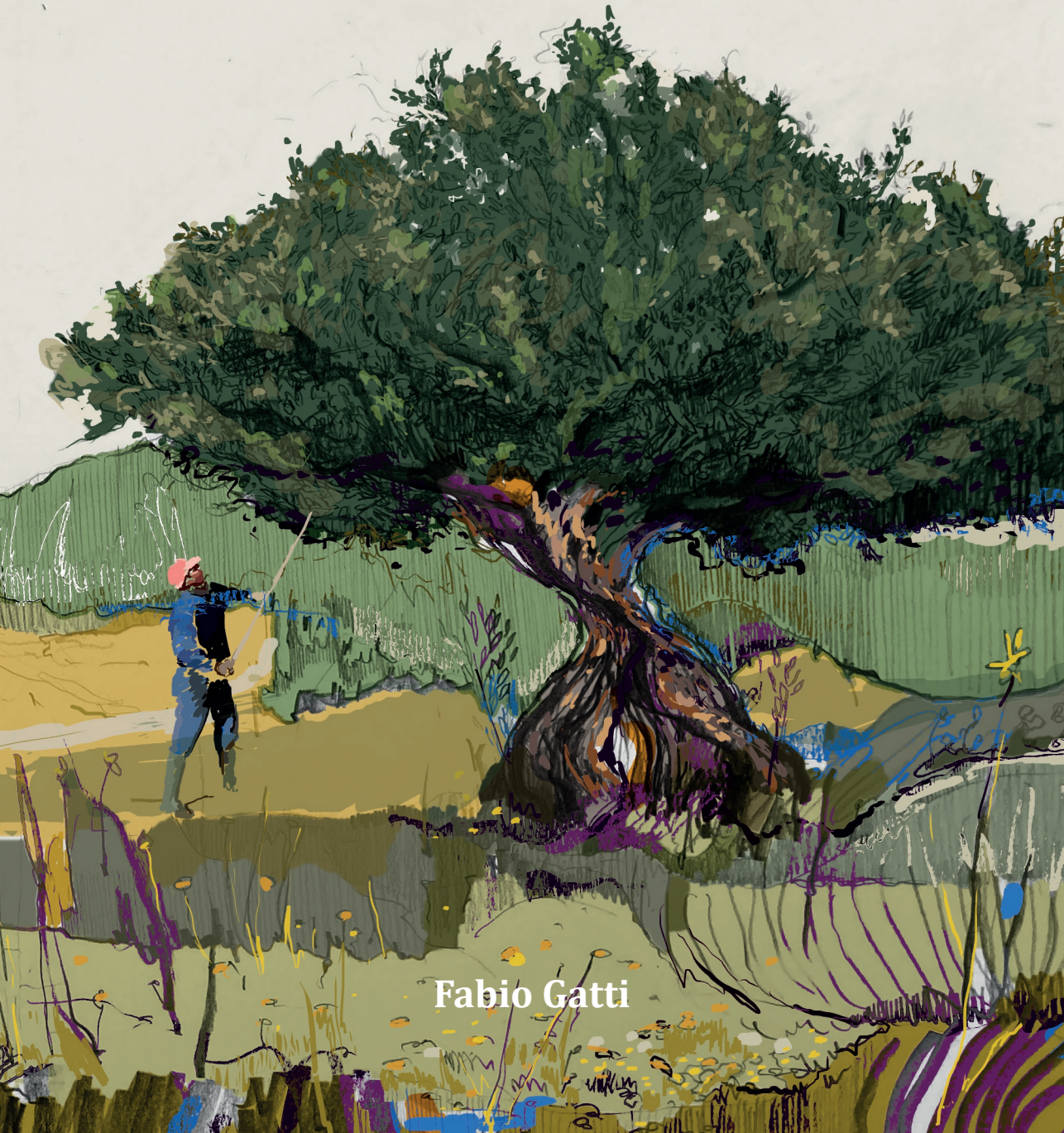
Olive trees in the more-than-human Anthropocene

The multidimensional politics of plant disease in Southern Italy



Fabio Gatti

Propositions:

1. Addressing the challenges of the Anthropocene requires multispecies collaborations alongside interdisciplinary and transdisciplinary ones.
   (this thesis)

2. The discussion around indigeneity and “ontologies” in Western academia is excessively idealized and trivialized.
   (this thesis)

3. All science is ultimately driven by friendship and love.

4. Competition for funding among WASS chair groups undermines collaboration and intellectual exchange.

5. The accelerating speed of academic publishing slows down scientific knowledge production.

6. Italian "traditional" cuisine is a modern invention.

7. Having a beer with a colleague is more useful for the advancement of science than formal institutional meetings.

8. Generative AI threatens work only when workers are turned into machines.

Propositions belonging to the thesis, entitled

Olive trees in the more-than-human Anthropocene: The multidimensional politics of plant disease in Southern Italy

Fabio Gatti,
Wageningen, 7th October 2026

Olive trees in the more-than-human Anthropocene

The Multidimensional Politics of Plant Disease in Southern Italy

Fabio Gatti

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Olive trees in the more-than-human Anthropocene

The Multidimensional Politics of Plant Disease in Southern Italy

Fabio Gatti

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in presence of the
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To my olive trees.
Many times, they saved me.
Now it is my turn to (try to) save them.

To my parents.
Like the olive trees
They have also protected me
And soon will need
The care of a child

Acknowledgements

I have often thought about when the time would come to write these acknowledgments. On the one hand, because that moment would mean my PhD had come to an end. On the other, because it would finally allow me to thank all the people without whom this work—and, more generally, what I consider to have been a reasonably good life during the challenging endeavor of pursuing a PhD—would simply not have been possible. Now that moment has finally arrived. Recently, a professor at WUR reminded me that "science can never be done in isolation." The same is true of a PhD: it can hardly be completed without a wide network of support, care, friendship, and intellectual companionship. What follows, therefore, is my necessarily incomplete attempt to acknowledge the many people who have accompanied me along this trajectory, and often well beyond it.

A couple of preliminary notes before I begin. First, not everyone mentioned on the following pages made a direct contribution to the final shape of this thesis. Many did something just as important: they created the intellectual, emotional, and social environment that made it possible for me to think, write, relieve stress, overcome difficult moments, share the happy ones, and eventually get to where I am today. A dissertation is never only the outcome of funding, research design, data collection, writing, and supervision. It is also—and I would dare to say, mainly—the compound result of informal conversations, dinners, coffees, beers, walks, parties, tiny and at times imperceptible acts of care, and the many forms of presence that make academic life less lonely.

Second, the problem with being, as people sometimes call me, "a social person," is that one ends up with many friends. This acknowledgment section will therefore be somewhat longer than the standard "I-am-putting-this-here-because-I-have-to". My supervisors used to tell me that the Introduction and the Discussion are the parts of a thesis where one can really hear the author's voice. In my opinion, however, the place where one's voice most clearly comes through—without filters, with emotion, and rich in (sometimes funny) details—is the acknowledgment section of any book, dissertation, or edited collection. So here it is: probably the most intimate and personal piece of this (at times, let's be frank, quite boring; although I hope not too much) academic dissertation.

In official institutional terms, this thesis took five and a half years, from February 2021 to October 2026, to complete (although is it really *finished*? What does

"finished" mean when one's research is not about a distant setting or an external case study, but is so intimately connected with one's life, family history, and familiar places? In a different world, with different financial resources, I could have written two, maybe three more chapters; I am confident they will still come at some point). During those five and a half years, I had the pleasure of meeting and spending time with a number of great scholars and wonderful people who helped me live in Wageningen without the urge to escape too often from what would be, for many, an unbearably small town.

First, I want to thank my promotors and supervisors. I still remember when Phil Macnaghten came to my office during one of my first months as a PhD candidate in KTI, asking whether I had already found a promotor for my PhD project. At the time, I was not entirely sure that his profile was the right fit for what I wanted to do. Over the years, I had to revise that initial impression. Phil, you have been a kind, supportive, and always-present-when-needed promotor. Thank you for your patience and guidance. I am aware that I am not always the easiest person to supervise or mentor, but history shows that, with patience and care, I can eventually come to grips with more reasonable—and sometimes milder—positions (and, most importantly, write!). I've learned a great deal from you over these past years.

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My PhD path would not have been the same without the PhD candidates, postdoctoral researchers, and external collaborators who made the GEOS project a stimulating environment for learning to become a researcher. Although at times I felt a bit of an outsider to the core group of Brazilian academics who constituted, from the beginning, the central spine of the project—various circumstances made the

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Likewise, I want to thank Matthias Kramm, Abigail Nieves Delgado, Luisa Poliseli, Luis Reyes Galindo, and Vitor Renck—the postdoctoral and more experienced researchers who formed an inspiring bridge between PhD life and the life of an established academic. Through you, I learned that it is possible to become an accomplished researcher while remaining genuinely close to younger, less experienced colleagues. Luis, I am still waiting for you at my place in Italy; I hope I will be able to host you one day, as we had planned in August 2023. Matthias, we should continue exploring ways to open nuts without a nutcracker. Luisa, thank you for the many conversations and good beers we shared—we were certainly among the group's most passionate appreciators of alcoholic beverages (though I still have to witness Phil's drinking habits—I expect that, as a good British man, he might be a span above us). Francisco Vergara-Silva, our external collaborator from UNAM, thank you for the conversations we had in Mexico City and San Cristóbal de las Casas—I hope our paths will cross again.

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Beyond these WUR academic communities, I had the pleasure of being part of another: Droevendaal. Although I remain critical of spaces that (often) carry a sense of moral superiority and display a high density of people from privileged, high-class backgrounds, it would be a mistake not to recognize how much this community helped me sustain a healthy life outside the office and fueled a social life that probably would not have been possible elsewhere. To my changing comrades and housemates during the first epoch of 107—Mariana, Eliot, Eleni, Fotis, Claire, Alessandro, and Sonja—you are beautiful people. To the second (or third) generation of 107eners (at least the ones I interacted with most), Ana-Maria, Ina, Merel, and Wilhelm, as well as the extended family of 106: Carlota, Anna, Julien, Alek, Alessio, and Belén; we shared meals and conversations, parties and tears, and I am grateful that you have been for a while—and surely will remain—a wonderful family to me.

The seeds of the arguments at the heart of this thesis were sown during my master's at the International Institute of Social Studies in The Hague, where I was fortunate enough to encounter a remarkable group of critical scholars. ISS is probably the place in the Netherlands with the highest concentration of critical scholars in a single small building. From that period, I thank my closest companions in the MA program in Development Studies—Fizza Batool, Martin Dacles, Lina Hötzeneder, and Daniel Ortiz Gallego—as well as the PhD candidates and postdoctoral researchers at the time who became friends, loves, sources of intellectual inspiration, and wonderful examples of fierce activist commitment: Ilaha Abasli, Alberto Alonso-Fradejas, Natacha Bruna, Andrea Floridi, Isis Meneses Taboas, Tsegaye Moreda, Jimena Pacheco Miranda, Daniele Rossi-Doria, and Amod Shah (I am surely forgetting some of the close ones and many of the less close ones, but please forgive me for the rush). To Sandy, for running the most important place in the building (the Butterfly bar) and for being the most un-Dutch person I know. Thanks also to my extraordinary cohort of teachers at the time: Murat Arsel, Saturnino (Jun) Borras, Julien François-Gerber, Wendy Harcourt, and Oane Visser. You were the kind of team any student of critical development studies would dream of. For me, this PhD was the natural

continuation of a process of becoming a social scientist that began long before I arrived at Wageningen University, and I consider you part of that journey.

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will serve as the basis for future investigations. Stacy Philpott and her "ants people"—Peter Bichier, Sanya Cowal, Suzanne Lipton, and Jocelyne Rojas—rapidly became a second academic family on the other side of the ocean. I loved hosting you and showing you around Puglia, and you showed me that people can be great researchers, obsessive wine tasters, and wonderful human beings all at once. I hope to visit you and your group someday in the near future. Rodrigo Almeida at UC Berkeley also opened the doors of another academic institution that many scholars can only dream of. I will not forget the generosity with which you welcomed me and the support I have felt from you since then, even at a distance. Stephen Gliessman and Robbie Jaffe, thank you for showing me your farm and for coming to visit mine—though by pure chance. Casey Walsh, thank you for putting me in the biggest room and in front of the biggest audience I could possibly imagine for an introductory lecture in Anthropology. It was the closest example of our saying in Italy: learn to swim by jumping into the water.

A brief note on the decolonial stance that guides—or at least aspires to guide—this dissertation. The thesis was initially conceived as a comparative project bringing together three case studies: olive trees in the Southern Italian region of Apulia, almond trees on the Spanish island of Mallorca, and coffee plantations in the Southern Mexican state of Chiapas. Accordingly, at the very beginning of my PhD, I conducted exploratory fieldwork in both Mallorca and Mexico. The fact that little of these visits remains in the final version of this thesis has to do in part with the fact that the empirical material from the Apulian case proved sufficiently rich and complex on its own to allow for substantial elaboration and publishing; incorporating a comparative paper would likely have diluted the argument and, in my opinion, made the overall thesis less coherent. But second, and importantly, this decision reflects a conscious choice to avoid speaking about—and claiming authority over—geographies, histories, and communities with which I have little personal, political, or emotional connection.

