) BPS. 2018. Hasil survey pertanian antar sensus sutas 2018. Available online: <https://www.bps.go.id/publication/2019/01/02/c7cb1c0a1db444e2cc726708/hasil-survei-pertanian-antar-sensus--sutas--2018.html> (accessed on 19 September 2019)
- (Brandes 2008) Brandes, Ulrik. 2008. On variants of shortest-path betweenness centrality and their generic computation. *Social Networks* 30: 136–45.
- (BSN 2002) BSN. 2002. SNI 2002 Sistem pangan organik.
- (BSN 2016) BSN. 2016. SNI 2016 Sistem pertanian organik.
- (Buck et al. 1997) Buck, Daniel, Christina Getz, and Julie Guthman. 1997. From farm to table: The organic vegetable commodity chain of northern California. *Sociologia Ruralis* 37: 3–20.
- (Campbell et al. 2013) Campbell, Natalie, Eva Schiffer, Ann Buxbaum, Elizabeth McLean, Cary Perry, and Tara Sullivan M. 2013. Taking knowledge for health the extra mile: participatory evaluation of a mobile phone intervention for community health workers in Malawi. *Global Health: Science and Practice* 2: 23–34.
- (Conford 2001) Conford, Phillip. 2001. *The origin of the Organic Movement*. Edinburgh: Floris Books.
- (David and Ardiansyah 2016) David, Wahyudi, and Ardiansyah. 2016. Organic agriculture in Indonesia: Challenges and opportunities. *Organic Agriculture* 7: 329–38.
- (Ditjen BPPHP 2001) Ditjen BPPHP. 2001. 4 tahun Go Organik 2010.
- (Edwards 2013) Edwards, Nicola. 2013. Values and the institutionalization of Indonesia's organic agriculture movement. In *Social Activism in Southeast Asia*. Edited by Michele Ford. New York: Routledge, pp. 72–88.
- (Eyhorn et al. 2019) Eyhorn, Frank, Adrian Muller, John P. Reganold, Emile Frison, Hans R. Herren, Louise Lutikholt, Alexander Mueller, Jörn Sanders, Nadia El-Hage Scialabba, Verena Seufert, and et al. 2019. Sustainability in global agriculture driven by organic farming. *Nature Sustainability* 2: 253–55.

- (Fox 1991) Fox, James J. 1991. Managing the ecology of rice production in Indonesia. In *Indonesia: Resources, Ecology, and Environment*. Edited by Hardjono James. Singapore: Oxford University Press, pp. 61–84.
- (Fox 1993) Fox, James J. 1993. Ecological policies for sustaining high production in rice: Observations on rice intensification in Indonesia. In *Southeast Asia's Environmental Future: the Search for Sustainability*. Edited by Brookfield Henry and Byron Yusof. Tokyo: United Nations University Press, pp. 210–24.
- (Fox et al. 2005) Fox, James J., Dedi Adhuri, and Ida Resosudarmo. 2005. Unfinished edifice or Pandora's Box? Decentralisation and resource Management in Indonesia. In *The Politics and Economics of Indonesia's Natural Resources*. Edited by Budy Resosudarmo. Singapore: Yusof Ishak Institute, pp. 92–108.
- (Freeman 1978) Freeman, Linton C. 1978. Centrality in social networks conceptual clarification. *Social Networks* 1: 215–39.
- (Goodman et al. 1987) Goodman, David, Barbara Sorj, and John Wilkinson. 1987. *From farming to Biotechnology: A Theory of Agro-Industrial Development*. Oxford: Oxford Basil Blackwell.
- (Green 2005) Green, Kristina. 2005. Decentralization and Good Governance: The Case of Indonesia. MPRA (Munich Personal RePEc Archive) Paper. Available online: <https://mpra.ub.uni-muenchen.de/18097/> (accessed on 2 May 2018).
- (IndORGANIC n.d.) IndORGANIC. n.d. IndORGANIC. Available online: <https://www.uni-passau.de/en/indorganic> (accessed on 10 November 2018).
- (Jahroh 2010) Jahroh, Sarah. 2010. Organic farming development in Indonesia: Lessons learned from organic farming in West Java and North Sumatra. Paper presented at ISDA, Montpellier, France, June 28–30. Available online: <http://hal.cirad.fr/hal-00521832> (accessed on 2 May 2018).
- (Kaltoft 1999) Kaltoft, Pernille. 1999. Values about nature in organic farming practice and knowledge. *Sociologia Ruralis* 39: 39–53.
- (Kloppenburger 2010) Kloppenburger, Jack. 2010. Impeding dispossession, enabling repossession: Biological open source and the recovery of seed sovereignty. *Journal of Agrarian Change* 10: 367–88.
- (Konefal and Hatanaka 2011) Konefal, Jason, and Maki Hatanaka. 2011. Enacting third-party certification: A case study of science and politics in organic shrimp certification. *Journal of Rural Studies* 27: 125–33.
- (KPPN/BPPN 2014) KPPN/BPPN. 2014. Peraturan Presiden Republik Indonesia Nomor 2 Tahun 2015 tentang rencana pembangunan jangka menengah nasional 2015–2019.
- (Krebs 2004) Krebs, Victor. 2004. Power in Networks. Available online <http://www.orgnet.com> (accessed on 12 August 2018).
- (Lähdesmäki et al. 2019) Lähdesmäki, Merja, Marjo Siltaojab, Harri Luomalac, Petteri Puskac, and Sami Kurkia. 2019. Empowered by stigma? Pioneer organic farmers' stigma management strategies. *Journal of Rural Studies* 65: 152–60.
- (Laksmana and Padmanabhan 2019) Laksmana, Dimas D., and Martina Padmanabhan. 2019. Institutional arrangement of organic farming in Indonesia based on net-map and SNA. Paper presented at Neue Institutionen Ökonomie Workshop by University of Kassel, Witzenhausen, Germany, February 14–15.
- (Lockie et al. 2006) Lockie, Stewart, Kristen Lyons, Geoffrey Lawrence, and Darren Halpin. 2006. *Going Organic: Mobilizing Networks for Environmentally Responsible Food Production*. Oxfordshire: CABI.
- (Lynggaard 2001) Lynggaard, Kennet. 2001. The farmer within an institutional environment. Comparing Danish and Belgian organic farming. *Sociologia Ruralis* 41: 85–111.
- (Matous 2015) Matous, Petr. 2015. Social networks and environmental management at multiple levels: soil conservation in Sumatra. *Ecology and Society* 20: 37. <http://dx.doi.org/10.5751/ES-07816-200337>

- (Michelsen 2001a) Michelsen, Johannes. 2001a. Organic farming in a regulatory perspective. The Danish case. *Sociologia Ruralis* 41: 62–84.
- (Michelsen 2001b) Michelsen, Johannes. 2001b. Recent development and political acceptance of organic farming in Europe. *Sociologia Ruralis* 41: 3–20.
- (Michelsen et al. 2001) Michelsen, Johannes, Kennet Lynggaard, Susanne Padel, and Carolyn Foster. 2001. Organic farming development and agricultural institutions in Europe: A study of six countries. In *Organic Farming in Europe: Economics and Policy 9*. Edited by Sabrina Dabbert. Stuttgart-Hohenheim: University of Hohenheim.
- (Mietzner 2013) Mietzner, Michael. 2013. *Money, Power, and Ideology. Political Parties in Post-Authoritarian Indonesia*. Singapore: NUS Press.
- (Ministry of Agriculture 2003) Ministry of Agriculture. 2003. Keputusan Menteri Pertanian No: 432/Kpts/OT.130/9/2003 tentang penunjukan pusat standardisasi dan akreditasi sebagai otoritas kompeten pangan organik.
- (Mutersbaugh 2004) Mutersbaugh, Tad. 2004. Serve and certify: paradoxes of service work in organic-coffee certification. *Environment and Planning D: Society and Space* 22: 533–52.
- (Nasution 2016) Nasution, Akita. 2016. *Government Decentralization Program in Indonesia*. ADBI Working Paper 601. Tokyo: Asian Development Bank Institute.
- (Neilson and Wright 2017) Neilson, Jeff, and Josephine Wright. 2017. The state and food security discourses of Indonesia: feeding the bangsa. *Geographical Research* 55: 131–43.
- (Neilson and Shonk 2014) Neilson, Jeff, and Felicity Shonk. 2014. Chained to Development? Livelihoods and global value chains in the coffee-producing Toraja Region of Indonesia. *Australian Geographer* 45: 269–88.
- (Nightingale et al. 2019a) Nightingale, Andrea J., Tom Böhler, and Ben Campbell. 2019a. Chapter 1 Introduction and Overview. In *Environment and Sustainability in a Globalizing World*. Edited by Andrea J. Nightingale. New York: Routledge.
- (Nightingale et al. 2019b) Nightingale, Andrea J., Tom Böhler, Linus Karlsson, and Ben Campbell. 2019b. Chapter 3 Narratives of Sustainability: Key concepts and issues. In *Environment and Sustainability in a Globalizing World*. Edited by Andrea Nightingale. New York: Routledge.
- (Nordholt 2012) Nordholt, Henk Schulte. 2012. Decentralisation and democracy in Indonesia: strengthening citizenship or regional elites? In *Handbook of Southeast Asian Politics*. Edited by Richard Robison. New York: Routledge, pp. 229–41.
- (Oka 1997) Oka, Ida. 1997. Integrated crop pest management with farmer participation in Indonesia. In *Reasons for Hope: Instructive Experiences in Rural Development*. Edited by Uphoff Krishna and West Hartford Esman. Connecticut: Kumarian Press, pp. 184–99.
- (Oka 2003) Oka, Ida. 2003. Integrated Pest Management in Indonesia: IPM by Farmers. In *Integrated Pest management in the Global Arena*. Edited by Dakouo Maredia and Mota-Sanchez. Wallingford: CABI Publishing, pp. 223–37.
- (Ostrom 2005) Ostrom, Elinor. 2005. *Understanding Institutional Diversity*. Princeton: Princeton University Press.
- (Plantation General Directorate of the Ministry of Agriculture 2016) Plantation General Directorate of the Ministry of Agriculture. 2016. Dukungan perlindungan perkebunan: Pedoman teknis pengembangan desa pertanian organik berbasis komoditas perkebunan tahun 2016.
- (Poerting 2015) Poerting, Jasuf. 2015. The emergence of certified organic agriculture in Pakistan — Actor dynamics, knowledge production, and consumer demand. *ASIEN* 134: 143–65.
- (President of the Republic of Indonesia 1992) President of the Republic of Indonesia. 1992. Undang-undang no. 12 tahun 1992 tentang: Sistem budidaya tanaman.

- (Rikolto n.d) Rikolto. n.d. Promoting Sustainable and Inclusive Rice Value Chain in Indonesia. Available online: <https://indonesia.rikolto.org/en/project/promoting-sustainable-and-inclusive-rice-value-chain-indonesia#tab-story> (accessed on 21 December 2019).
- (Sanders 2006) Sanders, Richard. 2006. A market road to sustainable agriculture? Ecological agriculture, green food and organic agriculture in China. *Development and Change* 37: 201–26.
- (Sawit and Manwan 1991) Sawit, M. Husein, and Ibrahim Manwan. 1991. The beginnings of the new Supra Insus rice intensification program: The case of the North Coast of West Java and South Sulawesi. *Bulletin of Indonesian Economic Studies* 27: 81–103.
- (Schiffer 2007) Schiffer, Eva. 2007. Net-Map toolbox: Influence mapping of social networks. Paper presented at the Sunbelt Conference of the International Network of Social Network Analysis, Greece, August 20–24.
- (Schiffer and Hauck 2010) Schiffer, Eva, and Jennifer Hauck. 2010. Net-Map: Collecting social network data and facilitating network learning through participatory influence network mapping. *Field Methods* 22: 231–49.
- (Schöley and Padmanabhan 2016) Schöley, Michaela, and Martina Padmanabhan. 2016. Formal and informal relations to rice seed systems in Kerala, India: agrobiodiversity as a gendered social-ecological artifact. *Agriculture and Human Values* 34: 969–82.
- (Schreer and Padmanabhan 2019) Schreer, Viola, and Martina Padmanabhan. 2019. The many meanings of organic farming: Framing food security and food sovereignty in Indonesia. *Organic Agriculture*. doi:10.1007/s13165-019-00277-z.
- (Scott 1994) Scott, Richard W. 1994. Institutions and organizations: towards a theoretical synthesis. In *Institutional Environments and Organizations – Structural Complexity and Individualism*. Edited by Ricard W. Scott and John Meyer. New York: SAGE Publications, pp. 55–80.
- (Slavova et al. 2017) Slavova, Petya, Heidrun Moschitz, and Zdravka Georgieva. 2017. Development of organic agriculture in Bulgaria (1990–2012): Actors, relations, and networks. *Sociologia Ruralis* 51: 507–28.
- (Tamtomo forthcoming) Tamtomo, Kristian. Forthcoming. Unarticulated tensions in the marketisation of organic agriculture in Indonesia: The case of pioneer organisations in Yogyakarta.. *South East Asia Research*.
- (Thiers 2002) Thiers, Paul. 2002. From grassroots movement to state-coordinated market strategy: The transformation of organic agriculture in China. *Environment and Planning C: Government and Policy* 20: 357–73.
- (Thorburn 2015) Thorburn, Craig. 2015. The rise and demise of integrated pest management in rice in Indonesia. *Insects* 6: 381–408.
- (Tomlinson 2008) Tomlinson, Isobel. 2008. Re-thinking the transformation of organics: The role of the UK government in shaping British organic food and farming. *Sociologia Ruralis* 48: 133–51.
- (Tomlinson 2010) Tomlinson, Isobel. 2010. Acting discursively: the development of UK organic food and farming policy networks. *Public Administration* 88: 1045–62.
- (Tovey 1997) Tovey, Hilary. 1997. Food, environmentalism and rural sociology: On the organic farming movement in Ireland. *Sociologia Ruralis* 37: 21–37.
- (Tsing 2003) Tsing, Anna L. 2003. Natural resources and capitalist frontiers. *Economic and Political Weekly* 38: 5100–6.
- (Utomo 2005) Utomo, G. 2005. Kekuatan dan kelemahan dunia pertanian dalam konteks tata ekonomi global, kerusakan lingkungan hidup, dan tata pembangunan pertanian dan pedesaan lestari. In *Membangun karakter petani organik sukses dalam era globalisasi*. Edited by Y.W. Winangun. Yogyakarta: Kanisius, pp. 17–31.
- (Vel and Bedner 2015) Vel, James A.C., and Anna W. Bedner. 2015. Decentralisation and village governance in Indonesia: the return to the nagari and the 2014 Village Law. *The Journal of Legal Pluralism and Unofficial Law* 47: 493–507.

- (Verdery and Humphrey 2004) Verdery, Katherine, and Caroline Humphrey. 2004. *Property in Question: Value Transformation in the Global Economy*. Oxford: Berg.
- (Widiyanto 2019) Widiyanto, Dodi. 2019. The third wave of Indonesia's food markets. Practices at small community markets in Yogyakarta. *Austrian Journal of South-East Asian Studies* 12: 49–67.
- (Willett et al. 2019) Willett, Walter, Johan Rockström, Brent Loken, Marco Springmann, Tim Lang, Sonja Vermeulen, Tara Garnett, David Tilman, Fabrice DeClerck, Amanda Wood, and et al. 2019. Food in the Anthropocene: the EAT–Lancet Commission on healthy diets from sustainable food systems. *The Lancet* 393: 447–92.
- (Winarto 1995) Winarto, Yunita. 1995. State intervention and farmer creativity: Integrated pest management among rice farmers in Subang, West Java. *Agriculture and Human Values* 12: 47–57.
- (Winarto 2004) Winarto, Yunita. 2004. *Seeds of Knowledge: The Beginning of Integrated Pest Management in Java*. New Haven: Yale University Southeast Asia Study.
- (Winarto 2011) Winarto, Yunita. 2011. The ecological implications of central versus local governance: the contest over integrated pest management in Indonesia. In *Beyond the Sacred Forest: Complicating Conservation in Southeast Asia*. Edited by Michael R Dove, Percy Sajise and Amity Doolittle. Publication place: Duke University Press, pp. 276–301.
- (Wollni and Andersson 2014) Wollni, Meike, and Camila Andersson. 2014. Spatial patterns of organic agriculture adoption: Evidence from Honduras. *Ecological Economics* 97: 120–28.

2. Fritz, Manuela; Grimm, Michael; Keilbart, Patrick; Laksmana, Dimas Dwi; Luck, Nathalie; Padmanabhan, Martina; Nurcayaningtyas, Subandi; Tamtomo, Kristian (2021): Turning Indonesia Organic: Insights from Transdisciplinary Research on the Challenges of a Societal Transformation. *Sustainability* 13 (23), p. 13011. DOI: 10.3390/su132313011.

A similar version has been presented:

The societal transformation of agriculture into bioeconomy – Indonesia turning organic? Presented (with Keilbart, Patrick) at Sarasehan webinar series organized by the Indonesian Embassy, Berlin, Germany, 17 December 2020.

Organic farming institutions and local agricultural knowledge. Presented at ‘Civil society’s responds to InORGANIC’s policy recommendations’ organized by PASAL (Partnership for Agriculture and Sustainable Livelihoods), Yogyakarta, Indonesia, 27 February 2020.

Organic farming institutions and local agricultural knowledge. Presented at the IndOrganic Workshop Series „Organic visions – policy recommendations for organic farming on Java“, Atma Jaya University, Yogyakarta, Indonesia, 20 February 2020.

Organic farming institutions and local agricultural knowledge. Presented at the IndOrganic Workshop Series „Organic visions – policy recommendations for organic farming on Java“, BAPPENAS (Ministry of National Development Planning of the Republic of Indonesia), Jakarta, Indonesia, 18 February 2020.

The contradictory regulations on organic farming by the Indonesian state. Presented at (with Keilbart, Patrick) the IndORGANIC worksop “Comparative perspectives on organic farming”, Passau University, Germany, 29 November 2019.

Chapter 2. Turning Indonesia Organic: Insights from Transdisciplinary Research on the Challenges of a Societal Transformation

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Citation: Fritz, M.; Grimm, M.; Keilbart, P.; Laksana, D.D.; Luck, N.; Padmanabhan, M.; Subandi, N.; Tamtomo, K. Turning Indonesia Organic: Insights from Transdisciplinary Research on the Challenges of a Societal Transformation. *Sustainability* **2021**, *13*, x. <https://doi.org/10.3390/xxxxx>

Academic Editor: Roberto Mancinelli

Received: 20 September 2021

Accepted: 15 November 2021

Published: date

Publisher's Note: MDPI stays neutral with regard to jurisdictional claims in published maps and institutional affiliations.



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Abstract: While there is a global consensus that agricultural systems need to be transformed to be more sustainable, possible pathways and challenges to this process are still debated. We analyse the challenges and opportunities involved in transforming smallholder farming to organic agriculture in Indonesia, where the intense application of Green Revolution technologies came at enormous environmental costs. We adopt a transdisciplinary approach to identify possible pathways towards organic agriculture, based on an analysis of farmers' knowledge and barriers to adoption, value and belief systems, and institutional structures, including policies and regulations. We present our empirical findings as 'system knowledge', 'target knowledge' and 'transformation knowledge' and incorporate insights from both academics and practitioners. We draw on evidence from large-scale surveys, field experiments, in-depth interviews, participant observation and document analysis. A key insight of our research is that Indonesia does not lack initiatives towards organic farming, but that these various initiatives have different motivations, goals and strategies. This misalignment detracts from the transformational potential of organic agriculture and is responsible for the hitherto limited success of the organic transition. Our findings suggest that policy action at multiple levels is required, guided by an inclusive strategy that is drawn up in a participatory manner.