This does not mean that my encounters with almond farmers in Mallorca or coffee farmers in Chiapas were irrelevant. Quite the opposite, they deeply shaped my thinking and provided valuable inspiration for approaching the Italian case. Still, rather than becoming yet another outsider speaking about Indigenous lands and Indigenous peoples, I deliberately chose to focus on a world I know more intimately, to which I am emotionally attached through my family history, and which my positionality allows me to engage with in the most respectful and responsible way: olive trees, olive landscapes, and olive farming.

I would also like to thank the many scholars—maybe now I can call them colleagues—who supported me or commented on early drafts of some of my papers and other chapters of this thesis: Rodrigo Almeida, Sayan Banerjee, Bram Büscher, Robert Fletcher, Julie Guthman, Carlota Houart, Edward Huijbens, Matthias Kramm, Ivette Perfecto, Adriana Ressiore, Michiel van der Pavert, and Mark Vicol. Your generosity has taught me that academia works not only through competition but also through collaboration and mutual aid.

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Finally, I turn to my friends and family in Italy and beyond. They know the long, decidedly nonlinear path that brought me here: from engineering to starting a PhD in physics, and then through the profound crisis that led me to completely overturn my formal education. They supported and cared for me throughout that difficult period and everything that followed.

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Some people say that family is not simply what you get assigned by fate, but is also what you choose. By that measure, mine is wonderfully large and richly composed.

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Looking back, I acknowledge that some mistakes were also part of this journey, as they are in everyone's life. I hope I have become a better person by recognizing them, learning from them, and trying to do better. I wish everyone could be given a second chance and the opportunity to show what they have learned. More than anything, this thesis has taught me that intellectual work is sustained by relationships and that care, friendship, and love are not peripheral to scientific research but, often, precisely what make it possible.

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Chapter 1



General Introduction

1

> *"The life worlds of plants, animals, fungi, and bacteria are already entangled in modernist enterprises—even as they also exceed the frames and boundaries of those enterprises, taking off in their own directions as well. Rather than stable ecologies that stay still to let themselves be used and named, we now have to learn to study ecologies that are unstable, undomesticated, and "on the move". These multispecies assemblages of life react to us—whether collapsing from our violent industriousness or, alternatively, taking advantage of it to proliferate with their own undomesticated violence."* (Bubandt & Tsing, 2018, p. S1)

> *"Although romantics like to see farmers as pursuing the virtuous vocations of tending land and feeding people, modern growers are businesspeople, imbricated in the dynamics of capitalism"* (Guthman, 2019, p. 11).

I am not sure when I first began to care about olive trees. Perhaps it was as a child, running through the groves around my family's countryside house, seeking shade from the often unbearable summer heat of southern Italy? Perhaps during the COVID-19 pandemic, while I was harvesting olives with my father through an unusually abundant season—without the usual help from friends and relatives, due to mobility restrictions—and after that, left wondering what to do with so much oil? Or perhaps when I first heard about the bacterium *Xylella fastidiosa* spreading throughout the whole Salento, and I started wondering whether the only way to save our trees from disease was to start caring for them—more intensively, more attentively—in the same way, or maybe better, as my father, uncle, and neighbors had done during my entire childhood? I cannot pinpoint a single moment of origin, nor an epiphany that suddenly revealed the centrality of olive trees to my life. What I do know, however, is that somewhere between my training as an engineer and my reorientation toward the social sciences, olive trees became a central concern—an entity I began to approach with intimate curiosity, bodily attachment, and a growing sense of political responsibility.

The story told in this thesis is, in part, a story of loss. It is a story of the decline of a particular form of nonhuman life—the centenarian olive trees of Southern Italy—but also of the erosion of a particular form of *human* life: the peasant farmer.

One of the central arguments of this thesis is that these two losses cannot be understood separately. Not simply because one contributes to the other in any straightforward sense (if there are no olive trees, then there cannot be any olive farmers), but because they co-constitute each other. The story of the Olive Quick Decline Syndrome (OQDS), the name given to the disease that has been spreading across the Southern Italian region of Apulia since the early 2010s (Martelli et al., 2016), is not only one of trees dying or suffering from illness. It is also the story of the gradual disappearance of those who, over generations, have cared for these trees, worked with them, and been sustained by them—and who, in doing so, have made the Apulian olive landscape itself possible in the form we know it today.

This thesis focuses on the controversy surrounding the management of a plant disease. In its simplest formulation, it asks: why did the conflict over OQDS in Apulia reach the intensity it did in the first place? Caused by the bacterium *X. fastidiosa* subspecies *pauca* (Saponari et al., 2017), the epidemic took hold in Apulia with particular force. Although the bacterium is endemic in the Americas, where it has been known since the 1970s (Purcell, 2013), and has been associated with diseases affecting crops such as almonds, citrus, and coffee (Sicard et al., 2018), its arrival in Southern Italy coincided with a historically specific conjuncture that amplified its impacts. Among the most important elements of this conjuncture was the spatial organization of the landscape itself. Apulia is one of the major olive-producing regions in the Mediterranean: it is estimated to host around 60 million olive trees across approximately 375,000 hectares and accounts for almost 50 percent of Italian olive production (Di Loreto et al., 2025). Much of this territory is characterized by extensive, often uninterrupted olive monoculture. This spatial configuration—centuries-old host trees distributed across vast, contiguous groves with limited ecological diversification and few interruptions—made the region particularly susceptible to the bacterium's spread (see Chapter 2).

Yet what makes the Apulian case exceptional is not only the scale of the epidemic or its economic significance. Olive trees in Apulia are central elements of complex olivescapes[1] shaped by rural histories, cultural identities, and affective attachments. They are landmarks in the deepest sense: they shape how Apulian people situate themselves in the landscape, relate to ancestors, and imagine their responsibilities

[1]I use this term in analogy with similar conceptual constructions that foreground the hybrid and relational character of formations at the interface of nature and culture, such as, for example, "waterscapes" (Swyngedouw, 1999; Baviskar, 2007; Karpouzoglou et al., 2017) or "firescapes" (Smith et al., 2016; Chastain & Islar, 2024), among others.

toward future generations—and, although increasingly less so, how they make a living. Uprooting an olive tree, in this context, cannot be seen merely as a phytopathological intervention aimed at eradicating a pathogen. For many, it represents a deeper rupture in a way of being in the world and inhabiting a territory. This thesis takes that rupture seriously. It is not exclusively concerned with the fate of a crop as an economic object, nor with measuring the effects of an epidemic on society, as if trees and people could be neatly separated. Rather, it seeks to illuminate the political stakes of a historically sedimented relationship between humans and nonhumans. In this sense, it is a multispecies story: a story of interwoven destinies, uneven responsibilities, and shared vulnerability.

It is also, fundamentally, a story about politics. Questions of what is to be done—how to respond to the spread of a bacterium, how to "save" the olive trees, how to sustain olive farming—are inherently political. They involve competing visions of what ought to be protected, by whom, through which means, toward what future and to what end. This thesis argues that this is a multidimensional political problem. It is a matter of (political) ecology, as the disease emerged within historically produced landscapes and highly specific socio-ecological conditions that contributed to the outbreak of the epidemic (Chapter 2). It is a matter of (political) epistemology, because competing forms of knowledge have shaped how the disease has been understood, validated, and governed (Chapter 3). It is a matter of (political) ontology, because the olive tree, the disease, and the very object(s) of phytosanitary intervention are different entities for different actors (Chapter 4). And it is a matter of (political) economy, as structural forces condition the landscape of possibilities for which practices of care can be sustained and which, conversely, end up relegated to the margins (Chapter 5).

Rather than treating these dimensions as separate domains or successive "generations" of political ecology (Escobar, 2010; see section 1.3.4), this thesis advances a different proposition: that political economy, political ecology, political epistemology, and political ontology are four *analytically distinct yet empirically inseparable dimensions* of politics in the Anthropocene, and that their analytical force is greatest when they are brought together rather than treated as competing—or, at times, fully incompatible—theoretical lenses. Economic forces shape socio-ecological dynamics; socio-ecological assemblages condition how particular ontologies sediment; ontological commitments influence epistemic practices; epistemic practices feed back into policy and economic interventions; and so on. What emerges, then, is not a simple addition of perspectives but a multidimensional

politics produced through their ongoing interaction.[2] None can be reduced to the others; none can be meaningfully analyzed in isolation.

Addressing these processes requires an analytical approach that clarifies how these dimensions intersect, overlap, and mutually influence one another in concrete situations. This thesis develops such an approach through an in-depth engagement with the *X. fastidiosa* epidemic in Southern Italy. Before setting out the research questions and theoretical framework more systematically, however, it is necessary to introduce the empirical terrain on which these dynamics unfold. Let me then briefly accompany you through the following: a multispecies story of care and extinction.

1.1. Burning trees

In the summer of 2023, while I was back at my family home, the burning of olive trees dominated the news. At night, if one looked carefully across the dark countryside, isolated flames could be seen illuminating the twisted silhouettes of trunks that had stood for centuries (Fig. 1.1). More often, what remained visible were the traces of such episodes: blackened trunks still standing after a night, or even several days, of slow combustion (Fig. 1.2). For someone so accustomed to their majestic presence and to landscapes where olive trees stretched as far as the eye could see, these images were deeply unsettling. One possibility was that these were wildfires, not unusual in a region where temperatures can easily reach 35-40 degrees Celsius in summer. Another was that they had been deliberately set alight as a warning to the owner, events not unheard of in an area dominated by local criminal groups. Yet, after closer inspection and multiple conversations with farmers during fieldwork, a competing explanation emerged: in some cases, the fires had been started by the owners themselves. How could it be that olive farmers—or, more broadly, orchard owners—whom I knew to be so intimately attached to these trees were now setting them on fire?

[2]The distinction proposed here is analytical rather than a claim about neat empirical separation. These four dimensions interact simultaneously and non-hierarchically, in ways that resist any neat linear account. How exactly they do so—and what that means for the analysis of socio-environmental conflicts more broadly—is a question I return to in the General Discussion.



Figure 1.1. A centuries-old olive tree set on fire, burning at night in the Apulian countryside. (Photo courtesy: Janos Chialà)



Figure 1.2. Remains of an olive tree after burning. Photo by the author (April, 2026).

To be fair, olive trees in the region were not in the best of health. A decade earlier, in 2013, the phytosanitary laboratory of the regional authority had been notified of the identification of a bacterium called *X. fastidiosa*, a pathogen that, as already mentioned, was known to be endemic in the Americas at the time but had not posed a threat to European agriculture. As retrospective accounts of the discovery suggest, the scientists involved were immediately aware of the gravity of the findings (Rielli, 2023). Because the pathogen was classified under European plant health legislation as a quarantine organism, its detection would have triggered containment measures focused on eliminating the infected plants—a response that some immediately anticipated would prove deeply contentious (Almeida, 2016).

Plant removal is a common strategy for pathogen eradication in plant health governance and, more broadly, in invasive species management (Branco et al., 2023). One can easily imagine applying this measure to a tomato or potato crop: destroying infected plants certainly entails economic loss, but few would argue that cutting down a tomato plant—that can be replanted and harvested the following year—amounts to cultural erasure. In the case of ecologically or culturally significant trees, a public reaction aimed at their "defense" is far easier to imagine (Carnegie & Grant, 2025; for the relevance of social and cultural elements in tree conservation, see Blicharska & Mikusiński, 2014). Yet where such trees are not bound to agrarian livelihoods and historically sedimented rural economies, these conflicts may remain more circumscribed. Olive trees in Apulia, however, are something else entirely: they are simultaneously productive crops, intergenerational inheritances, cultural landmarks, and constitutive elements of historically sedimented landscapes (Chapter 4). Uprooting them does not merely equal removing an "infected" host. It means, for many, cutting ties with place, ancestry, and livelihood. It is this tension, between the economic and the (bio)cultural, the material and the symbolic, that this thesis takes as one of its central points of departure.

After the bacterium was detected and reported, public debate over the disease escalated rapidly. Dominant scientific and institutional accounts framed *X. fastidiosa* as the primary driver of the epidemic. Introduced into Europe through the global trade in ornamental plants (Trkulja et al., 2022), the bacterium was welcomed in Salento by both an efficient insect vector—the meadow spittlebug *Philaenus spumarius* (Hemiptera: Aphrophoridae) (Cornara et al., 2017)—and an exceptionally hospitable host landscape in the region's vast olive monocultures. Because no curative treatment for *X. fastidiosa* diseases exists anywhere in the world (more on this in Chapter 3), containment became the only officially sanctioned strategy. A

detailed monitoring system was established, dividing the territory into an infected zone, a buffer zone, and a containment zone, each with distinct surveillance, plant removal, and control measures (European Commission, 2015). Representatives of the Regional Phytosanitary Observatory began systematically sampling olive orchards and collecting olive branches to send to the Apulian government's phytosanitary laboratories or to the National Research Council's plant pathology labs in search of molecular traces of the bacterium. If the bacterium was found, the tree's GPS coordinates would be recorded, and the positions of the previously mentioned monitoring zones would be updated accordingly.

Yet this account was never fully accepted by parts of the local population. A wide and heterogeneous constellation of actors—including some scientists, farmers, political activists, and landowners—challenged the dominant representation of the disease and the measures adopted in response. This contestation took multiple forms, from lawsuits and injunctions against eradication measures to public protests, media campaigns, and direct acts of civil disobedience aimed at preventing the uprooting of infected trees (Nadeau, 2015a). In the discursive domain, it also manifested through conspiracy narratives or science-denialist claims: that the bacterium "did not exist" or had been deliberately introduced into Apulia to "turn the region into a desert," clearing the way for speculative investment or benefiting multinational corporations with an interest in selling pesticides, herbicides, or other technological fixes (Rielli, 2023; Parmigiani, 2024). Yet this thesis contends that science denialism is only part of the story—and, in many ways, a relatively minor part (Chapter 3). In what follows, I seek to develop a more nuanced account of the controversy surrounding the management of the *X. fastidiosa* epidemic in Apulia: one that takes seriously the economic, ecological, epistemological, and ontological dimensions of a conflict that cannot be reduced to a simple opposition between science and its denial. This broader reading is also consistent with recent scholarship showing that resistance to science-based measures in Salento was shaped not only by misinformation but also by moral repertoires rooted in environmentalism, civil resistance, and distrust of institutional authority (Brandmayr, 2025).

The burning of olive trees that I started with is emblematic of the crisis's multidimensional nature, as it clashes with a purely ontological, more-than-human understanding of the case (more about these terms later in the text) and, at least in my reading, reminds us of the economic dimension that much of the more-than-human/ontological literature, at times, neglects (see subsection 1.3). Since 2007, olive trees in Apulia have been protected under regional legislation that recognizes

monumental olive trees as productive, ecological, and cultural elements of the regional landscape and prohibits their damage, felling, and uprooting except under derogation procedures. More importantly, removal is costly and often prohibitive for many smallholders, who receive a subsidy for replanting (Chapter 5) but not for clearing the field of diseased trees. In this context, therefore, burning becomes a desperate attempt to bypass an administrative and financial impasse, while also expressing widespread frustration: the sense of having been abandoned by institutions and markets, and by a political debate that has focused on a bacterium while losing sight of the people. The burning of olive trees thus brings back into view a dimension that discussions of epistemic disagreements or ontological clashes—important as they are—too often risk leaving in the background: the political economy of farming and the structural conditions that shape which responses to ecological crises are materially possible and which are not[3]. In this sense, I adopt Julie Guthman's observation in *Wilted: Pathogens, Chemicals, and the Fragile Future of the Strawberry Industry*, reported as one of the opening epigraphs of this introduction, and adapt it to the case of olive farming: while romantic visions of olive landscapes in Apulia depict them as "open-air monuments" or "sublime shapes" feeding an idyllic traditional past, the actual practice of olive farming is a modern business, and, as such, is heavily and constantly influenced by the dynamics of global capitalism.

Understanding how these dimensions—ecological, epistemological, ontological, *and* economic—interact in the Apulian case requires situating it within a broader frame: one that connects the local story of a bacterium and a landscape to wider questions about how socio-environmental crises unfold in the more-than-human Anthropocene. It is to this broader frame that I will now turn.

[3] This observation is directed as much at my own earlier engagement with the case as at broader tendencies within the literature. When I first encountered the *X. fastidiosa* epidemic, I was primarily driven by questions of ontology, knowledge, and more-than-human relations, reflecting my intellectual formation within (more-than-human) political ecology, STS, and the environmental humanities. As my engagement with the case deepened, however, it became increasingly clear that economic drivers and the material conditions of farming were not merely contextual factors but key dimensions of the conflict itself. In this sense, the arguments advanced in this thesis emerge as much from a process of self-critique and analytical refinement as from sustained dialogue with the empirical material and scholarly literature.

1.2. Research problem and research questions

1.2.1. Anthropocene, the Great Acceleration, and the rise of tree pathogens

The Anthropocene (Crutzen & Stoermer, 2000; Crutzen, 2002), proposed as an epoch in which humankind came to dominate nonhuman processes so powerfully as to be considered a geological force in itself, is often visualized through what has become known as the "great Acceleration" graphs (Fig. 1.3): a series of figures showing the exponential rise of a wide range of ecological and socioeconomic indicators—from atmospheric carbon dioxide concentrations and ocean acidification to urbanization, water use, and fertilizer consumption—particularly since the mid-twentieth century (Steffen et al., 2015). Less frequently acknowledged, however, is that a comparable trajectory can be observed in the global proliferation of tree pathogens and insect pests (Fig. 1.4) (Freer-Smith & Webber, 2017). In this sense, plant disease outbreaks are not anomalous disruptions external to the Anthropocene but part of its very fingerprint.

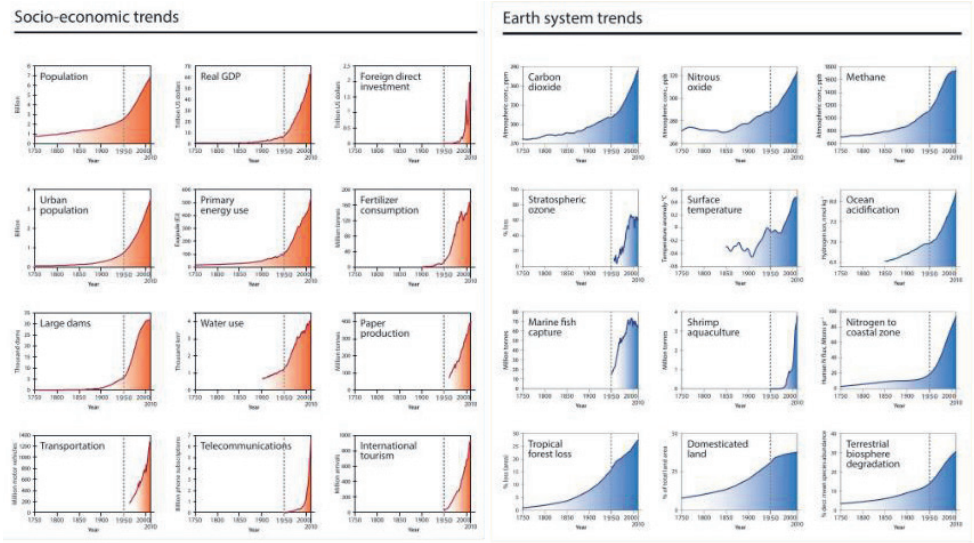


Figure 1.3. The "Great Acceleration" graphs showing the exponential increase of a variety of socio-economic and Earth System indicators. Reproduced from Steffen et al. *(2015), with permission from the Publisher.*

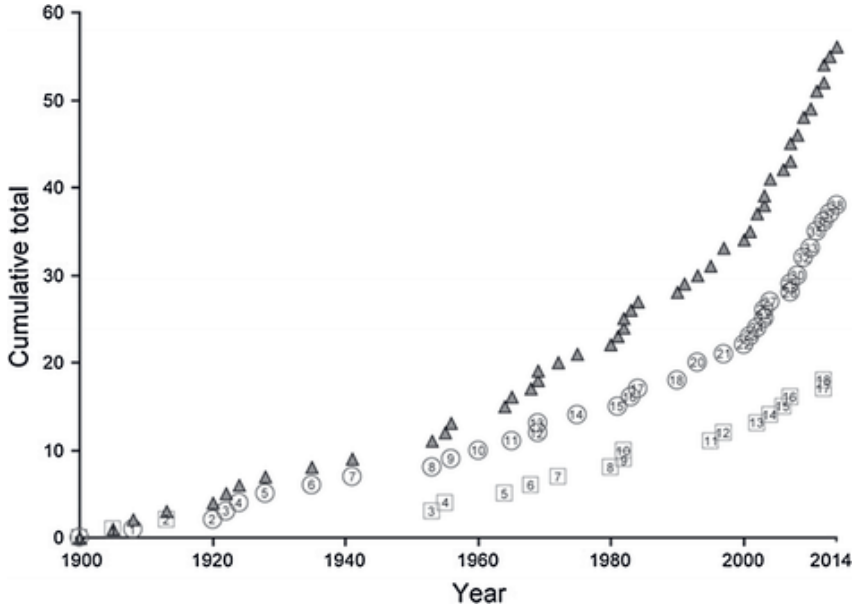


Figure 1.4. The cumulative numbers of new tree pathogens (circle) and insect pests (square) identified in the UK shown over time since 1900. Reproduced from Freer-Smith & Webber (2017), with permission from the Publisher.

Plant diseases have long demonstrated their capacity to transform human societies in profound and sometimes devastating ways. Historical cases such as the Irish Potato Famine (Braa, 1997) and Dutch Elm Disease (Karnosky, 1979) illustrate how plant pathogens can generate cascading effects across ecological, economic, and social domains that can lead to famine, displacement, and large-scale landscape transformation (Zadoks, 2017). Yet despite this, agricultural epidemics are still typically approached through a biological lens: as processes originating in pathogenic threats and subsequently affecting human systems. In this framing, disease appears as an external disturbance to which society reacts, rather than as a phenomenon emerging *from within* historically constituted socio-ecological relations. As a result, the ways in which environmental change, economic arrangements, and human practices actively configure both vulnerability to disease and the trajectories through which epidemics unfold—in other words, the ways in which they co-constitute the very making of disease itself—often remain backgrounded in dominant plant health framings.

In recent years, a growing body of scholarship across science and technology studies (STS), geography, political ecology, and the environmental humanities has increasingly sought to address this limitation. Social science inquiries into plant

diseases—including Julie Guthman's already mentioned work on fungal diseases in California's strawberry industry (Guthman, 2019), Emily Reisman's study of *X. fastidiosa* on Spanish almonds (Reisman, 2021), Stuart McCook's research on coffee leaf rust (McCook, 2019; see also Córdoba et al., 2023), and studies of banana Fusarium wilt (de la Cruz & Jansen, 2018; Paredes, 2021), just to mention a few—have complicated the notion of "plant disease," demonstrating that it should be understood not only as a biological event but as an emergent phenomenon shaped through social, ecological, and material relations. Together, these works form part of a broader effort to bring social sciences into more sustained dialogue with plant pathology and plant science (Castillo, in preparation).

More broadly, the work of Steve Hinchliffe and colleagues (2013; 2016) offers an important conceptual lens for thinking about disease relationally through what they call a "topological understanding" of disease, in which pathogenicity emerges through particular relations, proximities, and intensities rather than as a fixed or intrinsic property of pathogens alone. In a similar vein, Karen Barad's (2007) concept of "intra-action" challenges the assumption that organisms, technologies, and environments exist as fully formed entities prior to their encounters. Instead, entities emerge through the very relational processes that constitute them. Applied to plant disease, both approaches work in the direction of shifting attention away from the properties of pathogens in themselves and toward the relational configurations through which "disease situations" (Hinchcliffe et al., 2016) emerge, spread, and become consequential.

This thesis situates itself within this emerging conversation and shares with these inquiries the conviction that plant disease is a profoundly relational problem that cannot be adequately understood through biological explanation alone. At the same time, this thesis does not aim to offer "just another" multispecies ethnographic account of entangled human and nonhuman worlds, or merely to document the additional dimensions that have contributed to plant disease in the *X. fastidiosa* epidemic in Apulia. It surely does, but its overarching ambition is more synthetic and analytic: to delineate the contours of an integrated framework capable of analyzing how economic, ecological, epistemological, and ontological dynamics become historically articulated in the making of socio-environmental conflicts in the Anthropocene.

1.2.2. Research questions

With this in mind, this thesis is guided by the following overarching research question:

RQ: How is the conflict over X. fastidiosa management in Apulia constituted as a multidimensional political problem, and how do the economic, ecological, epistemological, and ontological dimensions interact to shape its emergence and evolution?

This general question is unpacked through four interrelated sub-questions, each addressing a key analytical dimension (while remaining mindful of their interdependence and, at times, attempting to bring them into partial dialogue):

SRQ1: What are the historical and socio-ecological causes of the Olive Quick Decline Syndrome?

SRQ2: How has knowledge of the disease been built, and who has been granted authority to inform public policy and decision-making?

SRQ3: To what extent can the conflict be understood as an "ontological conflict," that is, a conflict over what is at stake?

SRQ4: To what extent and in what ways do economic conditions, rural development policies, and competing visions of agricultural futures shape the range of possible responses to the crisis?

These four questions are addressed in Chapters 2 through 5 and then brought into dialogue and synthesized in the General Discussion. Together, they aim to move beyond single-domain explanations of plant disease and instead analyze how the economic, ecological, epistemological, and ontological dimensions of socio-environmental conflicts are co-constituted in practice.