Keywords: organic farming; transdisciplinarity; mixed-methods; technology adoption; Indonesia; sustainable agriculture; institutions

1. Introduction

Humanity faces unprecedented challenges due to climate change, increasing demand for food and the continuous depletion of natural resources, making the transformation to sustainable food production more urgent than ever [1]. Globally, except for Sub-Saharan Africa, agricultural development entailed a significant intensification in the use of chemical inputs, especially fertiliser and pesticides [2]. Intensive agriculture has contributed massively to global environmental change and the loss of important ecosystem services, for example due to the loss of biodiversity and decline in soil quality [3-5]. At the same time, agricultural production itself is threatened by these changes. For example, agriculture depends on biodiversity for the maintenance of genetic diversity, cultural identity, and essential ecosystem services, such as pollination, nutrient cycling and natural pest and disease control [6]. In this context, organic agriculture offers the potential to regenerate agricultural land and counteract biodiversity loss by abstaining from using chemical inputs and promoting practices such as crop rotation and vegetative buffer zones [7,8]. Simultaneously, it may also function as a sustainable pathway to poverty reduction for smallholder farmers [9]. Several studies indicate that organic agriculture can, in some contexts, positively impact smallholders' livelihoods due to the lower input costs and potential price premiums for organic food [7,10]. Nevertheless, organic agriculture remains a marginal activity. Only approximately 1.4 percent of total farmland worldwide is farmed organically, despite the increasing number of initiatives that promote such practices [11].

However, transforming to organic agriculture is not just a technical challenge; it also requires addressing constraints on access to information and technology [12-14], and socio-cultural and political challenges [15,16], while taking account of institutional contexts [17-19]. Instead of analysing these aspects of organic agriculture separately, we approach them as interconnected elements that, together, are essential for the generation of transformation knowledge (see also [20,21]).

This article synthesises the insights from IndORGANIC, an inter- and transdisciplinary research project that investigated the challenges and opportunities involved in transforming smallholder farming to organic agriculture in Indonesia. Indonesia offers a particularly interesting case study. Its current agricultural production system is characterised by persistently high levels of agrochemical inputs and faces severe environmental challenges. At the same time, government policies and civil society initiatives have increasingly engaged with organic agriculture over the past two decades [22,23], as has the German–Indonesian research consortium, IndORGANIC based at the University of Passau. This project was implemented over the period 2016 to 2020 and cooperated with three Indonesian institutions, Universitas Atma Jaya Yogyakarta (UAJY), Bogor Agricultural University (IPB), and the Indonesia Organic Alliance (*Aliansi Organik Indonesia*, AOI), an umbrella organization for organic agriculture in Indonesia. The project encompassed economic, anthropological, and sociological research, covering a range of topics, including farmers' knowledge, values and belief systems, barriers to adoption of organic agriculture, and the institutional context in Indonesia.

This article synthesizes the principal findings of the project and contributes to the literature on sustainable agriculture and transdisciplinary research in several regards. First, it presents findings from the application of transdisciplinary research methods to a real-world research project. This contrasts with the conceptual focus of much of the existing literature on transdisciplinarity [24,25] and adds to a very recent but growing literature on transdisciplinary in sustainability research (see e.g., [26-30]). We present our empirical findings in the form of 'system knowledge', 'target knowledge' and 'transformation knowledge' [31] and use this framework to explore possible pathways to organic agriculture. Second, we incorporate the insights of both academics and practice partners involved in the project in our analysis to capture the complex relationships between stakeholders and broader institutional, cultural, and social conditions (see also [32]). Third, we use a wide range of research methods to provide a comprehensive analysis of the complex issues addressed by the project, combining data from large-scale surveys with in-depth interviews, participant observation, and policy analysis.

The remainder of this article is organized as follows. Section 2 describes the contextual conditions in Indonesia. Section 3 gives an overview of the combination of qualitative and quantitative methods applied in this project. Section 4 synthesizes our findings with regard to the three knowledge categories.

Section 5 discusses the results and Section 6 concludes with policy recommendations and lessons for transdisciplinary research.

2. The Emergence of Organic Agriculture in Indonesia

The beginnings of organic agriculture in Indonesia date back to the 1980s, when the first initiatives emerged in response to perceived negative impacts of the so-called Green Revolution. Indonesia adopted Green Revolution programs in the 1960s as a strategy for agricultural modernization, which was seen as key for maintaining both socio-economic stability and public support for Suharto's New Order government [33]. This centralized program focused on expanding agricultural production by implementing large-scale irrigation schemes and providing farmers with modern agricultural inputs such as high-yielding rice varieties, synthetic pesticides and fertilizers as well as extension support [34,35]. The intensification of agriculture led to a spike in agricultural production [34,36,37]; however, after peaking in the 1980s, agricultural growth rates stagnated between 1993 and 2000 [36,38]. Simatupang and Timmer [39] identify a number of ecological problems associated with the Green Revolution in Asia, including soil degradation and fatigue from over-farming (see also [40]). Thorburn [35] documents outbreaks of insect pests in 1985–1986 and in 2009–2011, caused in part by declines in the populations of natural predators due to the overuse of chemical pesticides.

Alongside this decline in agricultural growth rates, various studies also report socio-economic problems associated with the Green Revolution program. Some studies report increased class differentiation among farmers adopting Green Revolution technologies, with benefits accruing to wealthier rural farmers and wealthier rural residents more generally [41-43]. There are also reports of farmers being forced to adopt Green Revolution inputs by government officials, and even by the army [44]. In summary, the intensive agriculture introduced by the Green Revolution in Indonesia was unsustainable, as evidenced by plateauing production due to the ecological impacts of intensive cropping, and increasing socio-political inequality, due in part to the centralised, state-led implementation of the program.

From the 1980s onwards, inspired by the growing international environmental movement, civil society initiatives throughout Indonesia promoted more sustainable forms of agriculture, marking the emergence of the organic agriculture movement in Indonesia. The Bina Sarana Bakti (BSB) Foundation, for example, established in 1984 in Bogor, West Java and initially supported by the Indonesian Catholic Church, was an important pioneer training centre which provided education and support for organic agriculture. This was followed, in the mid to late 1990s, by the formation of other organisations, including the BioTani Indonesia Foundation, Gita Pertiwi, the Seloliman Environmental Education Center (PPH Seloliman), the Serikat Petani dan Nelayan – Hari Pangan Sedunia (SPTN-HPS), the Sahani cooperative, and the Indonesian Development of Education and Permaculture (IDEP) Foundation [22,45,46]. Ultimately, an important breakthrough for the organic movement was the launch of the government's Integrated Pest Management (IPM) program in 1986, in response to advocacy by agricultural scientists and farmers during the brown planthopper outbreak that had started the previous year [35,44,47]. This was the first time that the organic movement had succeeded in influencing agricultural policy, which was by and large still dominated by the logic of the Green Revolution. The IPM program set up farmer field schools, where farmers received hands-on training in techniques informed by an agro-ecosystem perspective on agriculture [48]. The fall of Suharto in 1998 was a turning point in the history of organic agriculture. Existing organic organizations came together to form networks, which helped to further consolidate the organic movement [22]. These were, for example, the BioTani Foundation, PPH Seloliman, Gita Pertiwi and other organisations formed the Indonesian Organic Working Network (Jaringan Kerja Pertanian Organik Indonesia, Jaker-PO) in 1998 [46]. In 2000, staff from the Ministry of Agriculture (MoA) founded the Indonesian Organic Community (*Masyarakat Pertanian Organik Indonesia*, MAPORINA), while 2002 saw the foundation of AOI as well as the private organic certification company BIOCert [22,45]. These networks facilitated training and support of organic agriculture and played a leading role in the development of marketing initiatives, the participatory guarantee system PAMOR [49], community-based organic activities [50], and the documentation of community seed banks [51].

The post-Suharto period of reforms and political decentralization also led to increased government involvement in organic agriculture, which was now viewed as a potential market niche for Indonesian agriculture [52]. In 2001, the government launched the 'Go Organic 2010' program, which sought to establish Indonesia as a leading exporter of organic food by 2010 through the development of an institutional infrastructure comprising socialisation programmes, technical assistance, regulation, certification, and market promotion [46,53]. In 2002, the government introduced the Indonesian National Standard for the organic food system. Among other measures, the new standard stipulated that organic labelling could only be used on products certified by an officially recognised certification body (*Standar Nasional Indonesia*). Since 2014, the promotion of organic agriculture has continued under Indonesia's current President Joko Widodo. In 2015, the MoA has launched the '1000 Organic Agriculture Villages' program, whose aim was to establish organic agriculture in villages across the country by the end of 2019 [54].

Despite almost three decades of civil society initiatives and government efforts to scale up its adoption, organic agriculture is still practised on only a small proportion of total agricultural land in Indonesia. The share of land devoted to organic agriculture is only 0.2 percent according to IFOAM data from Willer and Lernoud [11] and up to 0.86 percent based on AOI data in David and Ardiansyah [22]. This slow progress towards set goals is partly a reflection of over-ambitious policy objectives as well as persistent obstacles encountered by farmers in shifting to organic agriculture. Such obstacles include reduced yields during the transition process, limited knowledge of organic farming, lack of support from extension workers, lack of experience in the marketing of organic commodities, and the cost of organic certification [50,53,55-57].

This historical overview of the Green Revolution and the subsequent emergence of sustainable alternatives in Indonesia highlights that the development of organic agriculture began as a civil society movement and was only later taken up by the state in the post-Suharto era. The different actor groups involved in organic agriculture define organic agriculture in different ways [54]. The pioneering civil society organisations see organic agriculture as a post-materialist enterprise explicitly directed towards social-political goals, that is at once a spiritual worldview, a practical philosophy, and a resistance movement opposed to the globalisation of capitalist agriculture. The Indonesian state adopts a narrower definition that reduces the diversity of meanings and traditions of organic farming by defining 'organic' as 'organically certified', privileging legal criteria over the agricultural practices that farmers engage in.

3. Conceptual Framework and Applied Research Methods

3.1. Conceptual Framework

Transdisciplinary research aims to have both societal and scientific impact. There is an emerging consensus that a transdisciplinary perspective on sustainability challenges is required for these to be effectively addressed [58]. Transdisciplinarity opens up new modes of interaction in binational and multinational research projects, while the mutual exchange of knowledge provides new insights into transformation strategies that can be shared with relevant stakeholders [59]. This approach to sustainability problems not only produces scientific knowledge but also generates practical solutions. In this article, we consider organic agriculture as a set of practices and guiding beliefs oriented towards the production of food within the limits of local nutrition cycles and with an explicit consideration of social and environmental justice.

The overall objective of this project was to identify the challenges and opportunities involved in 'turning agriculture organic' in Indonesia, as well as pathways towards achieving this goal. This research objective entailed addressing complex issues from a transdisciplinary perspective. An inclusive overarching methodological approach was required to synthesise findings from different disciplinary backgrounds into a coherent body of knowledge. We consciously took the decision to combine different qualitative and quantitative methods in order to meet this objective and to generate new insights. To align this project with the conceptual framework of transdisciplinary research as a knowledge generating process, the research approach was structured along three different knowledge types [31]: 'system knowledge', 'target knowledge', and 'transformation knowledge'.

System knowledge contributes to a multidimensional understanding of the current state. Target knowledge responds to the need for change by identifying the goals of important stakeholders, relating not only to technical aspects of sustainability, but also to corresponding belief systems and institutions. Since goals of different stakeholders may conflict with each other, trade-offs are a natural outcome [60]. Transformation knowledge identifies the changes that will be required to attain these goals, while seeking a consensus among contrasting interests. These necessary changes may include, for example, improved practices, conflict resolution, or a fundamental reconfiguration of society towards sustainability goals. Thus, transformation knowledge goes beyond descriptive analysis and considers the necessary conditions for change and the transition to sustainability [61]. It provides inputs for policy recommendations by identifying (in this case) technical, political, educational, or economic measures required to promote organic agriculture in Indonesia. In line with this conceptual framework based around these three types of knowledge, we derived three overarching research questions:

1. What is the current state of organic agriculture in Indonesia?
2. What are the aspirations of different stakeholders for the future of organic agriculture?
3. What are the possible pathways to organic agriculture?

We organised this research project into the three work packages (WP): ‘Values’, ‘Institutions’ and ‘Adoption’, with each package investigating a set of sub-questions encapsulating different aspects of the three overarching research questions. To address these questions, studies in each package applied different research methods, appropriate to the context and the stakeholders concerned.

The work package ‘Values’ (WP 1) explored the values and belief systems related to organic farming, focusing on the role of trade and potential markets for organic products. The work package ‘Institutions’ (WP2) focused on formal institutions and their roles in the policy arena of organic agriculture. The work package ‘Adoption’ (WP3) focused on farmers and consumers. The specific sub-questions that were addressed by each WP are summarised in Table 1.

Table 1. Sub-questions of the three work packages by knowledge type.

Work Package	System Knowledge	Target Knowledge	Transformation Knowledge
1: Values	Within which spiritual and non-spiritual traditions is organic farming located and what values underlie attitudes of farmers towards trade and certification?	What are the aims of civil society actors with regard to developing markets and enhancing trade in organic products?	How can the socio-cultural values of civil society actors be integrated into the development of organic agriculture?
2: Institutions	What governance structures are in place to regulate organic agriculture?	What are the aims of state and non-state actors with regard of organic agriculture?	What policy strategies are suitable to account for the diverse views by state and non-state actors? To what extent are information and awareness raising campaigns and training programmes effective in enhancing the knowledge and adoption of organic farming practices among farmers?
3: Adoption	What do farmers know about organic farming and what are their attitudes towards it? How much are consumers willing to pay for organic food?	What motivates farmers to experiment with and ultimately adopt organic farming? What motivates consumers to buy organic food?	Can health and environmental awareness campaigns increase consumers’ willingness to pay for organic food?

3.2. Research Methods: Combining Qualitative Stakeholder Interviews and Ethnographic Studies with Randomised Controlled Field Experiments

The research was mainly carried out within two regions of Java: in Tasikmalaya District in West Java Province and in the three districts Sleman, Bantul and Kulon Progo in Yogyakarta Province (see Figure 1). We selected these regions based on the capacity of our field partner AOI, who has a large number of actively engaged members in these two regions and could therefore implement organic farming training for 300 farmers in each region. Moreover, both regions share the characteristics of being important organic agricultural production areas, particularly for rice. Farmer groups in Tasikmalaya have succeeded in exporting organic rice [62], while the Yogyakarta region produces organic rice, vegetables, snake fruit and brown coconut sugar [63,64]. The research sites jointly have a population of 5.4 million inhabitants.



Figure 1. Field research sites on Java, Indonesia. Source: Own representation.

Figure 2 gives an overview of the research tools employed by the project. Although each work package has a clear focus, the boundaries between them are blurred. Each package also adds to the understanding of the wider context and the work packages mutually inform each other.

WP 1	In-depth semi-structured interviews with civil society groups (n=12)	Participant observations in villages and within civil society groups (n=6)	Documentary research on civil society groups
WP 2	Net-Map based on social network analysis (n=28)	Semi-structured interviews with government officials and society groups (n=176)	Content analysis of policy documents
WP 3	Preparatory qualitative explorative field work	Structured quantitative survey among farmers (baseline n=1,200)	Structured quantitative survey among farmers (follow-up)
		Willingness to Pay experiment and structured survey with consumers (n=293)	

Figure 2. Research methods used by the IndORGANIC project. Source: Own representation.

WP1 'Values' primarily employed semi-structured interviews with key informants from civil society groups, engaged in participant observation, and conducted an extensive document review, especially of local (mainly grey) literature. The work package comprised two substantial phases of field research. In both phases, the researchers adopted a 'collaborative ethnography' approach [65], creating knowledge through collaboration with informants and consultants [66]. Outputs consisted of transcriptions and analyses of interviews, field notes, field diaries, as well as content and discourse analysis of documents related to the promotion and spread of organic farming knowledge, practices, and products.

The first phase of WP1 took place between September 2017 and February 2018 and focused on three civil society groups from Yogyakarta which are considered pioneers in the development of organic agriculture. Field research elicited narratives of the formation and development of these groups, recovered institutional memory of their foundational values, and captured their reaction to the trajectory of the Indonesian organic agriculture sector, particularly with regard to certification and

trade. The researchers purposively sampled informants based on their role as administrators or key figures in each organisation. Narrative data was supplemented by observations of group activities and in-depth content and discourse analysis of a range of online and paper documents, including websites, brochures and trade labels. The second phase of field research was carried out in October and December 2018 in Yogyakarta and Tasikmalaya. This research investigated how and by whom value models are spread and become established, regionally and nationally. The researchers conducted in-depth qualitative interviews with key figures of six civil society groups and organisations in the two regions, covering Islamic, Christian and local cultural environmentalism. The interviews were complemented by participant observation.

WP2 'Institutions' combined two common sampling methods, namely purposive and snowball sampling. To cover the institutional environment of organic farming, both the Indonesian government and civil society groups were included. While the Ministry of Agriculture provided a sufficient sample in terms of government officials, policies and regulations, snowball sampling was especially useful in identifying networks of farmers and activists, and other influential civil society actors. The researchers conducted semi-structured interviews with government officials and civil society groups and an in-depth analysis of policy documents. The researchers interviewed a total of 176 respondents, including organic farmers, activists, NGO members, and governmental officials, particularly from the Department of Agriculture. The interviews and other interactions with respondents were documented in verbatim transcripts, field notes, and a research diary. These activities were complemented by a transdisciplinary workshop attended by 28 participants, including government officials, organic farmers, academics, and traders of organic products, to investigate their strategies for achieving their goals for organic agriculture. To recruit participants, we employed snowball sampling, especially among organic activists and local policy makers [67]. One outcome of the workshop was a Net-Map-based analysis of social networks among stakeholders [68]. To further investigate decision making processes and aims among government agencies and NGOs in relation to organic agriculture, we analysed relevant academic literature and policy documents and carried out a content analysis of NGO publications and their internal documents.

WP3 'Adoption' primarily employed field experiments and structured surveys to derive causal evidence with respect to the research questions. Specifically, we used a randomised experiment to identify the effect of a three-day organic farming training course on farmers' uptake of organic inputs as well as on their knowledge and perception of organic farming (for details, see [69]). The experiment was conducted in both Tasikmalaya and Yogyakarta and encompassed a total of 60 randomly sampled villages, 30 from each research site. The researchers conducted baseline interviews and a follow-up survey with a total of 1200 farmers (20 farmer group members from each village). Following the baseline survey, we randomly assigned half of the villages (and farmers) to the treatment group while the other half formed the control group. After the baseline data collection, respondents in all treatment villages received an invitation to participate in an organic farming training. The training was designed jointly with AOI, who also delivered the training. It was designed to be largely participatory with hands-on training in organic fertiliser production, but also included some lecture classes on organic principles. We collected follow-up data one year after the baseline survey and around eleven months after the training. The follow-up survey also elicited information on networks and information exchange among trained farmers to learn more about the spread of information about organic farming and identify the individuals that serve as knowledge hubs within such networks. In a second study, a Willingness to Pay (WTP) experiment was conducted with 293 participants to explore what price premium consumers in urban and suburban areas are willing to pay for organic rice. The experiment consisted of an incentive-compatible auction based on the Becker-DeGroot-Marschak (BDM) approach (for details, see [70]). Given the urban context of the WTP experiment, it should be noted that the findings of this study are more likely to reflect the status quo in other urban Indonesian regions rather than rural areas (where rice is often self-produced).