1.3. Theoretical and conceptual framework

1.3.1. Anthropocene, Capitalocene, Plantationocene?

Over the past decade, social scientists and humanities scholars have increasingly problematized the concept of the Anthropocene (Malm & Hornborg, 2014; Haraway, 2015; Moore, 2016). While the term has been effective in drawing attention to the planetary scale of human-induced ecological transformation, critics increasingly question its central figure: the undifferentiated *Anthropos*, a homogeneous humanity

depicted as equally responsible for environmental degradation and collapse. Typically, most lines of critique seek to identify more precisely the forces driving contemporary environmental change. Jason Moore (2016), for instance, argues that it is not "humanity" as such, but Capital—as a historically specific set of relations of production, reproduction, and accumulation—that should be foregrounded as the principal driver of planetary transformation. In place of the Anthropocene, he proposes the term *Capitalocene* as a more analytically precise and politically generative diagnosis.

Other scholars have proposed alternative framings that foreground different historical processes and ecological dynamics. The *Plantationocene*, developed through conversations among feminist philosopher of science Donna Haraway, anthropologist Anna Tsing, and others, identifies the plantation as a paradigmatic bio-spatial configuration organized through ecological simplification, coerced labor, and extractive forms of ordering that have been central to modern imperial and colonial projects (Haraway et al., 2016). This perspective is particularly relevant to a thesis concerned with olive monoculture. Although the olivescapes of Apulia differ from classical plantation systems in important respects, they nonetheless exhibit forms of ecological simplification, spatial ordering, and landscape legibility (Scott, 1998) that subordinate multispecies complexity to commodity production (see Chapter 2). Other proposals—including Haraway's *Chthulucene* (Haraway, 2015), as well as less popular interventions such as the *Wasteocene* (Armiero, 2021) or the *Ecocene* (Tănăsescu, 2022)—similarly reflect a broader dissatisfaction with the undifferentiated figure of the *Anthropos* and an effort to identify more precisely the relations, processes, and analytical concepts that shape contemporary planetary change.

In this thesis, I have resisted the temptation to introduce yet another "-cene," even though the case of *X. fastidiosa* might have well warranted a new *Pathogenocene* label (it may still be an idea for later). Instead, I situate my argument within the broader framework of the *more-than-human Anthropocene*.

1.3.2. The more-than-human (patchy) Anthropocene

The more-than-human Anthropocene, articulated most explicitly through the collaborative work that coalesced around the *Feral Atlas* project (Tsing et al., 2021; Tsing et al., 2024), seeks to center the entangled lives of humans and nonhumans in Anthropocene analysis. Rather than abandoning the term Anthropocene altogether, this framework attempts to re-signify it by destabilizing the figure of the universal

"Anthropos." For Tsing, the problem is not humanity as such, but the modernist figure of "Man" produced through Enlightenment thought, modernization, and projects of domination over nature (Haraway et al., 2015, p. 541). The aim, then, is not to completely reject the Anthropocene as a term, but to de-totalize it: to show that Anthropocene processes always emerge through situated socio-ecological relations and historically specific infrastructures. In a way, the Anthropocene is *patchy*: characterized by temporally and spatially uneven developments that need to be brought together through careful empirical analysis (Tsing et al., 2019). While acknowledging the value of planetary-scale modeling, the *Feral Atlas* therefore insists on attending to localized ecological (entangled human and nonhuman) histories, as well as on "rethinking anthropology's anthropocentrism while insisting that people matter, still" (Tsing et al., 2019, p. S188).

Central to this framework is the concept of *feral proliferations*: organisms, ecological processes, and material entities—including pollutants and toxic compounds, not only living beings—that escape human control and spread in unexpected ways, while remaining deeply shaped by human infrastructures and forms of landscape reordering. Feral proliferations are not external to modernity but form part of its unintended excesses: the often unforeseen yet structurally produced consequences of ecological simplification, monoculture, imperial expansion, colonialism, capitalism, and the reorganization of landscapes for commodity production. Rather than treating these developments as anomalies, the concept draws attention to how modernist projects routinely generate forms of life and material processes that exceed their intended purposes and capacities for control. What this framework asks us to study, then, are not stable ecologies awaiting classification or management, but unstable and mobile multispecies assemblages that both inhabit and exceed human projects, as the Introduction's opening epigraph claims.

Xylella fastidiosa can be understood as one such feral proliferation. Introduced into Europe via the global trade in ornamental plants, the bacterium encountered in Apulia a landscape that modernist agriculture had made highly favorable for its spread: vast contiguous extensions of olive monoculture, with limited ecological complexity to interrupt transmission and centuries of accumulated host material to sustain it. In this sense, *X. fastidiosa* did not simply arrive from elsewhere and cause damage. It proliferated within—and was, in important ways, enabled by—a historically produced configuration of human-nonhuman relations: a landscape shaped by long agrarian histories, intensified through agricultural modernization,

and rendered vulnerable by ecological simplification and the erosion of the care practices through which that fragile balance had long been maintained (Chapter 2).

What the more-than-human Anthropocene calls for, then, is an analytical approach that holds together ecological, historical, and political-economic processes without reducing any of them to the others. It also requires taking landscapes seriously, not merely as backdrops but as historically sedimented formations through which ecology, capital, and more-than-human life become entangled. As Tsing, Mathews, and Bubandt (2019, p. S187) write, "the multidimensional crises of our times call for an anthropology [...] that takes landscapes as its starting point and that attunes itself to the structural synchronicities between ecology, capital, and the human and more-than-human histories through which uneven landscapes are made and remade". This thesis takes up that invitation. The more-than-human Anthropocene provides its overarching analytical horizon, situating the *X. fastidiosa* epidemic at the intersection of ecological transformation, agrarian change, and complex multispecies relations. Translating that horizon into a concrete set of analytical tools, however, requires engaging with a broader set of debates—particularly those concerning the promises and limits of more-than-human and ontological scholarship when structural analysis recedes. The following subsection turns to these debates.

1.3.3. More-than-human and ontological "turns" in the social sciences

The more-than-human and ontological turns in the social sciences[4] (Lorimer & Hodgetts, 2024; Holbraad & Pedersen, 2017; Kohn, 2016) have made indispensable contributions to the study of human-nonhuman relations and their interplay with the politics of environmental conflict. By decentering the human subject, foregrounding the role of nonhuman entities, and showing that socio-environmental struggles often

[4]I cluster here two closely related but not identical strands of social science scholarship. Both emerged as critiques of anthropocentric and one-world assumptions, and both have sought to take seriously forms of difference that exceed modern Western ontological and epistemological premises. Yet they do not proceed in exactly the same way: whereas work associated with the ontological turn is especially concerned with alternative world-making practices and radical difference, multispecies and more-than-human scholarship more often foregrounds interspecies entanglements, encounters, and forms of relationality that unfold *within* and *beyond* such differences. As Anna Tsing (2018) notes, the two literatures overlap substantially in authors and concerns, even if some tensions also remain between them.

involve claims over reality and ways of knowing and being in the world—rather than just over access and control of "natural resources" (the same entity that some would call a resource could easily be linked to different relations; see Liboiron, 2021)—these approaches have significantly expanded the analytical repertoire of many social science disciplines, from political ecology to human geography to anthropology. Scholars in the environmental humanities, in particular, have produced beautifully narrated accounts of the entangled histories of humans and nonhumans, attending with care and precision to the slow, often invisible processes through which particular multispecies worlds come into being (see, for example, Van Dooren, 2014; 2022; Chao, 2022). Together, these contributions have been important in challenging anthropocentric assumptions and in demonstrating that environmental crises are always shaped by complex relations among humans, nonhumans, knowledges, and worlds.

At the same time, these approaches have drawn sustained criticism. A number of scholars have argued that an emphasis on "multiplicity", "relationality", "ontologies", "pluriverse", "assemblages", and related concepts can become politically blunt (and in some cases explicitly reactionary) when detached from the structural conditions and internal relations of power that determine the exact nature of those relations (Graeber, 2015; Büscher, 2022; Boelens et al., 2024; Ludwig, 2025; see also Hornborg, 2017; Malm, 2018). These critiques take different forms, and this space is not meant as a full review of them. What they broadly share, however, and what matters here, is a dissatisfaction with analyses that move too quickly away from political economy, material inequality, and historically specific relations of domination. Büscher (2022), for example, argues that excessive decentering of the human risks obscuring the historically specific forms of alienation and domination that intensify under capitalism. Boelens et al. (2024) contend that ontological turns in environmental governance can depoliticize deeply political nature-society relations; Graeber (2015), in dialogue with ontological turn scholarship, questions whether invocations of "radical alterity" are always politically productive; and Ludwig (2025) argues that a narrow emphasis on epistemic recognition can sideline the material conditions of social injustice.

Taken together, however, and in my reading, most of these critiques do not amount to a wholesale rejection of more-than-human or ontological inquiry—although there are also more pessimistic accounts that suggest a deeper incompatibility (see Lave, 2015). Rather, they raise questions about analytical weighting and how to preserve critical distinctions while moving beyond

anthropocentric binaries; in other words, how to position oneself along a hypothetical continuum between the "human" and the "nonhuman" or between "political economy" and "political ontology."[5] As Büscher and Fletcher put it, "the core of the problem we believe is simple: as these authors—and many others in a variety of theoretical "turns" from new materialism and actor-network-theory to the "more-than" or "post"-human—attempt to move beyond the dichotomy in order to show that nature and society are deeply integrated and related, they often push too far. In the process, they erase (too) many critical distinctions, with dangerous consequences" (Büscher & Fletcher, 2019, p.129). Concerns like this, in other words, seem to be less about the move beyond anthropocentrism as such than about the extent and practical implications of that move.

This thesis takes these critiques seriously, but not as definitive grounds for abandoning more-than-human or ontological inquiry altogether. On the contrary, it starts from the conviction that environmental conflicts, such as the one surrounding *X. fastidiosa* in Apulia, cannot be understood without attending to the more-than-human relationality between humans and nonhumans and to ontological differences in how an olive tree is understood and lived. Rather, these dimensions must be analyzed in relation to the structural conditions through which some worlds are sustained while others are rendered fragile, marginal, or impossible. Rather than "taking sides" along a continuum from human to nonhuman, or from political economy to political ontology, this thesis proposes a different way of addressing this problem: one that treats political economy, political ecology, political epistemology, and political ontology as distinct yet co-constitutive dimensions of socio-environmental conflict. In this context, political ecology (as a field rather than as an analytical dimension) needs to be briefly introduced.

1.3.4. Three generations of political ecology?

When analyzing the relationship between humans and the surrounding environment from an explicitly political perspective, political ecology stands out as the field—academic as well as activist—that has most systematically foregrounded

[5]Each of the authors discussed above could be located differently along these hypothetical continua, but a systematic mapping of those positions falls beyond the scope of this dissertation. For present purposes, it is sufficient to note that the disagreement should not be understood in terms of rigid either/or oppositions, but rather as one of gradation, emphasis, and analytical weighting. In this respect, the debate echoes earlier discussions in the social sciences around "structure and agency", or "material vs ideational" (see Knio, 2023).

questions of access to, control over, and distribution of natural resources, including contestation (is to say, politics) over them (Peet et al., 2010; Robbins, 2012; Perreault et al., 2015). This is, once again, not the place for a comprehensive review of the field. What I would like to do here is focus more narrowly on how political ecology has narrated its own evolution. Arturo Escobar's influential account in this regard proposes that political ecology has developed through three generations (Escobar, 2010). In this genealogy, an initial structuralist political ecology, shaped by strong Marxist commitments and the application of political economy to broader concerns about nature and the environment (O'Connor, 1988; for more contemporary work, see Moore, 2015; Foster & Burkett, 2016), is followed by a second generation more strongly influenced by post-structuralist and constructivist debates, in which discourse becomes central to the analysis of how environmental problems are framed and governed (Escobar, 1996). This culminates in a third generation that shifts attention "to issues of ontology besides epistemology" (Escobar, 2010, p. 91; see Mol, 1999; Blaser, 2013; Stengers, 2018). One could add a parallel and companion shift toward more-than-human sensitivities (see Whatmore, 2013; Donfrancesco, 2025; Lorimer, 2025; Margulies, 2026).

This third generation overlaps in fundamental ways with the ontological and more-than-human turns discussed in the previous sections and, in fact, could be seen as an integral part of these "turns": bringing to political ecology a concern with the multiplicity of worlds, the agency of nonhumans, and the limits of modernist epistemology as a frame for understanding environmental conflict. As Escobar describes it, this third generation is marked by "a renewed attention to materiality, whether through a focus on practice, or relations, networks, embodiments, performances or attachments between various elements of the social and the biophysical domains" (Escobar, 2010, p. 98). However, his claim that "taken as a whole, these trends reveal a daring attempt at looking at social theory in an altogether different way–what could broadly be termed flat alternatives" (ibid.) makes clear that an attention to materiality is not the same as an attention to the "structural" (for a critique of "flat ontologies", see Knudsen, 2023).

To be fair, Escobar himself acknowledges this problem. Having mapped the emergence of third-generation political ecology as a shift toward ontology and relational thinking, he concedes, toward the end of that essay, that "it is not clear how [post-constructivist political ecology] reconstructs understandings of power and production that were central to [earlier political ecology]" (Escobar 2010, p. 102). This is a significant admission: it suggests that the generational evolution, rather than

resolving the tension between structural and ontological analysis, has, in some ways, deepened it. The question of how to hold political economy and political ontology together—without dissolving one into the other—remains, in Escobar's own account, open.