4. Inter and Transdisciplinary Research Findings on the Sustainability of Organic Farming

4.1. System Knowledge

Regarding system knowledge of the values of organic civil society groups, we found that these values are situated within prevalent cultural traditions and are linked to specific views on organic trade and certification. Among civil society groups in West Java and Central Java, we identified three categories of value system, namely Islamic, Catholic, and local cultural agro-environmentalism. Islamic agro-environmentalism was represented by Islamic boarding schools in West Java and Central Java. These schools promote organic agriculture and support small-scale farmers against government-led large-scale agro-industrial projects [71]. Catholic agro-environmentalism was represented by a Catholic foundation and education facility that promotes ecological practices in West Java and a Catholic church and pilgrimage site in Central Java that teaches visitors about agroecology. Local cultural agro-environmentalism is represented by an official educational tourist site in West Java that preserves local Sundanese values to substantiate cultural agro-environmentalism and a cultural centre and tourist site in Central Java. In the latter, visitors and farmers are trained in Javanese philosophy related to local agro-environmentalism. In all three categories, shared values of a deep agro-ecology and organic lifestyle serve to promote eco-friendly small-scale production and consumption of local 'healthy' food. The common objective is to protect the environment—'the creation'—and farmers' (food) sovereignty, recognising their agricultural values, knowledge, and technologies. However, organisations differ in how they relate to government initiatives. While some actors cooperate strategically with the government, others openly reject government control and the dominant agro-economic policy framework oriented towards free trade and large-scale agro-industrial production.

We also conducted case studies of three pioneers of organic agriculture in Yogyakarta: SPTN-HPS, the Sahani cooperative, and the Farmer Activists of Sleman. Founded in the 1990s, these were some of the first organisations to promote organic agriculture among farmer groups in the region. Their aims were to contribute both to environmental conservation and farmers' food sovereignty, while campaigning for greater equity in the political-economic structures of New Order agriculture policy. Nevertheless, reductions in external funding subsequently forced two groups, SPTN-HPS and Sahani, to adjust their values and practices in relation to trade in organic products. Specifically, these two groups are now open to participation in government-led organic certification schemes. Meanwhile, the third group continues to maintain its pioneer values and retains its critical stance towards large-scale trade in organic products, insisting that they should be marketed locally by community-based organisations.

The current institutional environment for organic farming is framed by the national standards, regulations and agencies set in place by the Indonesian government in the early 2000s. The MoA implements government policy on organic agriculture, supported by the Competent Authority for Organic Food (OKPO) and third-party certification bodies regulated by the National Accreditation Committee (KAN). The design of the latest national organic program '1000 Organic Agriculture Villages' comprises three components: 1) provision of technological packages and other inputs in the form of organic fertilisers, pesticides, and livestock for producing manure, 2) financial assistance for organic certification, and 3) knowledge transmission through farmer field schools (using externally recruited trainers in some project implementation areas). The principal function of the national MoA is to distribute financial resources to ministry offices at provincial and district levels. At the district level, ministry offices select farmer groups which could potentially obtain organic certification by the end of the program, taking account of the management capacity of the farmer groups, the history of land use in the area, and biophysical conditions such as water availability and climate. Only those farmers who are officially registered as farmers and farmer group members can take part in the program. Nevertheless, the scope of this program implementation is still unclear since there are still considerable knowledge gaps on organic agriculture among farmers.

Alongside the MoA, civil society groups play a variety of roles, contributing to knowledge sharing, marketing, and networking. The BSB Foundation, one of the early pioneers, was recently divided into two organisations, a training centre for knowledge sharing and a commercial branch which focuses on the production and marketing of organic products through a vegetable box distribution program. SPTN-HPS mainly focuses on providing organic agriculture training and setting up pilot projects in cooperation with village governors. Recently, this organisation also set up a participatory guarantee

scheme in Yogyakarta as part of their marketing strategy. While these two organisations operate primarily at the regional level (though BSB also provides training throughout the country), AOI is an umbrella organisation that connects organic practitioners, private sector actors, and government agencies across the country. AOI has a networking function and actively engages in advocacy work to influence policies and regulations on organic agriculture.

At the farmer level, the baseline survey revealed considerable knowledge gaps and a heterogeneous perception towards organic farming and environmental consequences of agriculture. For instance, around 30% of farmers interviewed in the baseline survey had never heard of organic farming and 78% were not aware of the existence of organic farming labels. Less than 20% of the interviewed farmers believed that demand for organic products has increased over the past five years, an important aspect if we believe that farmers are also motivated by the market potential of organic farming. Around 58% of farmers thought that farmers' decisions affect the environment. However, more than half of respondents (54%) did not think (or at least were not willing to state) that agricultural pollution is an issue of concern. These results highlight that many farmers are still unaware of the interconnection between agriculture and the environment. In terms of current agricultural practices, the baseline survey indicated that around one-third of the farmers applied organic inputs such as processed manure or other types of organic fertiliser. However, these inputs were mostly applied in combination with chemical inputs. Overall, we would like to emphasize that this description of the current steady state is of course specific to our sample and we excluded known organic farmer groups from the sampling pool. We nevertheless believe it to be similar to the vast majority of farmer groups in Java as the number of excluded organic farmer groups was very small.

Results from our WTP experiment indicated that urban consumers in Yogyakarta are willing to pay an average price premium of 20% for organic rice compared to the non-organic rice they commonly purchased outside of the experiment. Around 44% offered a price equal or higher than the price commonly paid for certified organic rice at the farmgate in the time of survey in the study region and about 9% were willing to pay prices similar to those asked in supermarkets. Thus, there is a non-negligible local demand for organic food products. Yet expert interviews with producers in the study region indicated that they were at the time of the study oftentimes already unable to fulfill the increasing demand for organic food from supermarkets and private consumers. Not surprisingly, we found a strong positive relation between income and WTP, i.e., consumers with higher household income levels were willing to pay higher prices for organic rice. Consumers' answers regarding their price expectation showed that they know that organic rice is more expensive than conventional rice; however, their 'offer' was well below the prices that they expected to prevail on the market.

Conclusively, civil society shapes the institutional environment of organic farming through networking and advocacy, marked by common values of deep ecology and organic lifestyle but differing cultural traditions. Meanwhile, governmental initiatives shape it through issuing regulations and standards. Nevertheless, knowledge gaps and a diverse perception towards organic farming prevail among smallholder-farmers, hindering the adoption process. There seems to exist a demand for organic rice, indicated by urban consumers' willingness to pay a price premium. While the offered price was mostly well below prices prevailing in supermarkets, a substantial share of consumers was willing to pay a price commonly asked at the farmgate.

4.2. Target Knowledge

The research on organic civil society groups revealed two major strands of values in relation to the development of organic trade. The first strand, represented by the farmer activists in Sleman and the Islamic agro-environmentalist boarding school in West Java, retains the holistic ideals of the organic farming pioneers and their vision of a community-based organic farming system. These groups are dissatisfied with the current trend towards alignment of organic trade with conventional agri-food market structures. In their view, this market integration tends to foster inequality. Instead, they envision a deep ecologically oriented organic farming system emphasising farmer sovereignty and alternative community-based marketing. They are unwilling to compromise on their commitment to family farming and local organic markets as the only environmentally and socially just agricultural system. In

this value constellation, reconciliation of these actors' deep ecological ideals with a broader organic market framework seems very unlikely. The creation of incentives for engaging in the local organic market through alternative agri-food arrangements such as participatory guarantee schemes, community markets, and delivery of organic produce directly to local consumers, could initiate a rapprochement. However, since these groups prioritise goals such as self-sufficiency, community building, and health benefits over income generation (see e.g., [72]), this strand tends to seek reform and an alternative organic market arrangement rather than a simple integration into the existing organic agri-food market arrangement.

The second strand is represented by SPTN-HPS, Sahani, and most of the other agro-environmentalist groups in West and Central Java. Practitioners in these civil society groups envision an organic farming system that enables them to make profitable income, in addition to contributing to the goals of environmental sustainability and farmer sovereignty that were guiding principles of the early organic farming movement. These groups show similar directions of combining external and internal funding by encouraging farmers to set up small businesses to take advantage of new marketing opportunities and sell their organic products for a profit in local markets. Government support for certification and the development of marketing networks for organic agricultural products provides an additional incentive to those who wish to participate in the expanding organic market.

Although these two strands represent divergent reactions towards the expansion of organic markets, all groups surveyed expressed a shared aspiration for more equitable terms of trade, especially in dealing with traders, stores and supermarkets linked to the existing agri-food market [73].

To further examine the institutional framework for organic agriculture, we analysed the aims of state actors and how they differ from those of civil society actors [17,54]. According to the Indonesian National Standard [74], the aim of organic agriculture is to contribute to biodiversity conservation and environmental protection, taking account of agriculture's social, economic, and ethical dimensions. While this wording expresses a holistic understanding of organic agriculture, in practice, government initiatives such as the '1000 Organic Agriculture Villages' program follow a productivism- and market-oriented agenda with top-down decision-making under a decentralised government. Furthermore, as set out in the National Development Plan 2020–2024, the development of organic agriculture is measured by the growth in the market share of organic products. Between 2020 and 2024, the government aims to increase the market share of organic products from 5–20% of the total food market. However, in our research, we also met government officials from the Department of Agriculture with a more differentiated view of organic agriculture, who identified health of soils, the environment, and people as the key priorities.

Among civil society groups, we found diverse orientations. The community-based organisations associated with the organic movement tend to focus on grassroots activities, such as farmers' markets and knowledge sharing, to promote the holistic principle of organic agriculture and community building. The main aims of these actors are to empower organic farmers and to have greater control over organic agricultural inputs, by encouraging and teaching the use of locally available materials to make organic pesticides and fertilisers. Some NGOs also aim to improve the livelihoods of smallholder farmers, by strengthening their organisational and networking capacities to make it easier to access potential markets and government support. Since the early 2000s, the private sector tends to see the existing institutions in organic agriculture as source for a legal framework that allows access to a market for premium agricultural products. Therefore, these private sector actors focus on adherence to national and international organic standards to create national and international channels for marketing organic products.

A prerequisite for enhancing the adoption of organic agriculture is to understand the motivation of farmers to experiment with and ultimately adopt organic farming. Our research suggests that farmers' major concerns refer to production conditions and economic returns rather than environmental sustainability per se or independence from external inputs. Specifically, the majority of farmers who currently used organic inputs (but mostly applied it together with chemical inputs) reported that they were motivated mainly by the promise of improved soil conditions and resulting productivity gains.

Farmers were also motivated by the expectation that organic farming practices would produce higher quality harvests.

In addition to farmers' aims and motivations, our research also aimed to elicit consumers' motivations for buying and consuming organic food products. More specifically, we asked urban and suburban consumers in Yogyakarta about the considerations guiding their daily rice purchase decisions. They ranked high quality and good taste as the most important purchasing criteria in their daily food shopping. When asked what they perceived as the main benefits of organic food consumption, 83% mentioned health benefits, while environmental benefits and benefits for smallholder farmers were only mentioned by 5% and 1% of respondents, respectively.

Overall, our research indicates that civil society groups, who are driven by deep ecology, envision alternative agri-food markets, whereas agro-environmentalist groups seek integration into the existing organic market, environmental sustainability, and farmer sovereignty. On the contrary, government's policies tend to emphasise the trade aspect of organic agriculture. In addition, the findings from the survey indicate that farmers' motivations are driven by the desire to improve production conditions rather than by environmental concerns per se. However, farmers were also aware of the negative effects of conventional farming on soil conditions and expressed a desire to remedy this situation. Environmental benefits play only a minor role in consumers' purchasing decisions, whereas health aspects are overwhelmingly important.

4.3. Transformation Knowledge

Strategies and possible pathways towards organic agriculture have to be compatible with actors' values. Despite differences in knowledge and belief systems, civil society initiatives and non-government organisations face similar tensions and have to make similar trade-offs between their values on the one hand, and practical engagement with the market and the institutional structures of the agri-food market on the other. As described above, not all organic actors are able to reconcile their socio-ecological ideals with market expansion and the shift towards industrial-scale production. Some actively oppose these trends, promoting, as an alternative, short-chain and local-scale markets. Despite their opposition to prevailing trends, we suggest that these actors can still play important roles in developing sustainable organic agriculture in Indonesia. Some act as communicators of the underlying values that connect organic agriculture to wider issues of ecological and cultural sustainability [50,71]. This can help broaden the appeal of organic agriculture and ensure integration of knowledge across different value systems. Such civil society actors provide alternative spaces for social commentary that can balance the dominant market-oriented trajectory, for potential new forms of cooperation, and for articulation of wider social issues related to agriculture. These socio-cultural values can help organic agriculture to rediscover its roots as a holistic socio-ecological movement that proposes potential alternative pathways for Indonesian agriculture.

From an institutional perspective, strategies are required to enable a coherent development of organic agriculture that takes account of the diverse views of state actors and civil society groups. An overarching strategic framework is required that provides space for constructive negotiations and debates among different actors and accommodates the cultural and ecological diversity of farming communities across Indonesia. The decentralised structure of the Indonesian state provides a framework for decision making processes that are informed by the aspirations of farmers, NGOs and the private sector. Rather than seeking to reconcile the goals and motivations of different actors, the aim should be to create an institutional space that fosters dialogue and inclusive development. Individual actors often frame organic agriculture in one way, excluding other potential framings, i.e., either in economic terms or in terms of farmer sovereignty or social justice. In a functioning democracy, decentralisation can offer space for negotiation among these differing aspirations and views, and accommodate multiple trajectories in the development of organic agriculture.

The diversity of goals in organic agriculture raises a series of challenges that cannot be solved by the MoA alone. The development of organic agriculture raises environmental, trade, and logistical issues that require collaboration among different government ministries, both at the national and regional level, to formulate an 'organic agenda' and a plan for its implementation. This process should

also involve civil society organisations at each step and should be open to public scrutiny. Finally, organic agriculture depends on local conditions and local knowledge. Although this important principle is stated in government regulations, in practice it has so far been largely neglected by government policy. We propose the creation of context-based organic farming guidelines that provide a framework for integrating local ecological conditions and knowledge. These guidelines, which should be drawn up jointly by the government and other actors, could facilitate the implementation of organic agriculture in different contexts and enhance mutual learning among actors.

Our field experiments offer interesting insights into adoption behaviour and provide inputs for the development of policies that can effectively enhance adoption of organic agriculture. The results showed that training and awareness raising increased the adoption of organic inputs, especially self-produced organic fertiliser. Specifically, we found that farmers assigned to the training group were on average 13% more likely to use organic fertilizer and 8% more likely to use organic pesticide, compared to those in the control group. However, we found no significant effect of training on the use of chemical fertiliser, which remained high among farmers in the treatment group. Regarding knowledge and perceptions, we found that farmers who received training were more likely to answer questions about organic farming correctly (based on the training content) and to perceive organic farming as more profitable and modern than conventional farming. For example, farmers assigned to the treatment group were around 14% more likely to know about the prohibition of crop burning and around 20% more likely to know about the requirement for a buffer zone between organically farmed land and conventionally farmed land. They also knew more about organic labels. Furthermore, the training increased farmers' awareness of the potential negative effects of chemical fertilizer and pesticides.

Overall, our findings suggest that information constraints are a barrier to the adoption of organic farming, and that the encouragement and the provision of hands-on training increase the uptake of organic farming inputs. We believe that, especially, three mechanisms can explain the success of our training intervention: First, the training was based on hands-on experimentation; second, organic farming was endorsed by an external expert and trainer; and third, the training was implemented at the group level (i.e., farmer group members participated jointly), which enhanced mutual learning and peer effects. However, as expected, we cannot yet observe complete conversion, partly owing to the short time period of our study.

Our WTP experiment revealed that showing consumers a short video about health or, alternatively, environmental benefits of organic food was not effective in raising their WTP. However, the video about the environmental benefits of organic farming did have a positive effect on stated intentions to consume organic food. It was notable that 88% of respondents stated that certification is important. This highlights a potential difficulty for small-scale farmers, most of whom cannot afford to participate in official certification schemes. Alternative labels such as the participatory guarantee system promoted by some civil society actors could be a promising alternative. Finally, increasing the availability of organic rice at other retail outlets and traditional markets, where prices are lower than at supermarkets, could further boost the demand for organic products. Furthermore, increased competition could help to drive down the mark-ups that supermarkets currently apply.

In conclusion, civil society initiatives can position themselves as communicators of socio-cultural values and critics of the dominant market-oriented approach in organic farming. Furthermore, decentralization could foster dialogue among actors with different goals and facilitate cooperation across ministries. Our findings also reveal that, while information constraints are an important barrier to the adoption of organic farming practices, this can be addressed through hands-on and peer-group training. Lastly, increasing the availability of organic products at traditional markets could potentially increase the demand for organic products and decrease the currently high price mark-ups through increased competition.

5. Discussion

At the level of system knowledge, our synthesised findings on the current state of organic farming in Indonesia identify the state as the principal agent shaping the institutional environment, through the creation of a legislative framework and corresponding regulatory bodies under the MoA. National

programmes to promote organic agriculture emphasise technology packages, distribution of inputs, knowledge transmission and financial support for obtaining certification. By channelling its intervention through the lower tiers of the agricultural administration, the government targets organised farmer groups, hoping for the positive externalities associated with collective action. Nevertheless, other studies in Indonesia suggest still limited state support for organic agriculture extension despite the existence of national organic programs [75-77], hence the persistent low level of adoption and knowledge of organic agriculture among farmers due to systematic constraints [78]. Meanwhile, civil society organisations continue to play a central role in knowledge transfer and innovation. However, the top-down approach gives rise to a functional separation between knowledge creators and regulators, restricting the potential for mutual feedback. Similar results due to restricted knowledge exchange have been observed in government run programmes to promote organic farming in Thailand [79].

In response to this separation, different groups within the organic movement have adopted two contrasting strategies towards the state. While some groups strategically engage with state programmes, for example by participating as trainers, others remain opposed to government control of the organic movement. Faith-based organisations often occupy a middle position between these two extremes. These organisations typically articulate a deep ecology perspective combined with concerns for social justice but do not necessarily reject cooperation with the state. Overall, three perspectives emerge [80]: 1) The critical-alternative perspective emphasises localised autonomous production and distribution of organic products; 2) the sustainable rural development perspective promotes community-based local trade; and 3) the business-minded perspective favours developing national and international trade. The tensions among these distinct perspectives in Indonesia mirror debates over the 'conventionalisation' of organic agriculture elsewhere in the world [15].