This thesis treats that unresolved tension as a productive point of departure and proposes shifting from a genealogical to an analytical reading of these debates. Rather than following a narrative in which political ecology successively incorporates political economy, epistemology, and ontology by moving from one emphasis to the next, this thesis treats these as four analytically distinct yet co-present dimensions of socio-environmental conflict, to be held together rather than sequenced. In doing so, I also take seriously earlier critiques of political ecology as "politics without ecology" (Walker, 2005), while acknowledging the major contributions of more-than-human and ontological scholarship in decentering anthropocentric assumptions and showing that environmental conflicts are also struggles over ways of knowing and being—not only over access and control. The argument here is not that political ecology (as a field) has taken a wrong turn, but that narrating its key contributions as a temporal sequence can obscure the extent to which each layer remains necessary for analysis.

1.3.5. Critical agrarian studies

The concern with the political-economic conditions that sustain particular socio-ecological *rural* worlds places this thesis in dialogue with the field of critical agrarian studies. This field has provided essential tools for analyzing agrarian change and power relations—with particular attention to social inequality and social justice—in rural areas and agricultural contexts. These tools are key to a serious and engaged understanding of a conflict over a plant disease with both productive and cultural repercussions. It is also a field whose internal development, I would argue, reveals a trajectory that, in some respects, mirrors the one just described for political ecology.

Critical agrarian studies was originally shaped by strong Marxist foundations (Edelman & Wolford, 2017; Akram-Lodhi et al., 2021). The foundational debates around the agrarian question—centered on the fate of the peasantry under capitalism and the transformation of agrarian societies and rural areas through the penetration of capital—trace back to Lenin, Kautsky, and other theorists of the Russian revolutionary tradition (Byres, 1977; Akram-Lodhi, 1998; Akram-Lodhi & Kay, 2010c). Moreover, this debate was characterized, from the outset, by disagreement between those who saw peasant differentiation as an irreversible tendency, leading

ultimately to the disappearance of the peasantry (Bernstein, 2013), and agrarian-populist—or Chayanovian—perspectives, which argued that middle peasants could persist precisely because peasant farming operated according to a rationality not reducible to capitalist accumulation (van der Ploeg, 2013) .

This focus on distinct peasant *rationality,* characteristic of Chayanovian positions, can be interpreted as an epistemological shift in critical agrarian studies: a displacement of attention from political economy alone toward questions of political epistemology. It illustrates how epistemological—and, indeed, ontological—dimensions complicate any purely political-economic account of agrarian life. Although Jan Douwe van der Ploeg—one of the most prominent Chayanovian scholars who has extensively elaborated on how peasant farming rests on a completely different rationality with respect to commercial, capitalist farming (see van der Ploeg 2013; 2018)—does not frame them in such terms, his account of *peasant rationality* as grounded in a series of *balances*—between labor and drudgery, autonomy and market dependency, productive intensity and the long-term reproductive capacity of the land, and human and nonhuman natures (van der Ploeg, 2013, pp. 48-77)—can be reread as pointing not only to specific ways of knowing, but also to specific ways of *being* in relation to the farming world.

Discourses surrounding "indigenous ontologies" or "indigenous ways of being" are often framed in terms of balance with nature and, as a consequence, are treated as inherently "sustainable" (Berkes, 2018; Kenter & O'Connor, 2022; Reyes-Garcia et al., 2026). While there is strong evidence that Indigenous knowledges and practices often contribute to biodiversity conservation—and, in some cases, to its enhancement (Garnett et al., 2018; Fa et al., 2020; Sze et al., 2022;)—, this thesis does not fully endorse such essentializing and dichotomous representations of Indigenous ontologies (in line with the nuanced critique developed, for example, in Ludwig & El-Hani, 2025; on a similar vein see Dove, 2006 for a critical appraisal of "indigeneity" and "indigenous environmental knowledge"). Yet these debates make visible how discussions of "peasant rationality" can be extended to the question of distinct "peasant ontologies". In this sense, peasant farming may be understood not merely as an economic strategy or technical practice, but as an activity involving the acknowledgement of the existence of "complex webs of relations between humans and nonhumans" (Blaser, 2013, p. 14).

Recent work in critical agrarian studies has begun to foreground the ontological dimension of farming and to explicitly frame it as such, asking not only how farming is economically organized or shaped by different ways of knowing, but also what

farming is (Carolan, 2018; Campbell, 2020; Ehrnström-Fuentes, 2025). For example, Hugh Campbell's *Farming Inside Invisible Worlds* (2020) approaches the farm as a political-ontological formation whose boundaries, relations, and materialities actively enact particular worlds. From this perspective, modernist agriculture appears not simply as a technical model of production but as a historically specific way of organizing reality—one that renders alternative agrarian worlds less visible, less legible, and less viable. This ontological reorientation has also been shaped by sustained engagement with peasant and Indigenous struggles in the Global South, where conflicts over land, territory, and livelihoods have long been articulated as struggles over distinct ways of inhabiting, relating to, and worlding the earth (Escobar, 2016).

As with political ecology, one could reconstruct this trajectory genealogically, tracing a shift in emphasis from political economy to epistemology and ontology. In critical agrarian studies, however, it is perhaps even more evident that these dimensions have long been co-present rather than neatly succeeding one another. Once again, the thesis does not treat them as successive corrections in the field's evolution but as mutually necessary analytical lenses for understanding agrarian transformation in a field that claims to be "politically engaged, pluralist, and internationalist" (Borras, 2023). In this sense, its contribution to critical agrarian studies mirrors its contribution to political ecology: not the proposal of a new generation, but an insistence that insights into labor, capital, knowledge, practice, and ontological difference remain simultaneously in play, and that their analytical force lies precisely in being brought together rather than in treating them as competing lenses.

It is within this conversation that this thesis approaches olive trees and olive farming in Apulia: not (only) as a resource to be managed or a sector to be modernized, but as a historically constituted, more-than-human way of inhabiting a landscape. Its very space of possibility (read: the survival of the olive farmers and the olive trees) is now threatened not only by the arrival of a bacterium but also by the political-economic, epistemological, and ontological conditions that determine which agricultural futures are rendered possible, desirable, and supportable. Critical agrarian studies, in this sense, provide the analytical grounding that prevents the more-than-human and ontological dimensions of this thesis from floating free of the structural conditions of labor, capital, land, and livelihood through which multispecies worlds are made and unmade.

1.4. Social sciences research on *Xylella fastidiosa*

While the previous section situated this thesis within broader scholarly debates and disciplinary conversations—from Anthropocene discussions to the more-than-human and ontological turns, from political ecology to critical agrarian studies—this section addresses one final requirement: locating it within the narrower and more specific social science literature on *X. fastidiosa* in Apulia. Although the dissertation makes several original contributions to this debate, it is also indebted to a growing body of scholarship that has subjected the case to sustained social-scientific analysis. To be sure, I do not attempt to review here the much larger body of research on the pathogen's biology or the disease's epidemiology. Rather, I focus on work that has examined the social, political, and cultural dimensions of the Apulian case.

A first wave of social-scientific engagement with *X. fastidiosa* in Apulia coalesced around the work of scholars connected, directly or indirectly, to the experience of *Collettivo Epidemia* (Epidemic Collective), a group of scholars and activists from different disciplinary backgrounds—STS, geography, philosophy, and sociology—whose work engaged with the epidemic between roughly 2015 and 2022 (Colella et al., 2019; Colella, 2020; Bandiera & Milazzo, 2021; Vacirca & Milazzo, 2021; Bandiera, 2023). A foundational intervention in this regard is that of Colella et al. (2019), in which the authors framed the controversy as a conflict over both "problem setting and problem solving" and characterized the epidemic as a *socio-phytopathology* rather than "just" a phytopathology (see also Colella, 2020). Subsequent contributions further elaborated on the case from a social-scientific perspective, either interpreting the material entanglements of olive trees, spittlebugs, soils, microorganisms, and human bodies as "visceral ecologies" (Bandiera & Milazzo, 2021), or examining how the epidemic reorganized representations of value, aspiration, and "care" in post-disaster Salento, giving rise to divergent responses that ranged from productivist replanting to agroecological and commons-based projects of territorial regeneration (Vacirca & Milazzo, 2021).

Together, these works were crucial in subjecting the *X. fastidiosa* controversy to critical social science analysis, and in showing that what was at stake was not simply a phytosanitary problem but also a conflict over knowledge, practices, and more-than-human relations. At the same time, they also present some limitations. Colella et al.'s intervention, while pioneering, remains strongly organized around the denunciation of epistemic reductionism and the recovery of alternative knowledges,

at times risking an overly sympathetic treatment of social movements' claims—which, as will become clearer in what follows, do not always coincide with the claims of farmers themselves. The contributions by Bandiera & Milazzo (2021) and by Vacirca & Milazzo (2021) are particularly generative in conceptual terms, but they tend to move too decisively toward care, ontology, and regeneration, at times leaving the political-economic structuring of the crisis in the background.

More recently, a second wave of social science scholarship has revisited this debate to address some of its gaps. Brandmayr (2025), for example, argues that opposition to science-based *X. fastidiosa* containment measures in Salento cannot be explained by simple anti-scientific ignorance or by a straightforward case of lay resistance to technocracy. Instead, they show that distrust of experts was shaped by left-wing and environmental political cultures, in which olive trees were sacralized and scientific institutions were framed as complicit in authoritarianism, neoliberal restructuring, and even criminal collusion. In this way, the article highlights how resistance to expert authority was mediated by moral and cultural codes. Dell'Abate (2025), by contrast, shifts attention from the conflict over containment measures to the question of agrarian regeneration from Salento's farmers' standpoint. Questioning both the conflict-centered and normatively anti-productivist tendencies of earlier scholarship, they foreground the productive sphere and shows that the various responses to the crisis do not necessarily appear to farmers as mutually exclusive alternatives. Rather, they emerge as a flexible repertoire of at times coexisting strategies—intensification, diversification, reforestation, reconversion, multifunctionality—selectively combined according to each farm's conditions and possibilities. This thesis shares with Dell'Abate's intervention a concern with the productive sphere of olive farming and a sensitivity to the perspectives of those who depend on it for their livelihood—perspectives that often sit in tension with more romanticized or idealized visions of olive trees as monuments or as mere cultural heritage.

It is finally worth noting that, although *X. fastidiosa* has been detected not only in Italy but also in France, Spain, Portugal, and some non-European countries beyond the Americas (EPPO, 2026), the pathogen appears to have generated a substantial body of social-scientific reflection only in the Italian case. This likely has to do, first, with the exceptional intensity of the controversy that unfolded in Apulia, where phytosanitary measures, scientific expertise, judicial interventions, and local mobilizations shaped a highly polarized public space; and second, with the particularly dramatic impact of the epidemic on olive trees, a species carrying

extraordinary and simultaneous agrarian, historical, and symbolic weight in the region. Italy was also the first European country to confront the pathogen after its initial detection in the EU in 2013, a circumstance that arguably contributed to the uncertainty and politicization of the early response, whereas later-affected countries were able, at least to some extent, to act in the shadow of the Apulian precedent and its accumulated lessons. An important exception in this regard is Reisman's (2021) anthropological engagement with the outbreak in Mallorca, which extends the analysis of *X. fastidiosa* beyond Italy by interpreting the epidemic through the lens of "the politics of care" and by showing how disease emerges within a broader ecological breakdown of agrarian relations shaped by the complex interaction between tourism, precarious land tenure, state withdrawal, and climate change.

The present thesis draws on and extends these contributions. It builds on this emerging body of scholarship while seeking to complement it in two main respects: first, by integrating ecological, epistemological, ontological, and political-economic dimensions into a more explicitly integrated analytical framework; and second, by situating the *X. fastidiosa* case more firmly within broader debates on plant disease, agrarian change, and the more-than-human Anthropocene.

1.5. Methodology and positionality

The research presented in this thesis is grounded in ethnographic inquiry but departs in important ways from more conventional approaches in anthropology. First, it draws on what has come to be called multispecies ethnography (Kirksey & Helmreich, 2010; Locke & Munster, 2015; Hartigan, 2021), an approach that attends not only to human communities (the classical object of first anthropological explorations) but also to the ways those communities are constituted through relations with the nonhuman beings that surround them, and thus form part of *multispecies* communities. In the case of olive tree disease, this means not simply examining how human communities are affected by a pathogen damaging trees, but also attending to the entangled lives of the olive tree, the bacterium, the insect vector, the soil, and other living entities as participants in the making of complex interspecies relations in agrarian worlds (Galvin, 2018). While sustained attention to human–plant relationality is already present in most ethnobiological research[6] and, more recently, in emerging fields like plant neurobiology (Brenner et al., 2006;

[6] It is in fact foundational to ethnobotany or ethnoecology (Conklin, 1954; Berlin, 1992; Clement, 1998), fields that in some respects can be seen as predecessors of, or cognate to, contemporary environmental anthropology.

Baluška & Mancuso, 2007; Calvo, 2016)—multispecies ethnography goes further by attempting to decenter the human and to approach nonhumans as agential beings in their own right. Yet how, exactly, multispecies ethnography is to be conducted in practice (read: methodologically) remains an open question. If the mosquito can speak (Mitchell, 2002), the question of how to meaningfully develop our capabilities to hear it remains unresolved.

Various scholars have proposed different strategies—for example, John Hartigan's proposal to use drawing to attune and synchronize the temporalities of humans and plants (see Hartigan, 2017), or Anna Tsing's call for attentiveness and the embrace of "the art of noticing" (Tsing, 2015). In this thesis, I build on these conversations by proposing *multispecies autoethnography* as a productive methodology to explore entangled multispecies agrarian worlds. While the case for multispecies autoethnography has already been advanced by Gillespie (2022), my aim here is to extend it through my own practical and biographical engagement with olive farming and olivescapes in Apulia. Much academic research is still conducted from positions of relative detachment from the contexts in which research takes place. For a long time, such detachment was in fact treated as the appropriate precondition for guaranteeing the objectivity required by "proper science."[7] The approach adopted in this thesis rejects that view. It instead follows long-standing critiques of "a view from nowhere" (Haraway, 1988), the "god trick," as Haraway calls it, and embraces the possibility—indeed the necessity—of a situated "view from somewhere" as a condition of stronger rather than weaker knowledge claims (Haraway, 1988; Harding, 1991; 1993).

My own view comes from a deep, if partial, embeddedness within Apulian landscapes. I come from a family with agrarian roots (as most of us, I believe, if we go long enough back in time). Although my parents became high school teachers and, like many others during Italy's post-World War II economic transformation,

[7]The persistence of this false ideal is evident even today. On one occasion, while presenting this research and showing my personal and emotional involvement with the case, I was asked how I could ensure that such proximity did not bias me toward interpretations that might seem less plausible from a more detached position. This is precisely the point: I cannot. What I can do, however, is acknowledge the situatedness of my perspective and be transparent about where it comes from. Moreover, detached stances are far from emotionally "neutral" or unbiased and have only been considered superior because "detached rationality" has been a dominant paradigm within science. An account of science that no longer identifies "rationality" with "detachment" would shift the emphasis from detached research to *transparent* research, with transparency including one's positionality, methodology, and so on.

moved away from the countryside—to the biggest nearby city—in search for, actually actively pushed toward, a "better life", our attachment to the peasant world never fully faded. Every Sunday we would visit my grandparents in the town of Ostuni, and much of my childhood unfolded around a small countryside house and roughly two hectares of land that my father inherited there. The structure of the smallholding was typical of a subsistence-oriented Mediterranean farm: olive trees intercropped with figs, almonds, and vines, in what could broadly be described as a traditional agroecological landscape. It was in this field that I spent most of my summers—playing, wandering into neighboring lands, and occasionally helping my father with the agricultural tasks that his limited off-school time allowed him to carry out.

It was also there that my relationship with olive trees slowly took shape and evolved. Figure 1.5 shows me at age four, standing next to some of the young olive trees my father planted when I was born. I cannot say with certainty that this is where my attachment to olive trees began. As a child, farming often seemed either an adult activity or, just as often, a rather boring obligation. That perception changed only gradually. As an adult, after completing a technical degree in engineering and beginning what seemed a promising research trajectory in nanoscience and nanotechnology, I found myself increasingly fascinated by those attempting to "return to the countryside"—back-to-the-landers, neo-rurals, and similar movements seeking to rebuild a life in and with agrarian worlds. Often, back then, I wondered whether I might one day fully become one of them (at times, I still do). It was during this period that a stronger sense of responsibility—toward the countryside, toward agriculture, and toward agrarian ways of life—began to demand my attention. Against this backdrop, the family field gradually became more than a childhood landscape.

It became the place where I learned not only the arts of noticing, but also what van der Ploeg (2013) calls "the art of farming": a form of practical, embodied, and temporally patient engagement with the lives of the trees. Intimacy is an important dimension of multispecies ethnography (Gillespie, 2017), but in my case, this intimacy does not stem from a romantic fascination with "the rural" or from an abstract—and to be honest, rather privileged—desire to "reconnect with nature". It rather emerges from an ordinary, demanding, and historically situated relationship with olive trees and olive landscapes rooted in my life trajectory.



Figure 1.5. Me at the age of 4, next to some recently planted olive trees in the family field. (Photo by the author)

This is not to claim that I was a farmer, nor that I am an "indigenous Apulian" (although to some extent I am)[8]. Rather, the position from which I write is one of partial belonging, one that had to be actively cultivated. Familiarity with olive landscapes did not automatically translate into competence and knowledge in farming practices. To engage seriously with more-than-human worlds of olive trees, insect vectors, bacteria, humans, and other nonhuman actors, I had to undergo a process of situated learning that combined formal and informal forms of training: attending pruning courses, participating in farmers' meetings and technical

[8]Indigeneity is a contested and debated term that has been defined as "a boundary concept in political ecology–malleable enough to be used to make sense of particular histories of inequality and struggle, yet capable of circulating across different social worlds" (Yeh & Brian, 2015); usually used in post-colonial and Global South contexts, and often synonym of 'native' (see Merlan, 2009), it is a term that depends on the view from where "otherness" is perceived. For example, Anglo-American anthropological literature has made use of the term to look at peasant contexts in Italy (see for example Heatherington, 2010; Mathews, 2022). In many cases, ancestral connection to the land and a history of belonging to a place are highlighted as some key components of indigeneity (Witt et a., 2001; Lindsay-Latimer et al., 2024). Under this lens, I can self-identify as an Indigenous Apulian.

workshops, working during key moments of the agricultural calendar, and experimenting directly in the family field. Through these practices, I gradually acquired not only technical skills, but also a sensibility for timing, care, and attention that cannot be reduced to verbal knowledge alone.

The empirical material on which this thesis draws was produced through more than five years of (auto)ethnographic engagement with the *X. fastidiosa* epidemic and related controversy in Apulia, from 2019 to 2025. Data combined autoethnographic material generated through my own engagement with olive farming in the context of disease, as well as through more conventional qualitative methods. These included participant observation in olive groves, pruning and grafting activities, harvesting, public meetings, demonstrations, conferences, and everyday conversations in rural settings; more than 40 semi-structured and informal interviews with farmers, olive millers, agronomists, plant pathologists, public officials, policymakers, activists, and other actors involved in the controversy; and the collection and analysis of policy documents, regional directives, technical reports, scientific publications, media material, and movement texts.

My practical engagement with my family field also functioned as a site of ongoing observation and experimentation, allowing me to follow processes of decline, regrowth, treatment, pruning, grafting, and broader tree response over time. Some interviews were audio-recorded, transcribed, and analyzed through an iterative qualitative process conducted manually rather than through qualitative data analysis software. In other cases—especially for informal conversations, observational episodes, and commentaries emerging in the course of fieldwork—the empirical material was reconstructed and expanded from fieldnotes and field diaries. These different materials were then read comparatively and interpretively, with attention to recurring themes, divergences across actors, practical repertoires, and the situated conditions under which particular claims and forms of knowledge emerged.

The methodological approach just described complicates straightforward distinctions between insider and outsider, participant "observation" and active involvement—a tension widely discussed in qualitative and ethnographic research (Dwyer & Buckle, 2009; Nakata, 2015; Parikh, 2020; Liu & Burnett, 2022). If anything, it situates my work at the intersection between academic inquiry and practical engagement, where neither position is fully stabilized. I do not farm for a living, nor was I socialized into farming as my primary identity from an early age. Yet neither do I approach these worlds as a fully external observer. The standpoint from which I write is one of partial belonging, cultivated over time through family

histories, embodied engagement (a key component of multispecies research, see Charles et al., 2024), and theoretically informed ethnographic immersion. Precisely because it is neither one of full insiderhood nor one of detached distance, this position has proved methodologically productive: it has allowed me to move across different epistemic communities—farmers, scientists, policymakers, activists—while remaining attentive to the practical, affective, and more-than-human textures through which the controversy is lived. What multispecies autoethnography offers in this thesis is therefore not a claim to privileged authenticity but a way of grounding analysis in long-term embodied familiarity, reflexive involvement, and practical learning. It is through this combination that I have sought to understand olive trees not only as objects of discourse or governance, but as living beings entangled with labor, care, conflict, and the uncertain futures of agrarian life.

1.6. Structure of the thesis

The thesis is structured as follows. Chapter 2 examines the political-ecological dimension of the *X. fastidiosa* crisis and asks how the epidemic emerged within historically produced human-nonhuman relations. Bringing structural considerations back into multispecies analysis, it conceptualizes the outbreak's historical-material foundations as plant-disease detonators: specific socio-ecological conjunctures that facilitated the emergence and spread of the disease.

Chapter 3 turns to the epistemological dimension of the conflict. It shows that what is often represented as a simple opposition between “science” and “anti-science” is better understood as a more complex struggle among different ways of knowing, different epistemic sensibilities, and different understandings of what counts as a relevant research question or legitimate evidence. In doing so, it highlights the politics of knowledge that shaped plant disease governance in Apulia.

Chapter 4 addresses the ontological dimension of the controversy. It argues that both the olive tree and the disease are enacted in multiple ways across practices and perspectives, including within scientific practice itself. The chapter thus develops an account of ontological politics that rejects both naïve realism and full relativism, while insisting that ontology does not stop where science starts, but that ontological multiplicity runs through scientific communities as well.

Chapter 5 turns to political economy and develops the notion of a conservation dilemma: the structural tension between sustaining olive farming as an economic activity and preserving centuries-old trees as elements of a biocultural landscape. It

also extends debates in conservation studies and the political ecology of conservation beyond wilderness and wildlife to productive agroecosystems, asking under what material and institutional conditions olive trees can be conserved without severing them from agrarian livelihoods.

Chapter 6, the General Discussion, brings these dimensions into dialogue. It develops a synthetic account of how political ecology, political epistemology, political ontology, and political economy interact in the making and governance of socio-environmental conflict, and reflects on what the Apulian case can teach us more broadly about the politics of plant disease in the more-than-human Anthropocene.

A final note for the reader: with the exception of the Introduction and the General Discussion, all chapters have been written with a publication goal in mind and, therefore, are structured in article-like form. While this has inevitably constrained both the selection of the empirical material presented and the structure and style of the writing, it has also helped sharpen the argumentative focus of each chapter. Despite this, I hope that what follows will emerge not only as a set of stand-alone contributions, but as a journey through a controversy whose complexity only becomes fully apparent when its different pieces are held together—precisely the full argument this thesis seeks to convey.

2

Chapter 2



Plant Disease Detonators

Lamp oil, agrarian change, and the historical-material making of the *Xylella fastidiosa* outbreak in southern Italy

Abstract

Over the past decade, thousands of centuries-old olive trees in the Southern Italian region of Apulia dried out, and the whole olive farming sector teetered on the brink. Despite having been framed by the phytosanitary authorities as an exclusively technical agricultural problem related to the spread of a biological threat—the bacterium *Xylella fastidiosa*—this article argues that other historical, cultural, economic, and socio-ecological factors also contributed to the outbreak. It conceptualizes the ecological weakness of historically shaped monocultural landscapes of "colonial" origin, the cultural practices associated with the production of lamp oil (*olio lampante*), the increasing market pressures brought by globalization, and the abandoning of "good agronomic practices" as a consequence of broader processes of rural out migration, as *plant disease detonators* that, over space and time, created the perfect playground for a bacterium to spread widely and to occupy the center of the political stage. Combining multispecies (auto)ethnography with qualitative interviews and historical analysis, and integrating insights from critical agrarian studies, political ecology and environmental humanities, this study outlines a more-than-human political ecology of the *X. fastidiosa* outbreak in Southern Italy and highlights the complex multi-species relations that have shaped, and keep shaping, olive farming practices and Apulian landscapes. In doing so, it informs and contributes to critical scholarship aiming at going beyond human-nonhuman dichotomies, while at the same time keeping political economy and structural considerations at center stage.

Keywords: *Xylella fastidiosa*, Olive Quick Decline Syndrome, more-than-human political ecology, multispecies studies, Anthropocene detonators, agrarian change

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2.1. Introduction

The recent SARS-CoV-2 pandemic intensified the global interest in the interconnectedness of human and ecosystem health. Infectious diseases threatening human health have been shown to be linked to Anthropocene indicators such as biodiversity loss, climate change (IPBES, 2020; Baker et al., 2022), deforestation and land use change (Ellwanger et al., 2020), and the intensification of crop and animal farming (Jones et al., 2013). COVID-19 has also been shown to be linked to environmental pollution (Contini & Costabile, 2020), to the global circulation of people and goods (Wu et al., 2020), and it is widely accepted that other epidemics are likely to occur at an increasing rate (Jones et al., 2008).

In contrast, the rise of agricultural pest epidemics and their links with human activity often remains outside the focus of public attention. On the nonhuman side, there is increasing evidence that plant pathogens and insect pests are equally on the rise (Freer-Smith & Webber, 2017). Intensification of animal farming and crop cultivation practices has been shown to play a prominent role in creating the ideal ecological context for pathogens to spread and proliferate (Gibb et al., 2020). However, despite plant pathogens having been historically shown as capable of wiping out whole ecosystems, collapsing economies, redesigning entire landscapes, and restructuring socio-political matrixes (Yoshida et al., 2013; Biermann, 2016; Campbell, 2004), the *interdependent* role of human and non-human actors in co-creating diseased agrarian landscapes often remains insufficiently acknowledged.