The baseline survey of farmers revealed knowledge gaps and a generally low level of awareness of the principles of organic farming. For example, very few farmers knew about organic labelling. Similarly, few believed that the demand for organic products has increased in recent years and more than half did not view agricultural pollution as an issue of concern. Somewhat in contrast to the low expectations by farmers, we found that urban consumers are willing to pay a considerable price premium of about 20% for organic rice. Furthermore, around 44% of consumers were willing to pay a price higher or equal to the price commonly asked by farmers at the farm gate. Given that many Indonesian consumers continue to buy rice at traditional markets or directly from the farmer, this is a relevant share. Interestingly, consumers were aware that organic products are more expensive, even though their offer price was mostly lower than their price expectations.

At the level of target knowledge, our results highlighted the diversity of aspirations for organic agriculture among different actors. Religious and traditional strands of agro-environmentalism are united in striving for more equitable terms of trade for organic farmers. Social and ecological Islamic values are translated into the promotion of small-scale production and local marketing, and these values are spread via boarding schools and countrywide networks. Catholic agri-environmentalists support local farming practices and crop varieties for similar reasons, while remaining open to technological and scientific innovations. Both Islamic and Catholic organisations make links between Javanese and Sudanese cultural values and ecological sustainability. Groups drawing inspiration from deep ecology remain critical toward agri-business; others, in contrast, more inclined to cooperation, aim at developing markets in addition to achieving environmental and social goals. As Reuter [81] points out for Bali, ethical and economic motivations shape the idea of alternative agriculture.

The state's vision of organic agriculture also contains contradictory elements. At first glance the government follows a market-oriented agenda, adopts a top-down approach to its implementation (taking advantage of the structures and degrees of freedom of a decentralised system), and measures its success in terms of the market share. However, the national standard on organic farming also identifies soil health, the environment, and the people's wellbeing as its main aims. This more holistic vision of agriculture gives the possibility of defining broader measures of success.

Understanding farmers' motivations for adopting and continuing to practice organic farming is essential to boost the adoption of farming practices. Farmers stressed the importance of economic

viability. A key motivation for adopting organic farming methods was the belief that they would enhance the quality and quantity of production by improving soil structure and fertility. Farmers stated that they were concerned by declining soil conditions; thus, the benefits in terms of improved soil quality—a by-product of using organic fertiliser such as processed manure—provide a promising entry point for promoting organic farming. Our research found that consumers were motivated to buy organic rice by considerations of quality and taste and, above all, the perceived health benefits of consuming organic products. This far outstripped any other motivation for buying organic rice, such as concerns for the environment or social justice. Other studies on Indonesian consumers also report similar motivations (e.g., [82,83]), although Slamet et al. [84] note that environmental concerns can be significant particularly among urban residents with tertiary education.

In terms of transformation knowledge, and building on the above findings, we identified possible pathways for ‘turning Indonesia organic’. Building upon the analysis of the current state and the diverse goals of the different actors involved, our findings highlight the need for an overarching framework and a communication platform that brings together the diverse actors and allows for constructive negotiation and political debate to incorporate innovations emerging out of practice [85]. In this respect, the decentralised structure of the Indonesian state has great potential to accommodate multiple aspirations and development trajectories. Cooperation across different levels of the MoA and between the MoA and other ministries can help broaden the scope of the transformation brought about by the adoption of organic farming. Last but not least, an emphasis on local solutions could enhance contextualised mutual learning.

The randomised field experiment with farmers provided evidence of the potential benefits of training. A clear outcome was that information constraints are a barrier to the adoption of organic farming practices in the local context. The positive impact of information provision on adoption is in line with findings from other studies investigating the adoption of sustainable agricultural practices (e.g., [86,87]). At the same time, there is a need for greater awareness of the negative effects of agrochemicals. Existing studies emphasise that the awareness of problems associated with the current practices, as well as the knowledge of appropriate farming techniques, are pre-requisite for the adoption of environmentally sustainable practices [88,89]. The impact of the training was likely enhanced by the emphasis on hands-on learning, the use of trusted expert trainers, and the peer effect of group trainings. Next to information constraints, other factors such as economic and credit constraints or risk aversion could be important barriers to the adoption of organic farming—these factors have been identified by previous studies for other agricultural technologies (for an overview see [90,91]). Given consumers’ heightened awareness of health issues, more emphasis could be placed on the health benefits of organic foods, for example in certification schemes. The production of speciality rice varieties could help to justify the price premium for organic products.

6. Conclusions: Policy Recommendations and Lessons of Transdisciplinary Research

A key insight of our research is that Indonesia does not lack initiatives towards organic farming; however, the various initiatives have different motivations and different goals as well as unclear scope of actual implementation. The misalignment of interests and conflicts over strategies and values detracts from the transformational potential of organic agriculture and, combined with the unclear implementations of initiatives, is responsible for the hitherto limited success of the organic transition. Our findings suggest that, in order to realize the transformational potential, policy actions at multiple levels are required, guided by a strategy that is inclusive and developed with the participation of stakeholders.

National horizontal coordination—At the national level, it would help to intensify cooperation among the ministries directly and indirectly linked to the development of organic agricultural policies. Specifically, the MoA could consider a closer cooperation and coordination with the Ministry of Villages, the Ministry of Environment and Forestry, and the Ministry of Trade. The inclusion of civil society organisations could further facilitate the design of effective and more coherent organic farming policies.

National vertical coordination—The establishment of a communication platform that connects the diverse actors across civil society and the state, as well as farming communities and the private sector, as a space for constructive dialogue around the aims and methods of organic farming could further accompany such a process. In addition, such a platform could facilitate exchange of cultural and ecological knowledge among the highly diverse farming communities across Indonesia, for example, by building on the previous ‘1000 Organic Agriculture Villages’ program.

Regional and local coordination—It could be useful to draw up contextualised organic farming guidelines for local actors. Such guidelines could, for example, outline the specific aspects of local agricultural knowledge, biophysical conditions, belief systems, and social organisations which are relevant for the implementation of organic farming policies in a given context. At a local level, civil society actors can act as value communicators, to ensure that relevant knowledge is incorporated into the contextualised guidelines. These guidelines can be used by extension workers, farmers, and scientists striving towards the common goal of organic transformation. Local government at the regency level can also play a crucial role, not only in supporting organic farmer groups but also in initiating cooperation and coordination between local state agencies, civil society and farmer groups (see for instance examples in [62] in Tasikmalaya and in [50] in Central Java).

We identified knowledge and information constraints as an important barrier towards the adoption of organic farming practices. We demonstrated that hands-on training and providing information on organic practices can overcome information constraints and enable farmers to make informed decisions on the adoption of specific practices. Training also changed farmers’ perceptions of organic farming. Training courses could be integrated into existing extension activities or provided as stand-alone events. It is recommended to start by targeting farmer groups and villages that have already shown an interest in organic farming, as these are more likely to adopt organic practices. Successful experiences of these ‘pioneers’ can motivate and inform the adoption of organic practices by farmers in surrounding areas.

In addition to these policy recommendations, our research also contributes to the literature on transdisciplinarity. We followed [31] in using the categories of system, target and transformation knowledge, and demonstrate how a transdisciplinary framework can guide the synthesis of interdisciplinary findings.

We aligned the findings from development economics, social anthropology and institutional analysis to understand the current state of organic farming in Indonesia and the diversity of aspirations among stakeholders in order to identify promising pathways and strategies for organic transformation [92]. Transdisciplinary knowledge requires the acknowledgement of conflict and partiality, and a recognition of the need for compromise and collaboration in the development of contextualized strategies [93]. We demonstrated how discipline-specific research and transdisciplinary workshops involving policy makers, academics and civil society can overcome the difficulties inherent to ‘complex systems science’ [94] and arrive at a nuanced understanding and pragmatic policy recommendations.

We identified multiple definitions of organic agriculture and found it challenging to arrive at a shared understanding for operationalisation and evaluation. Similarly, Erbaugh et al. [95] describe transdisciplinary research on sustainable agricultural production in the tropics as a matter of definition, implementation and evaluation. They emphasise the need to tailor research to the geographical and temporal context, applying a definition of sustainability that can be translated into context-specific objectives that are relevant for local actors. With our specific focus on organic farming as a sustainable agricultural practice, we support their emphasis on hybrid governance as a mix of interventions through states, markets, and civil society.

Our findings contribute to the debate on behavioural change in the context of development-focused interventions. The research embraced the complexity of such behavioural change by adopting a transdisciplinary approach that considered individual knowledge and practices as embedded in larger conceptual frameworks of values, institutions and policies. We emphasise the value-orientation and normative foundations of decision-making processes among actors and stakeholders. Results from the rigorous evaluation of a training intervention combined with an institutional and policy analysis and ethnographic studies of underlying values and ethics underline that the adoption of organic farming

practices is a complex social-ecological change process. An outcome of our transdisciplinary research is the conceptual framework for understanding this process based on the synthesis of interdisciplinary perspectives.

Despite these contributions our study also has some limitations which should be addressed in future research. First, due to our sampling strategy and study setting in Java, our results might not be easily transferred to other Indonesian regions or islands with different levels of agricultural activity or economic development. Future studies in the context of organic farming in Indonesia are therefore needed that investigate these aspects in different regions. Second, despite our Willingness to Pay experiment, the focus of our study was primarily on the producer side. This implies that we can make only limited conclusions in how to increase the demand for organic products in Indonesia. However, our Willingness to Pay experiment has highlighted the fact that information about environmental pollution positively influences the intention to buy more organic products. In-depth studies that analyze whether more intensive information campaigns can further increase the demand for organic products would be informative. Likewise, the role of health aspects in the demand for organic products should be investigated further. Third, as well as information constraints, other factors such as credit constraints or risk aversion could be important barriers to the adoption of organic farming and more longitudinal research is needed to assess these factors in the context of organic conversion.

Lastly, more research on constraints in horizontal and vertical coordination, in relation to the development of sustainable agriculture, is needed.

Author Contributions: Conceptualization, all authors contributed equally; Methodology, M.F., M.G., P.K., D.D.L., N.L., M.P., K.T.; Formal Analysis M.F., M.G., P.K., D.D.L., N.L., M.P., K.T.; Investigation M.F., P.K., D.D.L., N.L., M.P., N.S., K.T.; Data curation, all authors contributed equally for their respective research areas; Writing—Original Draft M.F., M.G., P.K., D.D.L., N.L., M.P., K.T.; Writing—Review & editing M.F., M.G., P.K., D.D.L., N.L., M.P., K.T.; Project Administration P.K., N.L., N.S.; Funding Acquisition M.G., M.P. All authors have read and agreed to the published version of the manuscript.

Funding: The authors acknowledge funding of the German Federal Ministry for Research and Education (Grant no. 031B0233, Research for Sustainable Development, funding line ‘Bioeconomy as societal transformation’).

Institutional Review Board Statement:

Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

Data Availability Statement: Data available on request due to restrictions (privacy/ ethical). The data presented in this study [WP1] are available on request from the corresponding authors. The data are not publicly available in order to ensure confidentiality for the protection of informants, who might face negative consequences of the use of information contained.

Acknowledgments: The time and effort of all interview partners in Indonesia and the critical feedback from participants at the three transdisciplinary IndORGANIC workshops is highly appreciated. We would further like to thank Ronja Platz, Sarah Redicker and Franziska Steinhübel for excellent research assistance.

Conflicts of Interest: The authors declare no conflict of interest.

References

1. Willett, W.; Rockström, J.; Loken, B.; Springmann, M.; Lang, T.; Vermeulen, S.; Garnett, T.; Fan, S.; Food in the Anthropocene: The EAT–Lancet Commission on healthy diets from sustainable food systems. *Lancet* **2019**, *393*, 447–492. [https://doi.org/10.1016/S0140-6736\(17\)33393-4](https://doi.org/10.1016/S0140-6736(17)33393-4).
2. Liu, Y.; Pan, X.; Li, J. A 1961–2010 record of fertilizer use, pesticide application and cereal yields: A review. *Agron. Sustain. Dev.* **2014**, *35*, 83–93. <https://doi.org/10.1007/s13593-014-0259-9>.
3. FAO. The State of Food and Agriculture. *Moving forward on Food Loss and Waste Reduction*; Food and Agriculture Organization of the United Nations: Rome, Italy, 2019; Licence: CC BY-NC-SA 3.0 IGO. 2019. Available online: <https://www.fao.org/3/CA6030EN/CA6030EN.pdf> (accessed on 10 November 2021).

4. FAO and ITPS. *Status of the World's Soil Resources (SWSR)—Main Report*; Food and Agriculture Organization of the United Nations and Intergovernmental Technical Panel on Soils: Rome, Italy, 2015. Available online: <https://www.fao.org/3/i5199e/i5199e.pdf> (accessed on 10 November 2021).
5. IFAD. *IFAD Annual Report 2013*; International Fund for Agricultural Development: Rome, Italy, 2014. Available online: https://www.ifad.org/documents/38714170/40252718/AR_print_2013.pdf/47b6807c-7854-4ed6-9787-e0a2fb677323 (accessed on 10 November 2021).
6. IPBES. *Global Assessment Report on Biodiversity and Ecosystem Services of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services*; Brondizio, E.S., Settele, J., Díaz, S., Ngo, H.T., Eds. IPBES Secretariat: Bonn, Germany, 2019.
7. Jouzi, Z.; Azadi, H.; Taheri, F.; Zarafshani, K.; Gebrehiwot, K.; Van Passel, S.; Lebailly, P. Organic Farming and Small-Scale Farmers: Main Opportunities and Challenges. *Ecol. Econ.* **2017**, *132*, 144–154, <https://doi.org/10.1016/j.ecolecon.2016.10.016>.
8. Seufert, V. Organic Agriculture as an Opportunity for Sustainable Agricultural Development. Research to Practice Policy Briefs, 13. 2021. Available online: <https://www.mcgill.ca/isid/files/isid/seufert.pb13.pdf> (accessed on 10 November 2021).
9. Eyhorn, F.; Berg, M.V.D.; Decock, C.; Maat, H.; Srivastava, A. Does Organic Farming Provide a Viable Alternative for Smallholder Rice Farmers in India? *Sustainability* **2018**, *10*, 4424, <https://doi.org/10.3390/su10124424>.
10. Michler, J.D.; Baylis, K.; Arends-Kuenning, M.; Mazvimavi, K. Conservation agriculture and climate resilience. *J. Environ. Econ. Manag.* **2018**, *93*, 148–169, <https://doi.org/10.1016/j.jeem.2018.11.008>.
11. Willer, H.; Lernoud, J. (Eds.) *The World of Organic Agriculture. Statistics and Emerging Trends 2019*, 20th ed.; Research Institute of Organic Agriculture FiBL: Frick, Switzerland; IFOAM Organics International: Bonn, Germany, 2019.
12. Fafchamps, M.; Islam, A.; Malek, M.A.; Pakrashi, D. Can referral improve targeting? Evidence from an agricultural training experiment. *J. Dev. Econ.* **2020**, *144*, 102436, <https://doi.org/10.1016/j.jdeveco.2019.102436>.
13. Genius, M.; Pantzios, C.J.; Tzouvelekas, V. Information Acquisition and Adoption of Organic Farming Practices. *J. Agric. Resour. Econ.* **2006**, *31*, 93–113.
14. Burton, M.; Rigby, D.; Young, T. Modelling the adoption of organic horticultural technology in the UK using Duration Analysis. *Aust. J. Agric. Resour. Econ.* **2003**, *47*, 29–54, <https://doi.org/10.1111/1467-8489.00202>.
15. Constance, D.H.; Choi, J.Y.; Lara, D. Engaging the Organic Conventionalization Debate. In *Re-Thinking Organic Food and Farming in a Changing World*; Freyer, B., Bingen J., Eds.; Springer: Dordrecht, The Netherlands, 2015; pp. 161–185. https://doi.org/10.1007/978-94-017-9190-8_9.
16. Reed, M. *Rebels for the Soil: The Rise of the Global Organic Food and Farming Movement*; Earthscan: London, UK, 2010.
17. Laksmana, D.D.; Padmanabhan, M. Strategic Engagement in Institutions of Organic Farming in Indonesia. In *Transitioning to Sustainable Life on Land, Transitioning to Sustainability Series 17*; Beckmann, V., Ed.; MDPI: Basel, Switzerland, 2021; In Press.
18. Slavova, P.; Moschitz, H.; Georgieva, Z. Development of Organic Agriculture in Bulgaria (1990–2012): Actors, Relations, and Networks. *Sociol. Rural.* **2016**, *57*, 507–528, <https://doi.org/10.1111/soru.12134>.
19. Mohan, S. Institutional Change in Value Chains: Evidence from Tea in Nepal. *World Dev.* **2016**, *78*, 52–65, <https://doi.org/10.1016/j.worlddev.2015.10.004>.
20. Urmetzer, S.; Lask, J.; Vargas-Carpintero, R.; Pyka, A. Learning to change: Transformative knowledge for building a sustainable bioeconomy. *Ecol. Econ.* **2019**, *167*, 106435, <https://doi.org/10.1016/j.ecolecon.2019.106435>.
21. Leach, M.; Rockström, J.; Raskin, P.; Scoones, I.; Stirling, A.C.; Smith, A.; Thompson, J.; Millstone, E.; Ely, A.; Arond, E.; et al. Transforming innovation for sustainability. *Ecol. Soc.* **2012**, *17*, 11, <http://dx.doi.org/10.5751/ES-04933-170211>.
22. David, W.; Ardiansyah, N. Organic agriculture in Indonesia: Challenges and opportunities. *Org. Agric.* **2016**, *7*, 329–338, <https://doi.org/10.1007/s13165-016-0160-8>.
23. Matous, P. Social networks and environmental management at multiple levels: Soil conservation in Sumatra. *Ecol. Soc.* **2015**, *20*, <https://doi.org/10.5751/ES-07816-200337>.
24. Schäfer, M.; Kröger, M. Joint problem framing in sustainable land use research. *Land Use Policy* **2016**, *57*, 526–539, <https://doi.org/10.1016/j.landusepol.2016.06.013>.
25. Defila, R.; Di Giulio, A. Integrating knowledge: Challenges raised by the “Inventory of Synthesis”. *Futures* **2015**, *65*, 123–135, <https://doi.org/10.1016/j.futures.2014.10.013>.
26. Dannecker, P. Transdisciplinarity ‘Meets’ Power Structures: Challenges and Experiences of a Capacity Building Project on Transdisciplinarity. *Austrian J. South-East. Asian Stud.* **2020**, *13*, 175–192, <https://doi.org/10.14764/10.ASEAS-0042>.
27. Dannecker, P.; Heis, A. ‘Transdisciplinarity’: A Framework of Knowledge Production in North-South Partnerships?. *Austrian J. South-East. Asian Stud.* **2020**, *13*, 165–74, <https://doi.org/10.14764/10.ASEAS-0044>.