Recently, a small community of researchers in the social sciences and humanities has begun to critically reexamine disease ecologies, focusing on the interactions between plants, pathogens, and human communities. This scholarship stresses how the intensification of agriculture, together with structural factors such as, for example, rural out-migration and the dismantling of farmers' supporting institutions, are often co-constitutive events of a multi-dimensional crisis that goes beyond the incursion of a single biological entity into a native or artificial environment. In doing so, it highlights the interlinkages between agricultural practices, disease outbreaks, historical legacies, and economic constraints in a variety of crops and agricultural contexts (McCook, 2019; Guthman, 2019; Reisman, 2021).

This article joins this growing community of scholars in thinking about agricultural epidemics in historical and political terms, and framing them as “the product of long-term processes that produce vulnerable ecosystems” (McCook, 2019, p. 17). Using the highly contested *X. fastidiosa* epidemic on olives in Southern

Italy as a case study, it shows how the recent devastation of the Apulian olive landscape cannot be portrayed as the exclusive responsibility of the arrival of a new "invasive species" on European territory. Rather, it should be seen as the consequence of multiple historical, cultural, economic and socio-ecological factors that overlap with and complement biological and technical explanations.

Drawing on agrarian political economy, political ecology, and the environmental humanities, it conceptualizes the recent olive epidemic outbreak as facilitated by a series of *plant disease detonators*, that is, borrowing the concept introduced by Tsing et al. (2021), spatial as well as temporal conjunctures that overlapped and contributed to the disease's spread. By showing how the materiality of disease exposes deeper ruptures of historical relations between humans and non-humans on the Apulian territory, the article therefore seeks to reground the storying of this specific bacterial epidemic to its structural and economic underpinnings. At the same time, it stresses the need—for social scientists looking at power and politics around the management of the *X. fastidiosa* epidemic—to engage seriously with the biology and ecology of the disease.

The main purpose is to bring structural considerations back into multispecies studies without losing the valuable contribution of more-than-human scholarship in its acknowledgment of the entangled contributions of humans and non-humans in co-creating agrarian worlds (Galvin, 2018). The *X. fastidiosa* epidemic in Apulia is a case of environmental conflict in which the entity considered "responsible", by many, for the devastation of the local landscape and the dispossession of farmers is not, or at least not directly, a mining company, a polluting industry, or a neoliberal government—scenarios political ecology is well equipped to engage with. Rather, it is a non-human actor—a bacterium—that (some believe) needs to be "fought", "resisted" or "eradicated" in virtue of its undomesticated proliferation. Undomesticated proliferation that, however, happens in the midst of very specific human-made infrastructures and global political economic constraints.

The contribution is structured as follows: the next section outlines the conceptual framework of the article, situating more-than-human political ecology within broader debates in political ecology and the environmental humanities, with further insights from agrarian political economy and critical agrarian studies. Section 2.3 provides a historical and regional context for the *X. fastidiosa* epidemic, followed by an explanation of the research methodology (Section 2.4). Section 2.5 highlights different types of *plant disease detonators*, spatial as well as temporal conjunctions that layer up and contribute to the epidemic. Finally, the last section further

articulates a more-than-human political ecology of plant disease and provides some concluding remarks.

2.2. A political ecology for the more-than-human Anthropocene

Plant pathologists usually visualize the genealogy of plant diseases in terms of a "disease triangle" where three entities—the host, the pathogen, and the environment—must fit and link together in particular ways to give rise to a specific pathology (Agrios, 2005). The host is a susceptible plant that can be affected by the disease. The pathogen is a potentially disease-causing organism (such as a fungus, bacterium, virus, or nematode) capable of thriving on the host. The environment represents the biotic and abiotic conditions that favor the pathogen's survival, reproduction, and ability to infect the host (moisture, temperature, humidity, and so on) (Scholthof, 2007). While foundational in plant pathology, this model excludes broader socio-ecological factors that shape what the "environment" is. Implicitly, it perpetuates a dualistic separation between nature and culture that has been widely critiqued by social scientists and the broader field of science and technology studies (STS) (Haraway, 1991; Latour, 1993; Jasanoff, 2004, Hinchcliffe, 2007). Despite rising awareness of the need to be "holistic and inclusive" (Prasanna et al., 2022), or "multidisciplinary" (Jeger et al., 2021), solutions proposed by plant pathology still tend to lack a wider recognition of the role of the social sciences in plant disease management and food security (Castillo, in preparation).

Conversely, political ecology has historically been preoccupied with issues of power focusing on the social construction of "what nature is" (Robbins, 2012). Political ecologists complexify the idea of "nature" or the "environment" by analyzing the historical, social, and political factors implicated in shaping the very meaning of what nature and the environment are (Peet & Watts, 2004). For political ecology, the "environment" emerges from the *interaction* between humans and the other beings that surround them, and is therefore fundamentally shaped by power relations, historical patterns of land use, and economic structures (Blaikie & Brookfield, 1987; Escobar, 1999). As a mirror critique, political ecology has, at times, been criticized for an overly anthropocentric focus, prioritizing analysis of *human* institutions and power dynamics while neglecting ecological processes and more complex relationships with—including the out-of-human-control *agential capabilities* of—non-humans (Walker, 2005; Forsyth, 2003).

In the last couple of decades, the social sciences and humanities have undergone a "more-than-human turn" (Latour, 2005; Whatmore, 2006): a sustained effort to take into account the lives of other living beings - at times, even non-living, yet "lively" entities - in making sense of the (human) world and what it means to be human. Political ecology, especially in regard to studies of human-wildlife relationships, is no exception to this trend (Evans & Adams, 2018; Margulies & Karanth, 2018; de Silva & Srinivasan, 2019; Toncheva & Fletcher, 2022; Donfrancesco, 2024). More-than-human scholarship acknowledges the entangled role of humans and their institutions in shaping the environment around us, but attempts to include the contribution of other beings—be they animals, plants, fungi, bacteria, etc.—in co-creating the world we inhabit (Kohn, 2013; Tsing, 2015; Haraway, 2016). Very commonly, in this strand of social inquiry, lies a close collaboration with the natural sciences (especially those that deal with natural history) in the belief that "to do the work of crafting multispecies stories, we need […] scientists, not as objects of study, but as collaborators in learning about non-human worlds" (Swanson, 2017, p.95).

More-than-human scholarship has been criticized in various ways. Some critics point to its tendency to romanticize non-Western epistemologies, overlooking their political and economic dimensions, while others argue that these approaches risk diluting the material and structural analysis of inequalities by overemphasizing ontological multiplicity (Brassett & O'Reilly, 2018). Although this is not the space to discuss the various critiques to the more-than-human turn and its variegated scholarship, it is worth mentioning that there seems to be a widespread dissatisfaction with how more-than-human turn scholarship can, at times, decenter the human "too much" (see, for example, Büscher, 2021).

An interesting attempt to overcome this impasse is anthropologist Anna Tsing and colleagues' (2021) proposal of calling the current epoch the "more-than-human Anthropocene". Retaining the variously contested (among others, see Moore, 2016) term "Anthropocene", they augment it with an additional attribute—"more-than-human"—to emphasize the agency of non-human entities in engendering "feral" effects: uncontrolled, unintended proliferation of other-than-human entities in the interstices of human-made infrastructures. Their collaborative project *Feral Atlas: the more-than-human Anthropocene* thus, while engaging with a wide variety of nonhuman entities and their feral proliferations, simultaneously stresses the role of capitalism, colonialism, imperialism, and broader processes of human and nonhuman exploitation in creating the infrastructures that make possible these

"feral" proliferations, which they ultimately contend being the real enactments of the Anthropocene (Tsing et al., 2021).

Moreover, they coined the concept of "Anthropocene detonators": "the coming into being of new programs of infrastructure building that in turn set new challenges for humans and nonhumans"; "a conceptual conceit that points to particular founding conjunctures, that is, historical events that change in a big way what can happen afterwards" (ibid.). In this way, they add a temporal dimension to studies of the Anthropocene, and engage with the crucial question: when did the Anthropocene start? Detonators are layered temporal events that overlap and contribute to create the pathways and spaces of possibility for what we refer to now as the Anthropocene. In fact, they *are* the Anthropocene (ibid.).

This article is greatly inspired by this work, and attempts to contribute to anthropological literature that aims to add "spatial as well as temporal analysis" to studies of the Anthropocene (Tsing et al., 2019). While detaching slightly from the original "detonators" conceptualization—they define 4 over a temporal scale: Invasion, corresponding to the European invasion of the Americas and the "discovery" of the New World; Empire, i.e. project of imperial governance, such as for example the establishment of the British and Dutch East India companies; Capital, or the synergies between plantation profits from the colonies and industrial development in the European metropole in the 18th and 19th century; and Acceleration, corresponding to the well known "Great Acceleration" (Steffen et al., 2015) and the exponential increase of a wide variety of socio-economic and earth-system indicators in the last fifty years—the article borrows this conceptual innovation and uses it to show how the history of Apulian plantation landscapes, the specific practices of olive cultivation, the recent changes in global olive oil economy *and* the abandoning of the countryside can all considered "detonators" of the epidemic, that is, layered events that overlapped and intensified their effects over time, preparing the basis for ecological collapse. While plant pathologists explain the epidemic as a "biological invasion", this article claims that the epidemic actually started much longer ago.

Moreover, the study integrates this with insights from critical agrarian studies (CAS) and agrarian political economy, specifically with discussions about depeasantization and the "generation problem" in agriculture (White, 2020). CAS debates have historically focused on the "fate of the peasantry" and the ways in which global capitalism penetrates and transforms the countryside—the so-called "agrarian question"—thus shaping broader dynamics of agrarian change (Bernstein,

2010; Akram-Lodhi & Kay, 2010a, 2010b; Borras, 2023). In this context, de-peasantization is the process by which rural populations lose their agricultural livelihoods and transition away from small-scale, subsistence, or family-based farming (Van der Ploeg, 2018). This is part of a more general dynamics of peasant differentiation in which, due to market dynamics, state policies, and increasing urbanization and industrialization or agriculture, small farmers are caught into a capitalist market squeeze that, if not counteracted, often ends in rural displacement and land dispossession (Bernstein, 2010). This article looks at the relevance of these processes, rather than just for the survival of peasants' ways of living, for the overall health and survival of biocultural landscapes.

In sum, this article combines insights from critical agrarian studies, political ecology, and more-than-human turn scholarship into a more-than-human political ecology account of the *X. fastidiosa* epidemic. It emphasizes the need to account for non-human contributions while *at the same time* acknowledging the structural constraints that limit the actions of both humans and non-humans alike. By navigating the tensions between *X. fastidiosa*, its insect vector, olive trees, the global olive production economy and local practices of agricultural production, it therefore positions itself in the middle ground between a structuralist political ecology and a post-human, new materialist stance.

2.3. A brief history of the Olive Quick Decline Syndrome in Southern Italy

The olive landscapes of Apulia, Southern Italy, are renowned for their cultural, economic, and ecological significance. Stretching back hundreds and sometimes thousands of years, they are the symbol not only of regional identity but also of what was for centuries a solid livelihood-sustaining economy. In virtue of their majestic appearance, some of them are designated as “monumental olive trees” (*ulivi monumentali*) and, “by virtue of their productive function, of ecological and hydro-geological defense, as well as the peculiar and characteristic elements of the regional history, culture and landscape”, they are protected by the Apulian regional legislation (regional law n.14/2007 - Art.1).

In 2013, part of this iconic landscape began showing symptoms of disease, marking the onset of what is now considered one of the most devastating plant epidemics in Mediterranean Europe (EFSA, 2015). First signs of decline were recorded in the district of Gallipoli, in the southeastern part of the region (Saponari

et al., 2013). Initially described as "withering and desiccation of scattered terminal shoots, rapidly expanding to the rest of the canopy, leading to the tree's collapse and death" (Loconsole et al., 2014, p. 7), the disease was referred to as *Complesso del Disseccamento Rapido del Olivo* (CoDiRO) and considered as a "complex" of different causes. Among them there was the bacterium *X. fastidiosa*, known for its role in causing a wide variety of plant diseases in the Americas, but never detected on European territory. However, fungi and other insects were equally considered potential co-contributors of the decline (Nigro et al., 2013; Saponari et al., 2013; Martelli et al., 2016).

Xylella fastidiosa is a well-known pathogen on the other side of the Atlantic, where it is associated with Pierce Disease (PD) of grapevines in California, Citrus Variegated Chlorosis (CVC) of citrus plants in Brazil, and is found—sometimes pathogenic, sometimes not—on a wide variety of hosts in other countries. Coffee plants in Costa Rica, for example, are reported as commonly infected with *X. fastidiosa*, although the plants are often asymptomatic (Rodrigo Almeida, personal communication). However, this was the first time that the bacterium was showing up in Europe. Since then, it has spread across the Mediterranean basin and its presence has been reported in Southern France, Corsica, the Balearic Islands, Alicante province in Spain, parts of Portugal, and later on in other Eurasian countries that include Lebanon, Israel, Iran, and China (EPPO database). Aside from olive trees, the bacterium has found suitable hosts in a large list of Mediterranean species (EFSA, 2016).