28. Osinski, A. Towards a Critical Sustainability Science? Participation of Disadvantaged Actors and Power Relations in Transdisciplinary Research. *Sustainability* **2021**, *13*, 1266, <https://doi.org/10.3390/su13031266>.
29. Nicli, S.; Elsen, S.; Bernhard, A. Eco-Social Agriculture for Social Transformation and Environmental Sustainability: A Case Study of the UPAS-Project. *Sustainability* **2020**, *12*, 5510, <https://doi.org/10.3390/su12145510>.
30. Tönisson, L.; Kunz, Y.; Kecorius, S.; Madueño, L.; Tamayo, E.; Casanova, D.; Zhao, Q.; Schikowski, T.; Hornidge, A.-K.; Wiedensohler, A.; et al. From Transfer to Knowledge Co-Production: A Transdisciplinary Research Approach to Reduce Black Carbon Emissions in Metro Manila, Philippines. *Sustainability* **2020**, *12*, 10043, <https://doi.org/10.3390/su122310043>.
31. Hirsch Hadorn, G.; Hoffmann-Riem, H.; Biber-Klemm, S.; Grossenbacher-Mansuy, W.; Joye, D.; Pohl, C.; Wiesmann, U.; Zemp, E. (Eds.) *Handbook of Transdisciplinary Research*; Springer: Dodrecht, The Netherlands, 2008.
32. Lambe, F.; Ran, Y.; Jürisoo, M.; Holmlid, S.; Muhoza, C.; Johnson, O.; Osborne, M. Embracing complexity: A transdisciplinary conceptual framework for understanding behavior change in the context of development-focused interventions. *World Dev.* **2019**, *126*, 104703, <https://doi.org/10.1016/j.worlddev.2019.104703>.
33. Welker, M. The Green Revolution's ghost: Unruly subjects of participatory development in rural Indonesia. *Am. Ethnol.* **2012**, *39*, 389–406, <https://doi.org/10.1111/j.1548-1425.2012.01371.x>.
34. Davidson, J. Then and Now: Campaigns to Achieve Rice Self-Sufficiency in Indonesia. *J. Humanit. Soc. Sci. Southeast. Asia* **2018**, *174*, 188–215, <https://doi.org/10.1163/22134379-17402001>.
35. Thorburn, C. Empire Strikes Back: The Making and Unmaking of Indonesia's National Integrated Pest Management Program. *Agroecol. Sustain. Food Syst.* **2013**, *38*, 3–24, <https://doi.org/10.1080/21683565.2013.825828>.
36. Fuglie, K.O. Productivity growth in Indonesian agriculture, 1961–2000. *Bull. Indones. Econ. Stud.* **2004**, *40*, 209–225, <https://doi.org/10.1080/0007491042000205286>.
37. Booth, A. *Agricultural Development in Indonesia*; Allen and Unwin: Sydney, Australia, 1988.
38. Gérard, F.; Marty, I.; The 1998 Food Crisis: Temporary Blip or the End of Food Security? In *Agriculture in Crisis: People, Commodities, and Natural Resources in Indonesia, 1996–2000*; Gerard, F., Ruf, F., Eds.; Curzon Press: Richmond, UK, 2001; pp. 269–300.
39. Simatupang, P.; Timmer, C.P. Indonesian Rice Production: Policies and Realities. *Bull. Indones. Econ. Stud.* **2008**, *44*, 65–80, <https://doi.org/10.1080/00074910802001587>.
40. Pingali, O.; Hossain, M.; Gerpacio, R. *Asian Rice Bowls: The Returning Crisis?* CAB International: Wallingford, UK, 1997.
41. Pincus, J. *Class, Power, and Agrarian Change: Land and Labour in Rural West Java*; Macmillan: London, UK, 1996.
42. Huskens, F.; White, B. Java: Social Differentiation, Food Production, Agrarian Control. In *Agrarian Transformations: Local Process and the State in Southeast Asia*; Hart, G., Turton, A., White, B., Eds.; University of California Press: Berkeley, CA, USA, 1989; pp. 235–265.
43. Hart, G. *Power, Labor, and Livelihood: Processes of Change in Rural Java*; University of California Press: Berkeley, CA, USA, 1986.
44. Röling, N.; van de Fliert, E. Transforming extension for sustainable agriculture: The case of integrated pest management in rice in Indonesia. *Agric. Hum. Values* **1994**, *11*, 96–108, <https://doi.org/10.1007/bf01530451>.
45. Edwards, N. Values and the Institutionalization of Indonesia's Organic Agriculture Movement. In *Social Activism in Southeast Asia*; Ford, M., Ed.; Routledge: London, UK, 2013; pp. 72–88.
46. Jahroh, S. *Organic Farming Development in Indonesia: Lessons Learned from Organic Farming in West Java and North Sumatra*; ISDA: Montpellier, France, 2010; hal-00521832.
47. Winarto, Y. *Seeds of Knowledge: The Beginning of Integrated Pest Management in Java*; Yale University Southeast Asia Study: New Haven, CN, USA, 2004.
48. Fakhri, M.; Rahardjo, T.; Pimbert, M. *Community Integrated Pest Management in Indonesia: Institutionalizing Participation and People Centred Approaches*; International Institute for Environment and Development & the Institute of Development Studies: London, UK, 2003.
49. AOI [Aliansi Organik Indonesia]. PAMOR, Penjaminan Mutu Organik Komunitas di Indonesia. 2017. Available online: <http://organcindonesia.org/aoi/pamor-penjaminan-mutu-organik-komunitas-di-indonesia> (accessed on 27 January 2021).
50. Reuter, T.; MacRae, G. Regaining Lost Ground: A Social Movement for Sustainable Food Systems in Java, Indonesia. *Anthropology of Food*. 2019. Available online: <http://journals.openedition.org/aof/10292> (accessed on 18 July, 2021).
51. Pramono, S.; Wangsit, S.; Dharmanta, E.; Krishnayanti, I.; Eka, N. *Daulat Benih Daulat Petani: Benih Lokal Sebagai Pondasi Pertanian Organik*; Aliansi Organik Indonesia: Bogor, Indonesia, 2020.
52. Hidayat, A.S.; Lesmana, T. The Development of Organic Rice Farming in Indonesia. *Rev. Indones. Econ. Bus. Stud.* **2011**, *2*, 71–87. Available online: <https://jurnalekonomi.lipi.go.id/riebs/issue/view/13/14> (accessed on 13 July, 2017).

53. Farmia, A. Development of Organic Rice Farming in a Rural Area, Bantul Regency, Yogyakarta Special Province, Indonesia. *J. Dev. Sustain. Agric.* **2008**, *3*, 135–148, <https://doi.org/10.11178/jdsa.3.135>.
54. Schreer, V.; Padmanabhan, M. The many meanings of organic farming: Framing food security and food sovereignty in Indonesia. *Org. Agric.* **2019**, *10*, 327–338, <https://doi.org/10.1007/s13165-019-00277-z>.
55. Mayrowani, H. Pengembangan Pertanian Organik di Indonesia. *Forum Penelit. Agro Èkon.* **2016**, *30*, 91–108, <https://doi.org/10.21082/fae.v30n2.2012.91-108>.
56. Macrae, G. Rice Farming in Bali. *Crit. Asian Stud.* **2011**, *43*, 69–92, <https://doi.org/10.1080/14672715.2011.537852>.
57. Syaukat, Y. Socio-economic Assessment of Organic Farming in Bogor, West Java, Indonesia. *J. Int. Soc. Southeast. Asian Agric. Sci.* **2008**, *14*, 49–60.
58. Lang, D.J.; Wiek, A.; Bergmann, M.; Stauffacher, M.; Martens, P.; Moll, P.; Swilling, M.; Thomas, C.J. Transdisciplinary research in sustainability science: Practice, principles, and challenges. *Sustain. Sci.* **2012**, *7*, 25–43, <https://doi.org/10.1007/s11625-011-0149-x>.
59. Woltersdorf, L.; Lang, P.; Döll, P. How to set up a transdisciplinary research project in Central Asia: Description and evaluation. *Sustain. Sci.* **2018**, *14*, 697–711, <https://doi.org/10.1007/s11625-018-0625-7>.
60. Nightingale, A.J. (Ed.) *Environment and Sustainability in a Globalizing World*; Routledge: London, UK, 2019; <https://doi.org/10.4324/9781315714714>.
61. Padmanabhan, M. (Ed.) *Transdisciplinary Research and Sustainability: Collaboration, Innovation and Transformation*; Routledge: London, UK; Taylor & Francis Group: London, UK, 2018.
62. Saliem, H.P.; Susilowati, S.H.; Ariningsih, E.; Agustian, A.; Muksin Supporting organic rice exports: The success story of West Java organic rice exports. *IOP Conf. Ser. Earth Environ. Sci.* **2021**, *672*, 012095, <https://doi.org/10.1088/1755-1315/672/1/012095>.
63. Pratita, D.G.; Irham, I.; Mulyo, J.H. Entrepreneurship Competence Level of Organic Farmers in Yogyakarta Province. *Agro Èkon.* **2019**, *29*, 231–243, <https://doi.org/10.22146/ae.35887>.
64. Wijayanti, D.E.; Hartono, S.; Darwanto, D.H. Relative Efficiency of Brown Sugar Agroindustry in Kokap District, Kulon Progo Regency, D.I. Yogyakarta. *Agro Èkon.* **2016**, *27*, 52, <https://doi.org/10.22146/jae.30215>.
65. Rappaport, J. Beyond Participant Observation: Collaborative Ethnography as Theoretical Innovation. *Collab. Anthr.* **2008**, *1*, 1–31, <https://doi.org/10.1353/cla.0.0014>.
66. Reyes, V. Ethnographic toolkit: Strategic positionality and researchers' visible and invisible tools in field research. *Ethnography* **2018**, *21*, 220–240, <https://doi.org/10.1177/1466138118805121>.
67. Flick, U. *Designing Qualitative Research*; Sage: London, UK, 2018.
68. Schiffer, E.; Hauck, J. Net-Map: Collecting Social Network Data and Facilitating Network Learning through Participatory Influence Network Mapping. *Field Methods* **2010**, *22*, 231–249, <https://doi.org/10.1177/1525822x10374798>.
69. Grimm, M.; Luck, N. *Can Training Enhance Adoption, Knowledge and Perception of Organic Farming Practices? Evidence from a Randomized Experiment in Indonesia*. IZA Discussion Paper 13400; IZA: Bonn, Germany, 2020.
70. Grimm, M.; Luck, N.; Steinhübel, F. *Do Indonesian Consumers Value Organic Rice? – Evidence from an Incentive-Compatible Willingness-to-Pay Experiment*, IndORGANIC Policy Brief; University of Passau: Passau, Germany, 2019.
71. Großmann, K. Green Islam: Islamic Environmentalism in Indonesia. New Mandala: New Perspectives on Southeast. Asia. 2019. Available online: <https://www.newmandala.org/green-islam/> (accessed on 26 March 2021).
72. Widiyanto, D. The Third Wave of Indonesia's Food Markets: Practices at Small Community Markets in Yogyakarta. *Austrian J. South.-East. Asian Stud.* **2019**, *12*, 49–67, <https://doi.org/10.14764/10.ASEAS-0013>.
73. Tamtomo, K. Unarticulated tensions in the marketization of organic agriculture: The case of pioneer organizations in Yogyakarta, Indonesia. *South East Asia Res.* **2021**, *29*, 195–213, <https://doi.org/10.1080/0967828x.2021.1931422>.
74. BSN. Badan Standardisasi Nasional, Jakarta Standar Nasional Indonesia (SNI) Sistem Pertanian Organik. [Organic Food System]. 2016. Available online: <http://nasih.staff.ugm.ac.id/wp-content/uploads/SNI-6729-2016-sistem-pertanian-organik.pdf> (accessed on 26 June 2021).
75. Rozaki, Z.; Triyono; Indardi; Salassa, D.I.; Nugroho, R.B. Farmers' responses to organic rice farming in Indonesia: Findings from central Java and south Sulawesi. *Open Agric.* **2020**, *5*, 703–710, <https://doi.org/10.1515/opag-2020-0070>.
76. Shiotsu, F.; Sakagami, N.; Asagi, N.; Suprpta, D.N.; Agustiani, N.; Nitta, Y.; Komatsuzaki, M. Initiation and Dissemination of Organic Rice Cultivation in Bali, Indonesia. *Sustainability* **2015**, *7*, 5171–5181, <https://doi.org/10.3390/su7055171>.
77. Nugraheni, S.; Purnama, A. Problems and prospects of organic farming in Indonesia: Lessons from five districts in West Java province. *Bina Ekonomi* **2013**, *17*, 112–120. Available online: <https://journal.unpar.ac.id/index.php/BinaEkonomi/article/view/810/794> (accessed on 8 November, 2021).
78. Leksono, A.S.; Mustafa, I.; Gama, Z.P.; Afandhi, A.; Zairina, A. Organic cocoa farming in Indonesia: Constraints and development strategies. *Org. Agric.* **2021**, *11*, 445–455, <https://doi.org/10.1007/s13165-021-00351-5>.

79. Hérique, O.; Faysse, N.A. Large-scale public programme to promote organic rice farming in Thailand: Building solid foundations to enable farmers to engage? *Org. Agric.* **2021**, *11*, 27–40, <https://doi.org/10.1007/s13165-020-00320-4>.
80. Alrøe, H.F.; Noe, E. What makes organic agriculture move: Protest, meaning or market? A polyocular approach to the dynamics and governance of organic agriculture. *Int. J. Agric. Resour. Gov. Ecol.* **2008**, *7*, <https://doi.org/10.1504/ijarge.2008.016976>.
81. Reuter, T. Understanding Food System Resilience in Bali, Indonesia: A Moral Economy Approach. *Cult. Agric. Food Environ.* **2018**, *41*, 4–14, <https://doi.org/10.1111/cuag.12135>.
82. Najib, M.; Sumarwan, U.; Septiani, S.; Waibel, H.; Suhartanto, D.; Fahma, F. Individual and Socio-Cultural Factors as Driving Forces of the Purchase Intention for Organic Food by Middle Class Consumers in Indonesia. *J. Int. Food Agribus. Mark.* **2021**, 1–22, <https://doi.org/10.1080/08974438.2021.1900015>.
83. David, W.; Ardiansyah, N. Perceptions of young consumers toward organic food in Indonesia. *Int. J. Agric. Resour. Gov. Ecol.* **2017**, *13*, 315, <https://doi.org/10.1504/IJARGE.2017.088373>.
84. Slamet, A.S.; Nakayasu, A.; Bai, H. The Determinants of Organic Vegetable Purchasing in Jabodetabek Region, Indonesia. *Foods* **2016**, *5*, 85, <https://doi.org/10.3390/foods5040085>.
85. Setiadi, S. Social Entrepreneurship in the Leadership of Grassroots Innovation Movement: A Case Study of Joglo Tani in Yogyakarta. *J. Hum.* **2020**, *32*, 259–270, <https://doi.org/10.22146/jh.57263>.
86. Fisher, M.; Holden, S.T.; Thierfelder, C.; Katengeza, S.P. Awareness and adoption of conservation agriculture in Malawi: What difference can farmer-to-farmer extension make?. *Int. J. Agric. Sustain.* **2018**, *16*, 310–325, <https://doi.org/10.1080/14735903.2018.1472411>.
87. Hörner, D.; Bouguen, A.; Frölich, M.; Wollni, M. *The Effects of Decentralized and Video-Based Extension on the Adoption of Integrated Soil Fertility Management—Experimental Evidence from Ethiopia*; National Bureau of Economic Research: Cambridge, MA, USA, 2019, <https://doi.org/10.3386/w26052>.
88. Jones, S. A Framework for Understanding On-farm Environmental Degradation and Constraints to the Adoption of Soil Conservation Measures: Case Studies from Highland Tanzania and Thailand. *World Dev.* **2002**, *30*, 1607–1620, [https://doi.org/10.1016/s0305-750x\(02\)00056-6](https://doi.org/10.1016/s0305-750x(02)00056-6).
89. Lee, D.R. Agricultural Sustainability and Technology Adoption: Issues and Policies for Developing Countries. *Am. J. Agric. Econ.* **2005**, *87*, 1325–1334, <https://doi.org/10.1111/j.1467-8276.2005.00826.x>.
90. Bridle, L.; Magruder, J.; McIntosh, C.; Suri, T. *Experimental Insights on the Constraints to Agricultural Technology Adoption*; UC Berkeley: Center for Effective Global Action: Berkeley, CA, USA, 2020. Available online: <https://escholarship.org/uc/item/79w3t4ds> (accessed on 1 April 2021)
91. Magruder, J.R. An Assessment of Experimental Evidence on Agricultural Technology Adoption in Developing Countries. *Annu. Rev. Resour. Econ.* **2018**, *10*, 299–316, <https://doi.org/10.1146/annurev-resource-100517-023202>.
92. Hoffmann, S.; Pohl, C.; Hering, J.G. Methods and procedures of transdisciplinary knowledge integration: Empirical insights from four thematic synthesis processes. *Ecol. Soc.* **2017**, *22*, <https://doi.org/10.5751/es-08955-220127>.
93. Bärnthaler, R. Conflict, Controversy, Compromise, and Compression: The Pragmatics of Transdisciplinary (Development) Projects. *Austrian J. South.-East. Asian Stud.* **2020**, *13*, 193–210, <https://doi.org/10.14764/10.ASEAS-0038>.
94. Popa, F.; Guillermin, M.; Dedeurwaerdere, T. A pragmatist approach to transdisciplinarity in sustainability research: From complex systems theory to reflexive science. *Futures* **2015**, *65*, 45–56, <https://doi.org/10.1016/j.futures.2014.02.002>.
95. Erbaugh, J.; Bierbaum, R.; Castilleja, G.; da Fonseca, G.A.; Hansen, S.C.B. Toward sustainable agriculture in the tropics. *World Dev.* **2019**, *121*, 158–162, <https://doi.org/10.1016/j.worlddev.2019.05.002>.

3. Laksana, Dimas Dwi (under revision). Farmers' creativity and cultivated senses: The immediacy of embodied knowledge in alternative agriculture. *Engaging Science, Technology, and Society*.

A similar version has been presented:

Farmers' embodied knowledge in a technoscientific world of alternative agriculture. Presented at the Passau Research Colloquium on Southeast Asian Studies, Passau University, Germany, 7 January 2021.

Chapter 3. Farmers' Creativity and Cultivated Senses: The Immediacy of Embodied Knowledge in Alternative Agriculture

Abstract

The Indonesian government has promoted several forms of alternative agriculture in response to the productivity orientation and over-governance in the intensification of agriculture during the Green Revolution. Integrated Pest Management (IPM) marked a paradigm shift in that it focused more on human rather than technological development, while government-led organic agriculture combines these two paradigms. Against this backdrop, I argue that regulatory institutions of alternative agriculture have been historically contribute to the hierarchization of knowledge based on (dis)embodiment. This argument is built on the dialogical analysis of a book *Seeds of Knowledge*, an anthropological work that details the dynamic learning process of IPM farmers in early 1990s, and the insights of my ethnographic fieldwork with organic farmers in Central Java, Indonesia, between 2017 and 2019. Knowledge intermediation, which is shaped by regulatory institutions and interactions between farmers and agricultural trainers, influences the outcomes of these alternative forms of agriculture. In the process, farmers question the validity and authority of agricultural trainers' scientific knowledge to re-configure the existing knowledge hierarchy. Furthermore, the "immediacy" of their embodied knowledge which constitutes creativity and cultivated senses, offers a critique to the notion of expertise. I conclude by suggesting farmers' embodied knowledge can guide an epistemological shift in alternative agriculture.

Keywords

politics of knowledge; Integrated Pest Management; technoscience; organic agriculture; Indonesia

1. Technoscientific World of Alternative Agriculture

Symbolic language is not understood by technical university students and university students do not understand technical issues ... especially this [understanding of agriculture as science and culture] is important on the ground. At a university, it might be difficult to find the appropriate language, but this is not the case when we meet friends (farmers) on the ground because they practice what we disseminate. (Totok, an organic farmer and trainer)

On a sunny and humid afternoon in 2018, I visited Totok, a leading figure in the organic agriculture movement in Indonesia, at his home to learn about his insights on the current state of the country's agricultural development.⁷ For more than a decade, Totok has been active in the national and international organic agriculture movement, sharing agroecology with government agencies and smallholder farmers, and promoting organic agriculture to a wider audience. Previously, after graduating from an agricultural university, he worked as an agricultural extension worker for several years. We discussed the prevailing dichotomy between agriculture as science and technology, on the one hand, and culture on the other hand. Based on his experience working with different communities of practice, he considered this dualism, predominantly sustained in academia, to be less relevant in the "real world", where agriculture is practiced. As pointed out by Totok, the divergence between academics' and farmers' understanding of agriculture is signified by the lack of "appropriate language" that can bridge the dichotomies mentioned above, i.e. symbolic-material and science-culture. I further argue that this issue is rooted in the hierarchization of heterogeneous knowledges (Nygren 1999) according to their (dis)embodiment.

Responding to this issue, I ask: What are the implications of viewing the technoscientific world of alternative agriculture through the lens of farmers' embodied knowledge? Agriculture as technoscience implies a temporally and spatially contingent practice that transcends the conventional association of science with knowledge and technology with material production

⁷ All names are pseudonyms.

(Heath and Meneley 2007). This framing conceives agriculture as a site of contestation between ways of knowing and making, in which broader societal conditions and existing knowledge are brought into play into what Jasanoff (2004) proposes as the co-production of science and politics. I particularly examine knowledge-making embedded in the interaction between science, regulatory institutions, and society in the implementation of two forms of alternative agriculture in Indonesia, Integrated Pest Management (IPM) and government-led organic agriculture.⁸ “Alternative” in this context is historically framed as an attempt to address the hegemony of productivity orientation and over-governance, characteristics of the Green Revolution which persist in Indonesian agriculture to this day (Winarto 2011, 298).

Recent studies in cognitive sociology demonstrate a shift from amodal towards embodied theories of knowledge due to the former’s inadequacy in explaining the subjective and bodily experience of knowledge (Ignatow 2007). Knowledge as embodied means bodily sensations of experiences are partially stored as conceptual and perceptual representations instead of transduced into mental representations independent of perception and sensation as the amodal theories suggest (Barsalou et al. 2005). The latter approach is, for example, illustrated by the framing of farmers only as beneficiaries, not participants, of biotechnological research (Barragan-Ocana and del-Valle-Rivera 2016).

In the Science and Technology Studies (STS) literature, embodied knowledge is central in challenging uneven terrain of knowledge-making in institutions, such as animal health service (Gundermann 2017) and chemical safety regulations (Murphy 2017), that deny embodiment. Based on ethnographic research, laboratory studies in this field problematize the labor division between scientists and lab technicians (Heath 2007), highlight its significance in

⁸ The meanings of organic agriculture in Indonesia are contested (See Schreer and Padmanabhan 2019). For clarity, in this paper, this term includes farmers who identify their produce using at least one of the following terms, organic, natural, and healthy. One common point among these terms is cultivation methods that refrain from or gradually reduce chemical inputs.

scientist training (Myers 2008), and link it with scientific practices and institutions (Jeon 2019). Concerning the intersection between environmental justice and social movement, communities' experiences of bodily harm from pesticide spraying drove the deployment of counter-expertise, which involves a community-scientist alliance, to challenge environmental injustice (Arancibia and Motta 2019). Fundamentally, these works (Gundermann 2017; Murphy 2017; Heath 2007; Myers 2008) attempt to revise the notion of disembodied scientific knowledge by challenging the dichotomy between “knowing” and “doing” in knowledge-making and knowledge acquisition in (technology-mediated) sciences. Building on them, I contribute to the debate on embodied knowledge by highlighting the “immediacy” of it as knowledge emerges from and is manifested through their creativity (Winarto 1995) and cultivated senses (Paxson 2013).⁹ By “immediacy”, I mean a conscious engagement in an instance of particular situations, while reflecting on the past and anticipating the future. By foregrounding the temporality of embodied knowledge, my argument serves as a critique to the notion of expertise, thus is crucial in envisioning epistemological shift in alternative agriculture.

This paper is based on dialogical analysis (Gillespie and Cornish 2014) of my empirical work and *Seeds of Knowledge* (Winarto 2004).¹⁰ I conducted participant observation and in-depth interviews with organic farmers and government officials during nine months of fieldwork in Java between 2017 and 2019. In her book, *Seeds of Knowledge*, environmental anthropologist Yunita Winarto (2004) documented farmers' learning process during the early

⁹ Creativity in this context consists of trial and error in cultivation practices, evaluation of and inferences from the results of ones' experiments, and comparisons of variations in plant performance and farming strategies, all of which are essential in knowledge acquisition (Winarto 1995, 52). Cultivated senses are acquired through “... a reflexive feel for strategic action under contingent circumstances” (Paxson 2013, 136).

¹⁰ A dialogical approach in interpretive social science underscores the contextual, social, and unfinished nature of meaning. Thus, context is essential in interpreting the meaning of an utterance (meaning is contextual), an utterance is stated with an audience in mind (meaning is addressive), and every utterance responds to what was said in the past and what possibly will be said in the future (meaning is temporal) (Gillespie and Cornish 2014).

implementation of IPM in Java between 1990 and 1992.¹¹ This period marks the introduction of the Farmer Field School (FFS) model in IPM (known in Indonesia as *Sekolah Lapangan Pengendalian Hama Terpadu*, henceforth SLPHT). Through dialogical analysis, I interpret the complex processes it discusses within the broader discourse on technoscientific alternative agriculture. This thirty-year timeframe demonstrates the continuity of regulatory institutions predicated by the disembodiment of knowledge. Moreover, this approach has had major repercussions on whose and what knowledges count and on people-environment relations.¹² Such analysis of the social construction and politics of knowledge is critical given the paramount role of science in shaping agricultural policies, and more broadly, in defining and explaining agriculture-related problems, such as biodiversity loss and climate crisis, of global relevance (FAO 2019).

I begin by mapping the emergence of IPM and organic agriculture as in response to problems encountered during the Green Revolution. This analysis shows that these new approaches are still governed by regulatory institutions that marginalize farmers' embodied knowledge. The following section affirms the significance of farmers' embodied knowledge in knowledge intermediation, using examples from farmers' encounters with state and non-state actors. In the final section, I present the problem of scientisation and how farmers challenge expertise in the politics of knowledge.¹³ I conclude by highlighting the possibility of farmers' embodied knowledge to become a source of "alternative thinking" about alternative agriculture.

¹¹ Yunita Winarto's research and community engagement focus on the dialectics between scientific and local knowledge in agriculture. Building upon her own and other's work on IPM, she initiated Science Field Shops (SFS) in 2008 in Indonesia. SFS serves as a learning platform for farmers based on collaboration between agrometeorologists, anthropologists, and farmers.

¹² Regulatory institutions are understood as political decisions based on science which have origins and/or implications associated with politics (See Brown 2015).

¹³ Scientisation refers to "truth-making" through the processes of particularisation, validation, and generalisation, all of which arise from the instrumental logic of development (Agrawal 2002, 290-291). This term was introduced in the classification of indigenous knowledge to underscore a particular relationship between development, science, and power (ibid.).

2. Regulatory Institutions as Technoscientific Regimes of Power

This section argues that the regulatory institutions, which combine human and technological development in governing IPM and organic agriculture, originate from science that alienates society from knowledge production. This approach continues the marginalization of farmers' embodied knowledge. It also represents a continuation of the paradigm underpinning the Green Revolution that preceded the emergence of these two forms of alternative agriculture.

The Green Revolution was implemented in Indonesia in the 1960s as a national strategy to boost food production through the intensification and industrialization of agriculture (Sawit and Manwan 1991). This target was accomplished through a combination of technological packages distributed to farmers (containing High-Yielding Varieties (HYV) of rice and chemical pesticides and fertilizers), large-scale irrigation schemes, and technocratic institutions (Fox 1993). In addition, extension workers instructed farmers to synchronize their planting and harvesting using standardized and input-intensive techniques (Sawit and Manwan 1991). The notable achievement of this program was that the growth of food production in Indonesia exceeded population growth between 1969 and 1990 (Arifin 2008). However, from the mid-70s onwards, rice crops were affected by recurrent outbreaks of brown plant-hoppers (BPH), due to indiscriminate spraying of chemical pesticides. This phenomenon motivated the issuance of Presidential Decree (INPRES) no. 3 1986, which prohibited the use of 57 insecticides on rice crops and initiated IPM implementation in Indonesia (President of the Republic of Indonesia 1986). On the contrary, organic agriculture was driven by a vision of environmentally sustainable agroindustry, to take advantage of the global organic market that increased from 15,2 billion to 50.9 billion US dollars between 1999 and 2008 (Laksmana and Padmanabhan 2021; Sahota 2010).

2.1 New Ways of Managing Pests

As a global initiative promoted by the Food and Agriculture Organization (FAO) in the early 1970s, IPM aimed to solve the growing problem of pest outbreaks in the Global South through

a combination of biological and cultural control of pests and the judicious application of chemical pesticides (Sawit and Manwan 1991). In Indonesia, the implementation of SLPHT marks a broader shift in the government's strategy for agricultural development, from technology distribution towards human development, giving farmers a central role as agents in the development process (Winarto 1995).

Against this backdrop, *Seeds of Knowledge* documents the incorporation of scientific knowledge into farmers' embodied knowledge, a dynamic process that is intertwined with a paradigm shift in entomology and the subsequent formulation of new regulations (Winarto 2004). This book highlights how entomological investigation links the recurrent BPH infestations with injudicious spraying of pesticides on rice crops (2004, 22). In addition, the government's aim was "to support farmers' creativity instead of forcing them to implement technological packages" (2004, 24). As a result of the government's change of tone in agricultural development, entomology and adult learning formed the basis of the IPM curriculum in the nationwide training program for pest observers from the Directorate of Food Crop Protection and Agricultural Extension in 1989 (2004, 25-27).

Nevertheless, this program was informed by science that upholds the dichotomy between "knowing" and "doing" as evident in the selection and authority of pest observers and IPM trainers. Pest observers who were trained in entomology have the power to decide on the application of pesticides in specific situations, including the dosage and types (President of the Republic of Indonesia 1986). As Winarto remarks:

The main trainers were selected not from among extension workers but from among pest observers—officials from the Directorate of Food Crop Protection—who had never before had direct communication with farmers. The pest observers' main tasks were monitoring the conditions of pest populations and disease infestation on food crops and providing suggestions to local regional officials for the necessary management steps to take. ... The

pest observers, therefore, became resource persons for pesticide use. ... Few of them had ever grown their own crops ... (2004, 26)

This approach's fallacy results in Winarto's observation of some farmers who "complained about the incomplete information [in IPM]. They perceived the training as concentrating more on controlling pests than on rice farming in general" (2004, 167). Her commentary on this phenomenon is that, for farmers, "rice farming is an integrated activity that cannot be fragmented as it is in agricultural bureaucracies and sciences" (ibid.).

The above encounter may also reflect the prevalent interactions between science, government, and farmers at that particular time. Despite the inclusion of crop and nutrient management and learning-by-experience in IPM methodology (President of the Republic of Indonesia 1986), I argue that the emphasis here is on the experience of farmers, but not the trainers. Consequentially, the epistemic culture of IPM results in a fragmentation of agriculture into different components that do not correspond to farmers' lived experiences. This phenomenon resonates with the case of genetically modified maize where molecular biology, which produces policy-relevant knowledge, renders bio-cultural knowledge of gene flow and maize diversity invisible (Bonneuil, Foyer, and Wynne 2014). Similar observations can be made on the government-led organic agriculture programs that I describe in the following section.

2.2 The Creation of Organic Commodities

The market orientation of organic agriculture is apparent in the first national program in organic agriculture, "Go Organic 2010", whose aim was "... to accelerate the agribusiness development with environmental orientation as a way to improve the welfare of people, especially farmers" (Ditjen BPPHP 2001, 3). The launch of this program in the early 2000s was followed by the creation of the regulatory agency Competent Authority for Organic Food (OKPO), whose role is to oversee the work of newly created organic certification bodies (Ministry of Agriculture 2003). In the "Go Organic" program, environmental concerns associated with conventional agriculture are vaguely formulated as the negative impacts of synthetic chemicals on human

health and environment (Ditjen BPPHP 2001). In the National Standard (SNI) 01-6729-2002 for the Organic Food System, the links between agriculture and environment are specified, particularly in relation to biodiversity conservation, soil fertility, and nutrient recycling (BSN 2002, v). In my fieldwork, I observed how the long-term and continuous application of chemical inputs, particularly fertilizers, causes soil degradation and compaction. Furthermore, this process was aggravated by the shift from polyculture to monoculture driven by the Green Revolution (Amelia et al. 2018). Organic farmers and extension workers often talk about these effects in terms of “soil quality”; farmers’ embodied knowledge conceptualizes these issues quite differently, as I describe in the next section.

Alongside this market orientation, the latest organic standard SNI 6769:2016 defines organic agriculture as “based on minimum use of external inputs and without the use of synthetic fertilizers and pesticides” (BSN 2016, iii). This definition of organic agriculture focuses on the substitution of organic inputs for chemical inputs. The same standard also includes lists of banned and permitted substances (ibid., 27-37). Therefore, I argue that this approach to organic agriculture requires knowledge to define the thresholds of chemicals in organic commodities and agroecosystems, and technology to detect and measure their presence. These are technoscientific practices in organic agriculture. This characteristic and the use of certification mechanisms highlight the interdependency between agricultural research, agricultural commodities, and regulatory bodies, all of which underpins the creation of social categories (e.g. organic farmers and organic inspectors) with differentiated epistemic authority (Winickoff and Bushey 2010). It is worth noting that, in addition to science-based arguments, the Indonesian organic standard incorporates culturally specific values. For example, human excrements and pig feces are strictly forbidden (BSN 2016, 31), whereas they are permitted in some global guidelines for organic agriculture (FAO 1999). Since Indonesia is a Muslim-majority country, this regulation is most likely related to *halal*, a rule in Islam prohibiting pig products’ consumption.

Considering the overlap between the IPM and organic agriculture, they share common features, as I describe below. However, there are also instances where the same principles are applied in different ways, for example in their approaches to applying biological agents (*agensi hayati*). In 2018, I talked to Karim, an organic farmer and independent extension worker (known in Indonesia as *penyuluh pertanian lapangan*, henceforth PPL).¹⁴ I asked him for his insights into the relationship between IPM and organic agriculture, as he had previously participated in SLPHT. He explained that:

The capacity of PPL on organic agriculture should come from SLPHT ... In SLPHT the focus is on farmers' understanding of pests and diseases and protection measures. The priority of protection measures should be to return to nature. So, we (extension workers) introduced *agensi hayati*, for instance PGPR (plant-growth promoting rhizobacteria), *Paenibacillus*, *Beauveria bassiana*, etc. SLPHT graduates should know about these.

Karim's explanation is certainly true, as according to the latest organic standard, pest management should prioritize prevention through various mechanical and biological methods, such as intercropping, crop rotation, conservation of pests' natural predators, and the use of biological agent (BSN 2016, 11). These techniques are also taught in IPM (van de Fliert 1993). However, chemical pesticides are strictly banned in organic standards, whereas they are still allowed in IPM. The expanded use of scientific knowledge developed for IPM by organic agriculture is particularly evident in the application of biological agents. In IPM, they are only used to control pest populations, as in the case of *Beauveria bassiana* fungi which can kill insects by infecting them (McKinnon et al. 2018). In contrast, in organic agriculture, the inoculation of PGPR (plant-growth-promoting rhizobacteria) into plant roots is intended to boost plant growth (Backer et al. 2018), as Karim mentioned. In addition, his use of biological

¹⁴ A distinction is made between independent extension workers (*PPL Swadaya*) who work on voluntary basis and extension workers whom the government employs, thus receiving a monthly salary.

agents' scientific names and experimentation with them on his rice field may be understood as a strategy to gain more credibility on his embodied knowledge as a farmer *and* extension worker. This strategy is akin to what Epstein (1996) has termed "expertification".

Nevertheless, organic farmers often mentioned to me the difficulty of managing pests using organic inputs. This experience, I argue, stems from the different working mechanisms of chemical and organic inputs that farmers perceive. As Winarto (2004, 83) pointed out, farmers believe that Thiodan, a pesticide that rice farmers widely used before its ban, is a potent pesticide as it kills various organisms around their paddy fields, including fish and snakes. For farmers, she further explains, the effectiveness of a particular pesticide is evidenced by the indiscriminate killing of organisms in an agroecosystem (ibid.). However, some organic farmers believe that, in organic agriculture, pests should not be killed and should only be "repelled" using "medicine" (i.e. organic pesticide) that does not contain any synthetic chemicals. For example, Parto, a "plasma" farmer who produces organic vegetables for a company that supplies supermarkets in Central Java, explained this to me.¹⁵ This would exclude pest control using fungi from *Beauveria* genus that kill the infected pests. The other difference, as explained to me by Arko, an organic farmer who prepares his own biological agents, is that the effects of organic pesticides "... are not immediate like chemical [pesticides] but *jawa* (over some time)."¹⁶ Therefore, farmers' long-term routine of applying chemical pesticides shape their expectation on the potency of organic pesticides.

The above dialogical analysis of IPM and organic farmers' embodied experiences reveals differences between them. However, I have shown how their regulatory institutions are rooted in the disembodiment of scientific knowledge. In IPM, this is demonstrated by the role

¹⁵ Plasma farmers are smallholders who are contracted by "nucleus" enterprises that handle logistics and marketing. This system aims to link commercial agricultural production and agricultural industry.

¹⁶ *Jawa* is an abbreviation for *jangka waktu* or over some time.

assigned to trainers with specialized knowledge of insect ecology, but with minimum experience of growing rice. Likewise, organic farmers seem to suggest that the standardization of organic agriculture predicated by the absence of banned chemical compounds may influence their preference to use organic inputs as a primary strategy to manage pests. Consequently, the influence of IPM in introducing comprehensive methods of controlling pest to organic farmers is limited as the emphases between IPM and organic agriculture are different. Reflecting on this difference, Parto proposed that “organic agriculture is about self-innovation, people seldom recommend a particular medicine (i.e. organic pesticide), because often [the dose] is not precise. ... Organic [agriculture] is like this, the dose cannot be measured ... so it is about trial and error.” His explanation highlights the importance of experimentation and attunement to observable changes on the farm, which rely on farmers’ creativity (Winarto 1995). This creativity that gives rise to farmers’ embodied knowledge shows that the power of the technoscientific regulatory institutions is not total. In the following section, I examine the centrality of farmers’ embodied knowledge in reconfiguring the relations between science, society, and regulation through its subjectivity.

3. The Corporeality of Technoscientific Knowledge Among Farmers

... discussions with my laboratory colleagues, along with my own hands-on experiences in the lab, reveal the persistent division between mind and body in technoscientific practices. Yet the same interlocutors also present critiques of the dominant paradigm. These counterdiscourses ... accord significance to an intuitive, corporeal knowledge that, while embedded in practice, is nonetheless conscious and socially transmissible ... knowledge that is embodied in material practice, not held at distance by a disembodied mind. (Heath 2007, 140)

The above excerpt from Deborah Heath’s laboratory fieldwork illustrates that the disembodiment of scientific knowledge is still predominant, yet it continues to be revised within scientific institutions. Building on this project, I present two examples of how this process takes

place in farmers' interactions with agricultural trainers and their long-term observation on different farming techniques. The first case is the transformation of the meaning of economic threshold, a key concept in IPM, as it was incorporated into farmers' knowledge. The second example is organic farmers' tactile and visual evaluation of changes in soil quality due to the application of organic fertilizers.

3.1 Economic Threshold – from Disembodied to Embodied Concept

As previously described, IPM introduced new pest management ideas based on the ecological understanding of insect dynamics promulgated through SLPHT that emphasizes field observation and experiential learning. Winarto observes that within two years of the introduction of SLPHT, farmers at her field site identified white stem borers as rice pests, though farmers have diverse understandings about the reproductive cycle of white stem borers (2004, 4). In contrast, she further describes that before IPM, "farmers did not understand that larvae hatched from the egg-clusters that were laid by white moths caused these symptoms (deadhearts and whiteheads). ... Without any knowledge of the white stem borer's reproduction, farmers did not understand that those thousands of white moths would cause severe damage of their plants" (2004, 1).¹⁷ Therefore, farmers' new understanding of white stem borers is a major achievement of IPM, as the occurrence of whiteheads, in combination with other factors, such as soil properties, fertilizer use, and rice variety, affect yield (Winarto 1995). In agreement with Winarto (2004, xv), the incorporation of scientific knowledge into farmers' (embodied) knowledge is a multidirectional process that involves mutual learning between scientists and farmers, as elaborated below.

I exemplify a process that facilitates constructive interactions between different knowledges or what Davies and colleagues have termed (2008) "knowledge intermediation",

¹⁷ Deadheart and whitehead are symptoms of infestation by rice stem borers during the rice plants' vegetative stage (i.e. the stems) and reproductive stage (i.e. the seed heads), retrospectively.

through the shift of meaning of economic threshold, from economic to prey-predator analysis. During her field observations, Winarto noticed that IPM trainers encouraged farmers to evaluate the need for pesticide application based mainly on “whether the pest population had reached the economic threshold level (ETL)”, instead of using agroecosystem analysis (2004, 149). ETL is defined as the level of yield loss beyond which it is economically feasible to control a particular pest through pesticide spraying (van de Fliert 1993). As an economic analysis, the value of ETL is specific to crops, pests, and pesticides. However, in SLPHT, Winarto observed that IPM trainers omitted reference to economic factors such as cost and yield, and re-defined threshold values for particular pests based on assessing the observable damage symptoms that farmers associated with them (2004, 149-150). As a result, farmers’ decision to spray pesticide was informed by “the number of pests, the level of pest attack and damage symptom” (2004, 151). The IPM trainers placed a different emphasis because they were trained in entomology, and unfamiliar with the economic concepts underpinning ETL, as Winarto argues (2004, 152) with reference to the work of van de Fliert (1993). In addition, I suggest IPM trainers recognized that ETL is based on disembodied knowledge. This transduces farmers’ perceptual-subjective experiences of weather conditions, pests, and plants in their fields into an amodal symbol in the form of discreet numbers that farmers need to memorize. On the contrary, the emphasis on observable symptoms introduces perceptual aspect to the concept. Thus, the concept is more readily incorporated into farmers’ embodied knowledge.

As Winarto observed in the subsequent training sessions, following the initial introduction of ETL, IPM trainers abandoned calculation-based approaches altogether due to their lack of success (2004, 152-153). Instead, they set up a group exercise in which farmers were asked to decide on an appropriate intervention for a rice field in circumstances defined by a set of variables including weather conditions, rice variety, plant age, the type of pest, and the presence of natural predators (ibid.). One IPM farmer who participated in this exercise explained his rationale for not spraying:

The rice variety is resistant, there are no natural enemies, the weather is hot, the immigrants are few, the insects are at mature stage. ... Our conclusion: brown plant hoppers do not need to be controlled, because the variety is resistant and the weather is hot. (2004, 154)¹⁸

While this group discussion depicts a hypothetical situation and the trainers did not explain the relations between these conditions, Winarto argues that farmers' ability to establish the relations among these variables is derived from their past experiences (2004, 152). She further explains that farmers combined their experience and empirical evidence to incorporate the concept of natural enemies, i.e. predators of insect pests, another important concept in IPM, into their agroecosystem analysis (2004, 153 - 154). Building on Winarto's analysis, I argue that the concept of natural enemies was incorporated into farmers' embodied knowledge through their creativity, which combines *conceptual representation* (the relations between various conditions in the hypothetical exercise) and *perceptual representation* (their experience of growing rice).

The above example highlights the dependence of knowledge intermediation on inter-subjective interactions and existing regulatory institutions. The dialogical learning between farmers and IPM trainers as scientists/bureaucrats leads to the incorporation of ETL into farmers' decision-making. In this process, a scientific concept that was initially disembodied became embodied. In addition, IPM's human development paradigm facilitates constructive interactions among different knowledges. This opening up of different possible configurations among actors involved in the country's agricultural development under an authoritarian government may suggest that IPM is, as Barry (2007) states, "political inventive". Nevertheless, the co-existence of IPM and the Green Revolution is evident in the persistence of a reductionist understanding of agriculture. On the one hand, Winarto notes that, in other training sessions, IPM trainers and staff of Rural Extension Centers (BPP) and national agricultural agencies reduced ecosystem analysis back to the memorization and calculation of ETL values (2004, 156). This inertia resonates with Asdal's (2007) argument that quantification is essential for the

¹⁸ As explained in the book, the term immigrants refer to the incoming insect pests (152).

governability of scientific objects. On the other hand, as the result of this training farmers assessed the severity of pest attacks by describing their observations of average numbers of insects and their natural enemies using terms like “a bit numerous” instead of discreet number (2004, 161). This subjective expression of estimation and “feeling” (2004, 182) of their embodied knowledge, I argue, is not arbitrary. On the contrary, they are shaped by the cultivated senses that are conscious and socially transmissible, as the following section further elaborates.

3.2 Tactile and Visual Evaluation – a Matter of Experience

One change commonly mentioned by organic farmers after switching from chemical to organic fertilizers for several years is that the soil structure becomes more porous and less compacted. This condition facilitates manual plowing with hoes. Similar observation is typically shared by organic farmers who previously practiced conventional agriculture.

During the first few weeks of my fieldwork, I was recommended by numerous organic farmers and extension workers to meet with Samin who is an experienced organic farmer and a seed breeder of local rice varieties (e.g. *cempo merah* and *cempo hitam*).¹⁹ In our numerous conversations, he shared his life history with me. Samin became a rice farmer after moving back to his village to marry his wife in the 1980s. Initially, he farmed conventionally on paddy fields that he inherited from his parents. It was not until 2003 that he gradually reduced the application of chemical fertilizers on his fields, after attending a training course on “environmentally-oriented agriculture” in his village. He replaced chemical fertilizers with cow and goat manure and reincorporated the cut rice straws back into the soil after every harvest. Samin described the difficulties he encountered in the 1980s when he still used chemical fertilizers: “I tilled in the year of 80, 85, or 87, 88; it was very hard to till [the soil], because, if the hoe was not right, not really sharp, it quickly felt painful here (he pointed to his wrist), because the soil was very hard”. This period marked the expansion of rice intensification

¹⁹ Other names for these rice varieties are *sembada merah* and *sembada hitam*. They are red and black rice.

programs, targeting farmers across Indonesia, but especially in Java, as the island has always been one of the country's food production centers (Arifin 2008). However, when he started applying organic fertilizers, he noticed that the soil in his field became looser and less compacted after a few harvests. Other organic farmers reported similar experiences during my fieldwork.

Samin also made an astute observation on the link between the change in soil structure and the durability of *pematang* or dykes on his paddy field. I was fascinated when he described how:

In the 90s, I grew chili peppers in that field of more than 2 hectares. The dykes were seldom damaged. After we used a lot of organic fertilizers (since 2003), used liquid organic fertilizers, then the [rice] straws were frequently returned to the field, the soil became *gembur* (loose), but the dykes sometimes got damaged ... so every planting season [they] have to be repaired.²⁰ ... You can try to ask Faris (another organic farmer in his farmer group) if it is true that the dykes often get damaged because it (the soil) has become loose. [His] answer will be the same. On average. However, people seldom observe this. In the end, because the soil starts to become good, to be loose, the dykes are frequently damaged, it is *wajar* (reasonable). Because loose soil is *empuk* (soft). Just imagine it, [when] the soil was hard like in the 80s, 90s I seldom saw damaged dykes. Now, it is more common ... Unless there was a flood, then they were damaged.

Samin's explanation for his observations highlights the corporeality of technoscientific knowledge in agriculture. I would argue, with reference to the work of Paxson (2013, 136) on cultivated senses, that his visual and tactile evaluation of the relations between organic fertilizer use, soil structure, and other perceptible changes in his fields is derived from his *reflexive engagement* with the material world and his *cumulative experience* of farming in the same area

²⁰ In this conversation, he explained that after the infestation of yellow mosaic virus that causes the yellow mosaic disease to chili peppers in 2002, he converted the chili pepper into paddy field.

for over four decades. Notably, his embodied knowledge was acquired in the course of his seed breeding activities in his village. During my fieldwork, he was the only rice seed breeder in the village. To this end, he set aside a few square meters in his field for selectively breeding rice plants, using seeds from plants with the desired characteristics, such as uniform plant height, high yield, and resistance to pests. In addition to cultivated senses, this particular expertise relies on farmer creativity through which farmers evaluate and compare their experiments (Winarto 1995).

Moreover, embodied knowledge guides present action in light of past experiences and anticipated future. After making the observations cited above, he explained that frequent damage to dykes is dangerous as rainwater can wash away the fertile topsoil through gaps in the dykes. In addition, the repair of the dykes represents an increase in production costs. Nevertheless, he accepts this additional, unintended cost of using organic fertilizer as reasonable, as the benefit of improved soil structure outweighs it, and the dykes can always be repaired. Samin explained that farmers in his village adapt to this change by growing *kolonjono* grass (*Penissetum purpureum*) on the embankment of their paddy fields, as the roots of this grass can hold soils, and the grass can be used as livestock fodders.

I have shown that technoscientific practices and knowledge-making in IPM and organic agriculture are central to social and cultural processes in which subjects and objects are made (see Asdal, Brenna, and Moser 2007, 13, 27). Farmers were central agents of agricultural development in IPM, not targets, as envisaged in its institutions. This is illustrated by the interactions between IPM trainers and farmers in relation to ETL, whose outcome was to render the life cycle and pest-predator relation of white stem borer visible to farmers. In addition, shared farmers' experience of damage to dykes on organic fields due to loose soil structure illuminates a dimension of soil quality that soil scientists do not commonly discuss, yet has significant impacts on farming. Therefore, the reformulation of disembodied scientific knowledge is shaped by knowledge intermediation and farmers' embodied knowledge, which

is subjective and intuitive, yet transmittable. Building on Winarto's (2004, 352) observations on the limitation and incompleteness of farmers' knowledge, the above analysis illustrates that the knowledge of agricultural trainers is also partial. Furthermore, the epistemological basis of scientists' and farmers' knowledge is susceptible to change and development. However, it should be noted that this dynamic interaction still exists within regulatory institutions that perpetuate an uneven terrain of knowledge-making. The following section delves deeper into farmers' mobilization of their embodied knowledge to engage with this hierarchy.

4. Heterogenous Knowledges in Alternative Agriculture

When I joined Adma's group in week VI of IPM training, Wira told me that "The PPL should cultivate rice by himself." "So that the other farmers can observe it," agreed Ardi. ... Akim said that, first there should be evidence to be observed: "For example, there is a successful performance [of rice farming] ... The PPL should not just 'talk' like that. Hence, we can see [the results] ourselves." ... This conversation illustrates how the farmers perceived the trainers as "expert-outsiders" who were only "talking" without "doing".

(Winarto 2004, 163)

Previously, I described how the regulatory institutions of IPM and organic agriculture undermine farmers' embodied knowledge despite its centrality in alternative agriculture. In this section, I build on these arguments, focusing on farmers' actions and their reflections on the validity and authority of the knowledge of IPM and organic trainers to explore the politics of knowledge. In other words, this section follows the view of politics-as-activity (Brown 2015).

4.1 Epistemological Difference

As explained by Winarto, the farmers she observed recognize the interdependency between farming and science (2004, 162). They appreciate the knowledge gained from IPM and are aware of "the inadequacy of their knowledge to solve unforeseen problems and risks" (ibid.). This attitude is particularly evident in their appropriation of scientific knowledge on the life cycles of pests and predator-prey relationships among insects, as mentioned previously.

Nevertheless, the same farmers consider IPM trainers to be outside experts and are prepared to question the validity of their knowledge. Winarto explained that this conflict arises from the fact that IPM knowledge, in farmers' perspective, "still existed at the narrative level" as it was introduced as "propositions and methods already established by scientific procedures outside the farmers' experiences" (2004, 163). In other words, when IPM knowledge is only transmitted orally or textually, it is disembodied as it is only represented conceptually, but not perceptually. It was explained to me by an extension worker who shared his experience of convincing farmers of the benefits of organic agriculture. He told me: "So if our farmers are only given knowledge, they do not believe it. But if we take them to the field, they learn there, directly, there are many worms, more, [the soil is] more fertile, there are more tillers. (they are convinced)."²¹ Furthermore, farmers validate knowledge they are presented through empirical experience and experimentation, which leads to varying degrees of acceptance of IPM knowledge (Winarto 2004, 85, 164). Therefore, when farmers question the validity of scientific knowledge in IPM, it is not because they do not acknowledge its benefits or feel that accepting this new knowledge would discredit their existing knowledge (2004, 162). It is the disembodiment of this scientific knowledge that leads them to call it into question.

In addition, the politics of knowledge is also contingent on regulatory institutions that maintain differentiated authority. I illustrate this point by the following story of interactions between IPM and non-IPM farmers. In her fieldwork, Winarto met two IPM farmers, Ayim and Idham, who experimented with a particular pest reduction method in their fields and assessed how it affected yields and the cost of production (2004, 209). Based on this experience, they considered themselves as "more appropriate sources of information" than extension workers (ibid.). Ayim's rationale was that:

²¹ Tillers are the grain-bearing branches of rice plants.

If only the PPL talks, the farmers won't believe them 100%. What does the PPL know? He only sits behind a desk. Behind a desk, so, if the farmers themselves present the words, the other farmers might believe what is said. Maybe not 100%, but they might believe it because I have tried it myself. (2004, 209-210)

Idham agreed with this line of reasoning; however, according to Winarto, "he was aware that his position was subordinate to the extension worker" (2004, 210). She interprets this as evidence of the farmers' awareness of "their ambivalent position", where (to paraphrase her), in relations with other farmers, their good grasp of these farmers' epistemology comes up against their lack of authority as ordinary people (*ibid.*). In Java, particularly in rural societies, government officials are perceived as authority figures due to the historical, political, and cultural context (Antlöv 2010). As expertise is conferred by power relations, such as those embedded in expert networks and institutions (Levidow and Boschert 2011, 14), I argue that IPM farmers may not self-identify as experts because of their lack of authority but not the validity of their knowledge.

Winarto further recounts that Ayim and Idham suggested some measures to respond to this frustrating situation, including assigning model farmers a role in the IPM training program (2004, 211). However, the idea went no further since, in the absence of follow-up activities by IPM trainers in this particular hamlet, farmers did not know to whom they should address this concern (*ibid.*). Therefore, this example demonstrates the co-production of science and politics where farmers' embodied knowledge is manifested in their interactions with the government. This analytical approach may explain why hiring model farmers for developing organic agriculture leads to different outcomes.

4.2 Model Farmer

In 2015, the Ministry of Agriculture launched the "1000 Organic Villages" program to provide organic certification to 1000 villages across the country (Plantation General Directorate of the Ministry of Agriculture 2016). This program combined technological packages comprising

organic inputs and machinery with training events for organic trainers and farmers following FFS (ibid.). According to Braun and Duveskog (2008), one of the achievements of the IPM program is that FFS has become a model for farmer training worldwide. Similarly, training and support from the 1000 Organic Villages program were provided to farmer groups in the villages.²²

I learned about this program's implementation in one village from my conversations with Eka, an organic snake fruit farmer from the area, who was hired by the Department of Agriculture in his province as an organic trainer at the start of the program in 2015. When I asked about his involvement in the program, he explained: "So *dinas* (the Department of Agriculture) chooses people with known backgrounds ... who have already been involved in organic activities. Then they are selected to become organic trainers." He further explained that most trainers are organic farmers in the area, and some even volunteer as independent extension workers. He also added that from the perspective of *dinas*, he was perceived as "experienced" in organic agriculture, given his past experience of successfully applying for organic certification for his farmer group. Therefore, as third-party certification, which is both political and science-based, relies on a particular epistemology (Konefal and Hatanaka 2011), qualified trainers are expected to have technical and administrative knowledge in organic agriculture. Although he did not use the term "model farmer", his description of his participation in the program seems to match that role. I often heard farmers and government officials mentioned the term when talking about strategies to promote organic agriculture.

By analyzing the training module of this program and farmers' experiences, I also argue that the model farmer approach was implemented to address what Agrawal (2002) terms

²² In Indonesia, farmer groups are officially recognized, and their formation requires the government's permission. More than one farmer group exists in one village, whereas only one farmer group is allowed in a hamlet. A hamlet is one administrative level below a village in rural areas, and one village can comprise more than one hamlet. This governance structure goes back to the Green Revolution period.

“scientisation” that comes with knowledge cataloging. These organic trainers received training before starting to work in the respective areas. Eka described his training at the Agriculture Training Centre (BBPP), a training center for extension workers, lasted for more than one week. Based on his explanation and a copy of the training module that he gave me, the training covers various topics, including technical knowledge of organic agriculture, group dynamics, and institutions. For example, one PowerPoint presentation on “processing organic fertilizers”, elaborates on procedures for making manure and compost, including a step-by-step guide and precise information on the period of fermentation (BBPP 2015). This presentation also provides tips on recognizing when manure is ready to use, based on its odor, texture, and color (ibid.). However, information on other inputs involving fermentation, for instance liquid fertilizers, is presented as a standardized procedure with exact quantities of ingredients, without including any perceptual information (ibid.). Therefore, this training module demonstrates that disembodiment still prevails in teaching scientific knowledge of agriculture, despite the government’s acknowledgment of the importance of farmers’ embodied knowledge, as evidenced in the above ETL example. As discussed in the STS literature, when documented and circulated, embodied knowledge may run the risk of being decontextualized, whereby its intuitive-subjective and relationality characteristic are obscured (Gundermann 2017; Lin, Bates, and Goodale 2016; Myers 2008). Nevertheless, the disembodied knowledge that Eka acquired from this training was transmitted and transformed into embodied knowledge to other farmers in FFS, where he demonstrated the preparation of organic inputs, and farmers had the opportunity for hands-on practice. He was also responsible for motivating farmers throughout the whole five years of the implementation of the program. In this respect, he claimed, organic trainers are vital drivers of the implementation of this program. Furthermore, this example suggests that discussion on embodied knowledge is closely linked to its acquisition and transmission.

The above discussion on the documentation of embodied knowledge points to the question of expertise in alternative agriculture. In contrast with the above IPM farmers, the farmers he “trained” did not question the validity of Eka’s knowledge of organic agriculture as it was rooted in the same epistemology. Meanwhile, his association with the government gave him an authority to which farmers were receptive. When I visited the farmer group he was responsible for, one farmer told me, “Eka is like a consultant who teaches snake fruit farmers in Sleman (a sub-regency in Central Java). He could come to this *dusun* (hamlet) because he was close to the *dinas*.” While the farmer was talking, he made a gesture of two fingers hooked together, meaning that while Eka was a farmer and not a government official, he was closely connected with them. Therefore, based on my observation of this farmer group, they did not encounter any severe problems in switching to the organic cultivation of snake fruits. However, these farmers struggled to comply with the administrative and record-keeping requirements of the organic certification process.

The last time I was in the village, in December 2018, the farmer group was visited by inspectors from a certification agency as one of the final steps in awarding organic certification to the group. However, during this visit, the organic inspectors encountered some “minor” and “major” issues, such as unclear borders of farmers’ gardens, lack of sale records, incomplete records of harvests, etc. These inspectors presented their findings using an Excel sheet, which was projected onto a screen from a laptop. Their final remark to farmers was that they would have to “correct” these findings on an Excel sheet for their snake fruit gardens to be certified as organic. As Eka (and also other organic farmers) confessed, the creation of organic commodities through the certification process introduces new forms of relations between people and technology that, arguably, expands the notion of organic agriculture. Therefore, this case illustrates record-keeping is a technoscientific practice that contributes to commodification (Paxson 2013).

The above examples show that the politics of knowledge in alternative agriculture is contingent on existing regulatory institutions, broader cultural contexts, and interpersonal interactions. The involvement of different actors in IPM and organic agriculture is assumed to facilitate achieving the “best” solutions in technical and social terms. However, multi-stakeholder participation does not necessarily address inequalities in people’s capacity to participate in knowledge-making (Pestre 2008). In the above example, I explain the hierarchies of knowledge, in terms of validity and authority, through the interactions between disembodied and embodied knowledge. In both IPM and organic agriculture, the broader institutional context influences how farmers accept experts’ knowledge as authoritative, though not necessarily valid. In the case of IPM, influencing factors are cultural norms and the Presidential Decree that gave a mandate to government officials and entomologists involved in IPM’s implementation. In organic agriculture, the recruitment of model farmers from the local area facilitated the intermediation of disembodied scientific knowledge taught to organic trainers and farmers’ embodied knowledge. However, scientisation problem and the need for new knowledge of administration and record-keeping that comes with the creation of organic commodities, could potentially introduce new sites and objects of politics in alternative agriculture.

5. Re-thinking Alternative Agriculture

First, we don’t need alternatives; we need rather an alternative thinking of alternatives.

(Santos 2018: viii)

I have highlighted that a post-structuralist approach to the science-society dichotomy reveals the lack of language to address the hierarchization of heterogeneous knowledges in alternative agriculture adequately. In this context, alternative agriculture continues to operate under the prevalence of amodal theories of knowledge despite recent findings in cognitive sociology and STS that underscore bodily experience as an essential attribute of knowledge. This has consequences for conceptualizing the place of knowledge in tackling environmental crises associated with agriculture. For example, more than two decades after the implementation of

IPM and organic agriculture, soil degradation and pest outbreaks due to overuse of chemical fertilizers and pesticides are still widespread. In Java in 2009–2011 and 2013, outbreaks of brown stem borer, a pest of rice crops, have been attributed to injudicious use and lax regulations of chemical pesticides, among other factors (Winarto 2016). In addition, the institutionalization of organic agriculture extends the Green Revolution paradigm of productivity orientation and over-governance to environmental conservation (Laksmana and Padmanabhan 2021). Under this condition, through their embodied knowledge, farmers transform their encounters with scientific knowledge into sites of contestation where they reinterpret, question, and challenge established practices and institutions. Therefore, my analysis suggests the need to redirect our attention away from institutional and technological fixes towards an epistemological shift.

The immediacy of embodied knowledge offers a different configuration of science and society in the politics of knowledge. During a conscious engagement in an instance, knowing how a material world works becomes inseparable from doing something to it. In this case, farmers' creativity and cultivated senses point to possibilities that elude those who understand agriculture either only mentally or corporeally, but not both. Therefore, embodied knowledge questions the notion of expertise in the technoscientific regimes of power. Acknowledging the risk of scientisation that comes with knowledge classification, I suggest that farmers' capacity in influencing regulatory institutions needs to be understood in terms of knowledge intermediation. In this context, the roles of knowledge mediators, which can be taken by scientists and farmers, in bridging epistemological differences are crucial. It also implies greater involvement of farmers in contributing to regulatory institutions should receive proper compensation, financially and/or institutionally, for their labor and knowledge. Following Santos' (2018) call for the necessity of epistemological shift to recognize alternatives, farmers' embodied knowledge offers alternative thinking about alternative agriculture.

Funding

This research was funded by the German Federal Ministry for Research and Education (BMBF), grant number 031B0233, Research for Sustainable Development, funding line “Bioeconomy as societal transformation”.

Acknowledgments

This article has been long in the making and the writing process has taken me to thinking places that I did not know existed. My encounters with farmers, extension workers, and activists during my fieldwork have inspired me to think deeply about some common, though uneven, grounds which may connect their differing perspectives on agriculture. I highly appreciate the encouraging and constructive feedback from Yunita Winarto, Enid Still, Siti Maimunah, Patrick Keilbart, and Martina Padmanabhan. I thank the numerous suggestions from the editorial collective of ESTS journal and the two anonymous reviewers. Their encouragement and keen eyes have helped advancing my arguments. Nevertheless, all shortcomings are mine. Language editing by Andrew Halliday is highly appreciated.

Conflicts of Interest

The author declares no conflict of interest. The founding sponsors had no role in the design of the study; in the collection, analyses, or interpretation of data; in the writing of the manuscript, and in the decision to publish the results.

References

- Amelia, Fatiya, Johan Iskandar, Ruhyat Partasmita, and Nicholas Malone. 2018. “Recognizing Indigenous Knowledge of the Karangwangi Rural Landscape in South Cianjur, Indonesia for Sustainable Land Management.” *Biodiversitas* 19 (5): 1722–29. <https://doi.org/10.13057/biodiv/d190518>.
- Agrawal, Arun. 2002. “Indigenous knowledge and the politics of classification.” *International Social Science Journal* 54 (173): 287-297. <https://doi.org/10.1111/1468-2451.00382>.

- Antlöv, Hans. 2010. "Village Government and Rural Development in Indonesia: The New Democratic Framework." *Bulletin of Indonesian Economic Studies* 39 (2): 193–214. <https://doi.org/10.1080/00074910302013>.
- Arancibia, Florencia, and Renata Motta. 2019. "Undone Science and Counter-Expertise: Fighting for Justice in an Argentine Community Contaminated by Pesticides." *Science as Culture* 28 (3): 277–302. <https://doi.org/10.1080/09505431.2018.1533936>.
- Arifin, Bustanul. 2008. "From Remarkable Success Stories to Troubling Present: The Case of BULOG in Indonesia." In *From Parastatals to Private Trade: Lessons from Asian Agriculture*, edited by Shahidur Rashid, Ashok Gulati, and Ralph W. Cummings, 137-146. Baltimore, Md., Washington D.C. Johns Hopkins University Press; International Food Policy Research Institute.
- Asdal, Kristin. 2007. "Re-Inventing Politics of the State: Science and the Politics of Contestation." In *Technoscience: The Politics of Interventions*, edited by Kristin Asdal, Brita Brenna, and Ingunn Moser, 7-53. Oslo: Oslo University Press, Unipub.
- Asdal, Kristin, Brita Brenna, and Ingunn Moser. 2007. "The Politics of Interventions: A History of STS." In *Technoscience: The Politics of Interventions*, edited by Kristin Asdal, Brita Brenna, and Ingunn Moser, 7-53. Oslo: Oslo University Press, Unipub.
- Backer, Rachel, J. Stefan Rokem, Gayathri Ilangumaran, John Lamont, Dana Praslickova, Emily Ricci, Sowmyalakshmi Subramanian, and Donald L. Smith. 2018. "Plant Growth-Promoting Rhizobacteria: Context, Mechanisms of Action, and Roadmap to Commercialization of Biostimulants for Sustainable Agriculture." *Frontiers in plant science* (9): 1-17. <https://doi.org/10.3389/fpls.2018.01473>.

- Barragán-Ocaña, Alejandro, and María del Carmen del-Valle-Rivera. 2016. "Rural Development and Environmental Protection Through the Use of Biofertilizers in Agriculture: An Alternative for Underdeveloped Countries?" *Technology in Society* (46): 90–99. <https://doi.org/10.1016/j.techsoc.2016.06.001>.
- Barry, Andrew. 2007. "Political Invention." In *Technoscience: The Politics of Interventions*, edited by Kristin Asdal, Brita Brenna, and Ingunn Moser, 287–307. Oslo: Oslo University Press, Unipub.
- Barsalou, Lawrence W., Aron K. Barbey, W. Kyle Simmons, and Ava Santos. 2005. "Embodiment in Religious Knowledge." *Journal of Cognition and Culture* (5): 14–57. <https://doi.org/10.1163/1568537054068624>.
- BBPP. 2015. "Memroses Pupuk Organik [Processing Organic Fertilizer]."
- Braun, Arnoud, and Deborah Duveskog. 2008. "The Farmer Field School Approach—History, Global Assessment and Success Stories." Accessed 4 May 2021. <https://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.634.8572&rep=rep1&type=pdf>.
- Brown, Mark B. 2015. "Politicizing Science: Conceptions of Politics in Science and Technology Studies." *Social Studies of Science* 45 (1): 3–30. <https://doi.org/10.1177/0306312714556694>.
- BSN. 2002. "SNI 2002 Sistem Pangan Organik [Organic Food System]."
- BSN. 2016. "SNI 2016 Sistem Pertanian Organik [Organic Farming System]."
- Christophe, Bonneuil, Jean Foyer, and Brian Wynne. 2014. "Genetic Fallout in Biocultural Landscapes: Molecular Imperialism and the Cultural Politics of (Not) Seeing Transgenes in Mexico." *Social Studies of Science* 44 (6): 901–29. <https://doi.org/10.1177/0306312714548258>.

- Davies, Huw, Sandra Nutley, Isabel Walter. 2008". Why 'knowledge transfer' is misconceived for applied social research." *The Journal of Health Services Research and Policy* 13 (3):188–90. <https://doi.org/10.1258/jhsrp.2008.008055>.
- Ditjen BPPHP. 2001. "4 Tahun Go Organic 2010 [4 Years Go Organic 2010]."
- Epstein, Steven. 1996. *Impure Science: AIDS, Activism, and the Politics of Knowledge*.
- FAO. 1999. "Guidelines for the Production, Processing, Labelling and Marketing of Organically Produced Foods."
- _____. 2019. "The State of the World's Biodiversity for Food and Agriculture."
- Fox, J. James. 1993. "Ecological Policies for Sustaining High Production in Rice: Observations on Rice Intensification in Indonesia." In *South-East Asia's Environmental Future: The Search for Sustainability*, edited by Harold Brookfield and Yvonne Byron. Kuala Lumpur: Oxford University Press.
- Gillespie, Alex, and Flora Cornish. 2014. "Sensitizing Questions: A Method to Facilitate Analyzing the Meaning of an Utterance." *Integrative Psychological & Behavioral Science* 48 (4): 435–52. <https://doi.org/10.1007/s12124-014-9265-3>.
- Gundermann, Christian. 2017." Reading Blood Work Is an Art Form: Toward an Embodied Feminist Practice of Veterinary Science and Care." *Catalyst: Feminism, Theory, Technoscience* 3 (2): 1-28. <https://doi.org/10.28968/cftt.v3i2.28841>.
- Heath, Deborah. 2007. "Bodies, Antibodies, and Modest Interventions." In *Technoscience: The Politics of Interventions*, edited by Kristin Asdal, Brita Brenna, and Ingunn Moser, 135-155. Oslo: Oslo University Press, Unipub.
- Heath, Deborah, and Anne Meneley. 2007. "Techne, Technoscience, and the Circulation of Comestible Commodities: An Introduction." *American Anthropologist* 109 (4): 593–602. <https://doi.org/10.1525/AA.2007.109.4.593>.

- Ignatow, Gabriel. 2007. "Theories of Embodied Knowledge: New Directions for Cultural and Cognitive Sociology?" *Journal for the Theory of Social Behaviour* 37 (2): 115–35. <https://doi.org/10.1111/j.1468-5914.2007.00328.x>.
- Jasanoff, Sheila. 2004. "Ordering knowledge, ordering society." In *States of Knowledge: The Co-Production of Science and the Social Order*, edited by Sheila Jasanoff. London: Routledge.
- Jeon, June. 2019. "Rethinking Scientific Habitus: Toward a Theory of Embodiment, Institutions, and Stratification of Science." *Engaging STS* 5: 160–72. <https://doi.org/10.17351/ests2019.303>.
- Konefal, Jason, and Maki Hatanaka. 2011. "Enacting Third-Party Certification: A Case Study of Science and Politics in Organic Shrimp Certification." *Journal of Rural Studies* 27 (2): 125–33. <https://doi.org/10.1016/j.jrurstud.2010.12.001>.
- Laksmana, D. Dimas and Martina Padmanabhan. 2021. "Strategic engagement in institutions of organic farming in Indonesia." In *Transitioning to Sustainable Life on Land*, edited by Volker Beckmann. Switzerland: MDPI.
- Lin, Yu-Wei, Jo Bates, and Paula Goodale. 2016. "Co-Observing the Weather, Co-Predicting the Climate: Human Factors in Building Infrastructures for Crowdsourced Data". *Science & Technology Studies* 29 (3): 10–27. <https://doi.org/10.23987/sts.59199>.
- Levidow, Les, and Karin Boschert. 2011. "Segregating GM Crops: Why a Contentious 'Risk' Issue in Europe?" *Science as Culture* 20 (2): 255–79. <https://doi.org/10.1080/09505431.2011.563570>.
- McKinnon, Aimee C., Travis R. Glare, Hayley J. Ridgway, Artemio Mendoza-Mendoza, Andrew Holyoake, William K. Godsoe, and Jennifer L. Bufford. 2018. "Detection of the Entomopathogenic Fungus *Beauveria Bassiana* in the

Rhizosphere of Wound-Stressed Zea Mays Plants.” *Frontiers in Microbiology* (9): 1-16. <https://doi.org/10.3389/fmicb.2018.01161>.

Ministry of Agriculture. 2003. “Keputusan Menteri Pertanian No: 432/Kpts/OT.130/9/2003 Tentang Penunjukan Pusat Standardisasi dan Akreditasi sebagai Otoritas Kompeten Pangan Organik [The Ministry of Agriculture’s Decision Number: 43/Kpts/OT.130/9/2003 on the Appointment of Standardization Centre and Accreditation as a Competent Authority in Organic Food].”

Myers, Natasha. 2008. Molecular Embodiments and the Body-work of Modeling in Protein Crystallography. *Social Studies of Science* 38 (2): 163-199. <https://doi.org/10.1177/0306312707082969>

Murphy, Michelle. 2017. ”What Can't a Body Do?” *Catalyst: Feminism, Theory, Technoscience* 3 (1): 1-15. <https://doi.org/10.28968/cftt.v3i1.28791>.

Nygren, Anja. 1999. “Local Knowledge in the Environment–Development Discourse.” *Critique of Anthropology* 19 (3): 267–88. <https://doi.org/10.1177/0308275X9901900304>.

Paxson, Heather. 2013. *The Life of Cheese: Crafting Food and Value in America*. Berkeley: University of California Press.

Pestre, Dominique. 2008. “Challenges for the Democratic Management of Technoscience: Governance, Participation and the Political Today.” *Science as Culture* 17 (2): 101–19. <https://doi.org/10.1080/09505430802062869>.

Plantation General Directorate of the Ministry of Agriculture. 2016. “Dukungan Perlindungan Perkebunan: Pedoman Teknis Pengembangan Desa Pertanian Organik Berbasis Komoditas Perkebunan Tahun 2016 [Supports for the Protection of Plantation: Technical Guidelines for the Development of Organic Village of Plantation-based Commodities in the Year of 2016]”.

- President of the Republic of Indonesia. 1986. "Instruksi Presiden No. 3/1986 Tentang Peningkatan Pengendalian Hama Wera Coklat pada Tanaman Padi [Presidential Decree number 3/1986 on the Improvement of Brown Plant Hopper Control on Rice Crop]."
- Sahota, Amarjit. 2010. "The Global Market for Organic Food and Drink." In *The World of Organic Agriculture: Statistics and Emerging Trends 2010*, edited by Helga Willer and Lukas Kilcher. 54-58. Bonn, Frick: IFOAM, FiBL.
- Santos, Boaventura de Sousa. 2018. *The End of the Cognitive Empire: The Coming of Age of Epistemologies of the South*. Durham: Duke University Press.
- Sawit, M. Husein, and Ibrahim Manwan. 1991. "The Beginnings of the New Supra Insus Rice Intensification Program: The Case of the North Coast of West Java and South Sulawesi." *Bulletin of Indonesian Economic Studies* 27 (1): 81–103. <https://doi.org/10.1080/00074919112331335948>.
- Schreer, Viola, and Martina Padmanabhan. 2020. "The many meanings of organic farming: framing food security and food sovereignty in Indonesia." *Organic Agriculture* 10: 327-338. <https://doi.org/10.1007/s13165-019-00277-z>.
- van de Fliert, E. 1993. *Integrated Pest Management: Farmer Field Schools Generate Sustainable Practices : A Case Study in Central Java Evaluating IPM Training*. Wageningen: University of Agriculture.
- Winarto, Yunita T. 1995. "State Intervention and Farmer Creativity: Integrated Pest Management Among Rice Farmers in Subang, West Java." *Agriculture and Human Values* 12 (4): 47–57. <https://doi.org/10.1007/BF02218566>.
- _____. 2004. *Seeds of Knowledge: The Beginning of Integrated Pest Management in Java*. Yale Southeast Asia Studies monograph 53. New Haven Connecticut: Yale University Southeast Asia Studies.

_____. 2011. "The Ecological Implications of Central Versus Local Governance." In *Beyond the Sacred Forest*, edited by Michael R. Dove, Percy E. Sajise, and Amity A. Doolittle, 276–301. Durham: Duke University Press.

_____. 2016. "Bab 1: Mengatasi "Ancaman Krisis Pangan" dan Menanggulangi "Sesat Pikir": Suatu Pengantar [Chapter 1: to Address "The Threat of Food Crisis" and to Tackle "Wrong Mindset": a Preface]." In *Krisis Pangan Dan "Sesat Pikir": Mengapa Masih Berlanjut? [Food Crisis and "Wrong Mindset": Why It Continues?]* edited by Yunita T. Winarto, 1-20. Jakarta: Yayasan Pustaka Obor Indonesia.

Winickoff, David E., and Douglas M. Bushey. 2010." Science and Power in Global Food Regulation: The Rise of the Codex Alimentarius." *Science, Technology, & Human Values* 35 (3): 356-381. <https://doi.org/10.1177/0162243909334242>.

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