Once detected, control measures aimed at slowing the disease's progression were put in place, and relied on the uprooting of infected trees—whether or not they were showing symptoms—and the reduction of insect vector populations. This was justified by the 12-18 months latency time between infection and actual appearance of symptoms, and were mandated by European Plant Protection legislation. *Xylella fastidiosa* is in fact classified as a quarantine pathogen, and as such is subject to strict eradication protocols (EFSA, 2019). These measures, however, became soon contested by part of the local population, who emphasized the symbolic and cultural value of centuries-old olive and refused to accept uprooting of infected trees as the only way to contain the disease. Moreover, they started questioning the role of *X. fastidiosa* in the decline of the trees, and hypothesized a wider range of contributory factors (Colella et al., 2019): from its interconnections with other pathogens to the excessive use of herbicides and pesticides, the salinization of water resources and the improper management ("lack of care") of olive orchards.

Antagonistic positions spread over a "spectrum of disagreements", with local farmers and other actors (among which also some natural scientists, see for example Xiloyannis et al., 2015; Scortichini et al., 2018) at times denying the very existence of the bacterium, at times bringing forth the argument that while the bacterium exists, it is but one—and not the main—cause of olive tree desiccation. For some, the *X. fastidiosa* epidemic was used as an excuse by certain interest groups to get rid of a thousand-year old—but unproductive—cultural heritage to make space for more profitable economic activities, either in the form of intensified agricultural production (high-density plantations) or in the form of tourism infrastructures. For others, *X. fastidiosa* was (and remains) an entity that should be attempted to *live with*, by focusing on a paradigm of care rather than a paradigm of eradication: a "probiotic environmentality" (Lorimer, 2017), rather than an antibiotic one.

In 2017, however, natural science journal *Scientific Reports* published a study in support of the hypothesis that *X. fastidiosa* was the etiological agent of the disease (Saponari et al., 2017). Since then, in the scientific literature and in the public debate CoDiRO left a place for its English translation: Olive Quick Decline Syndrome (OQDS). Far from being a trivial etymological controversy, this transformation from a *complex of causes of unknown etiology* to a *complex of symptoms of known etiology* (Colella et al., 2019) represents the core of an epistemic conflict that is still currently taking place in Apulia between and amongst scientists and social movements. However, while debates related to the disease's etiology—and more broadly the epistemic dimension of this story—will be discussed more in depth elsewhere, this article focuses on an analysis of the contrasts between the *hegemonic* natural science explanation of the epidemic and a different perspective provided by a more comprehensive social scientific inquiry.

On the one hand, the mainstream natural science explanation of the epidemic runs as follows: due to the intensification of the global trade in ornamental plants, the bacterium *X. fastidiosa* reached Europe via a coffee plant from Central America (Sicard et al., 2021). Once introduced, it found an ideal host in the olive tree (*Olea europaea*) and an effective vector in a class of autochthonous insects known as *Sputacchine* (*Hemiptera, Aphrophoridae*), present in high densities on the territory, giving rise to a perfect match in the disease triangle. The pathogen colonizes the tree's xylem, leading to systemic desiccation and eventual death. Contagion happens through the insect vector feeding on infected trees and carrying the bacterium to non-infected ones (Cornara et al., 2017). The insect vector starts its life cycle in the weeds that proliferate during spring, and therefore a poor management of the weeds in the

orchards (e.g. due to abandonment) implies a higher density of insect populations and subsequently higher infection rates.

What is widely accepted, both in the phytosanitary authorities and the antagonistic field, is that the *abandoning* of the countryside has played a key role in favoring the spread of the bacterium. For phytosanitary authorities in favor of eradications, because not removing weeds under the trees increases the density of adult insect vectors that in summer, when weeds dry out, move from the ground to olive trees in order to feed themselves, thus intensifying contagion. For people opposing the eradication measure, because trees have not been properly "taken care of" for too long, and that the lack of "good agricultural practices" – proper pruning, organic fertilizing, post-pruning and post-harvest disinfection techniques, treatments against other insects and fungi – have decreased the immune defenses of the trees and these became weak, not ready to defend themselves from a new pathogen. Additionally, the abandonment of neighboring fields is pointed by many as a crucial aspect: even if a single farmer respects compulsory weed removal in his field, but her neighbors don't, then the effort is useless. Proper management of the epidemic requires a collective action rather than an individual one.

2.3.1 *Xylella fastidiosa* and the social sciences

While natural science research on the epidemic in the last decade has focused extensively on host-pathogen interactions, early detection techniques, and pathogen's spread mitigation strategies (Serio et al., 2024), it has to date produced very limited accounts on *the role of humans* – their histories, institutions, economies, cultivation practices and socio-ecological implications – in the establishment and spread of the disease. By contrast, a smaller body of research from a variety of social sciences and humanities disciplines has begun to engage with the "more-than-human" dimension of the *X. fastidiosa* epidemic, although studies in this regard remain scarce.

Colella et al. (2019) have provided the most comprehensive social sciences analysis of the conflict around the management of the *X. fastidiosa* epidemic so far, conceptualizing OQDS as a "socio-phytopathology". While their analysis acknowledges the interplay of natural, social, economic, and political factors, their account focused on the conflict between (some) scientists and (some) social movements strongly active in opposing prescriptive control measures, a deeper exploration of the broader historical, cultural, and economic contributors to the epidemic remains out of reach.

Vacirca and Milazzo (2021) performed an interdisciplinary sociological and anthropological analysis of the case where they discuss "practices of care" in post-*X. fastidiosa* settings in Salento. Once again, while hinting at some of the economic forces at play – specifically the fact that practices of "care for the trees" are only possible in the presence of sufficient income to sustain increased management costs – they fall short in developing a fine-grained account of *how* the global political economy has influenced olive cultivation in the last decades and *thus* influenced the spread of the disease in ways that will become clearer in the remainder of the article.

Bandiera and Milazzo (2021) adopted a feminist political ecology lens, and proposed a conceptualization of the entanglements between the bacterium, vector, host plants, and humans as *visceral ecologies*, therefore *doing* a form of more-than-human philosophical engagement with the epidemic without, however, explicitly situating their analysis within a more-than-human political ecology framework. Finally, Tanasescu (2022) mentions the *X. fastidiosa* epidemic in his theorization of the current epoch as *Ecocene*, an era of increased incursion of ecological processes in political and societal life where uncertainty and complexity, as exemplified by the Apulian case, challenge us to imagine new approaches to environmental governance.

This article inserts itself in this line of inquiry, but takes a step back and asks: why did all of this happen? Can a bacterium *alone*, with its biological characteristics, disrupt an entire ecosystem, transform the socio-political matrix of a whole territory, and redesign its rural landscapes in the way it did in Southern Italy in the last decade? The answer, I argue, is no. The point is not merely to show that the abandoning of the countryside and the *lack of care* for the olive orchards have contributed to the epidemic (something that most people agree upon, although differing in the "why it is so"), but rather to go a bit further and ask: why have people been abandoning olive farming, facilitating the spread of *X. fastidiosa* even more? I propose that the answer lies in broader dynamics of global political economy and agrarian change.

2.4. Methodology

Methodologically, the article builds on more than 5-years ethnographic engagement with olive trees, human stakeholders involved in olive cultivation and commercialization, and other non-human actors contributing to the diseased olive landscapes of Apulia. Since 2019, I have been moving across the Apulia region, in an attempt to understand the more-than-human interactions that made the epidemic – and its unexpected intensity – possible. I engaged in 30+ interviews with olive farmers, plant pathologists, olive oil millers, non-professional olive orchard owners,

government officials, and environmental activists, in and beyond the region. I also embedded myself in the actual *practice* of olive farming, with the belief that we cannot meaningfully talk about nonhumans if we do not learn how to engage and relate with them in embodied and "intimate" ways.

Engaging with the actual challenges of making (and selling) olive oil, moreover, brought me to slowly detach from abstract representations of idyllic human-nature relationships and to re-ground myself to the material challenges of what it means to relate with olive trees for (among other things) making a living. I would call this approach a multispecies autoethnography (Gillespie, 2022). By combining the features of multispecies ethnography (Kirksey & Helmreich, 2010, Ogden et al., 2013; van Dooren et al., 2016) with the sensitivities and self-reflexive components of autoethnography (Ellis, 2004), multispecies autoethnography allows for a representation of the life worlds of nonhumans from the intimate, embodied interaction with them.

This methodology is a direct result of my own positionality: I am originally from the region, and my family owns a small inherited olive orchard in the countryside of Ostuni, a small town of about forty thousand inhabitants in the area. There, I spent all my summers playing and wandering around. Some of those trees were planted when I was born (more on this cultural practice later in the text), thus being an intimate "companion species" (Haraway, 2003; 2008) for me since I was a child. I do have a strong emotional connection with those trees, feelings that I share with many other people in the region. Every year, I go back to the region and spend time harvesting olives with my father and some friends. What matters here, however, is the kind of ethnographic experience that this connection, and my family history, allowed me to perform.

Aside from the classical methods of anthropological inquiry – participant observation in olive cultivation activities, interviews with farmers, agricultural workers, scientists, environmental activists, attendance at community meeting, regional policy forums, and international scientific conferences addressing the *Xylella* crisis – I spent considerable amount of time *with* the trees, taking care of them and learning to understand their needs, and the way they *make their own world* (van Dooren, 2022) and interact with the surrounding environment. I took multiple pruning courses and attended events organized specifically for farmers in order to deal with the disease. I gave myself the time to learn and understand *from* and *with* the trees. I ultimately practiced what Anna Tsing calls "the art of noticing" (2015,

p.17) that allows observers to learn and understand – although with some degree of incommensurability – nonhuman worlds.

At the same time, I resisted the temptation of treating olive trees *exclusively* as "more-than-human companions." While intimacy and affect were central to my relation with the trees, working with them as economy-sustaining crops brought to the fore their role within specific agrarian regimes oriented – especially in a not-so-distant past – toward oil production and family reproduction. This dual positioning allowed me to trace how "matters of care" (Puig de la Bellacasa, 2017) are intertwined with broader economic constraints shaping everyday farming practices, features that tend to remain less visible in more abstract accounts of more-than-human care (Ressiore et al., 2024), or vague "relational ontologies" (Muller et al., 2019; for a critique see Castree, 2003). In this sense, multispecies autoethnography, in this work, functioned not only to deepen attentiveness to nonhuman lives, but also as a methodological lens for tracing how historical political–economic transformations are lived, negotiated, and materialized in human–olive multispecies relations over time. This approach also aligns with longstanding feminist theorizations of situated knowledge and standpoint epistemology (Haraway, 1988; Harding, 1986).

Finally, I complemented the multispecies autoethnographic approach outlined above by a sustained attention to landscapes and tree morphologies, inspired by Andrew Mathews' anthropological work on the material and historical processes shaping plant form (Mathews, 2018, 2022). As Mathews argues (2022, p. 5), "histories of disaster and care are embedded in the morphologies of plants and landscapes, if we can only learn to notice them." In a similar vein, I followed "the kinds of landscapes and histories that have emerged from encounters between people, trees, pathogens, and soils […]," an approach through which "landscape description pushes us to think about how particular forms emerge through histories of encounter" (2022, p. 46). The anthropogenic olive landscapes of Apulia offer a particularly compelling case in this respect: as will become clear in the next section already, the forms of centuries-old olive trees and the extensive monocultural groves that dominate the landscape constitute material traces of a relatively recent agrarian past in which olive oil functioned as the region's "green gold." In other words, they allow histories of agrarian relations, regimes of labor and care, and multispecies arrangements to "emerge" from the present landscape.

2.5. Detonators of plant disease

2.5.1. Plantation

"The forms of trees, as of other beings, emerge from relations with others. […] Individuals of the same tree species take a particular shape depending upon where they are growing and upon their history of encounters with animals, fires, and diseases" (Mathews, 2017, p. G151)

"The history of olive oil in Puglia is also a history of colonialism"
(Spredicato, quoted in Bandiera, 2019, p. 47)

Olive trees (*Olea europea*), in their undomesticated state, are shrubs. Known with the original botanical name of *Olea europaea L. var. Sylvestris* (*olivastro selvatico*), they have been growing spontaneously in the warm areas of the Mediterranean since pre-Roman times (Primavera et al., 2017). However, in their uncultivated "wild" form, they present features that are quite different from domesticated olive trees. Young branches, which sprout from the base of the tree, are hard and spiky. The leaves are smaller and more rounded, with fruits that are also smaller, and with a proportionally larger pit. Although the relationships between cultivated and wild Mediterranean olives are still unclear (Besnard et al., 2018), genetic studies suggest that domesticated olives likely originated from multiple wild populations through complex processes of selection and hybridization influenced by both natural and human-driven factors (Julca et al., 2020).

The shape of olive trees *in their current form* is also a result of centuries of multispecies interaction with humans (and other nonhumans). Responsible for olive trees' current shape is pruning, the practice that probably best exemplifies the intimate relationship that has evolved between olive trees and Apulian farmers. Pruning serves the explicit purpose of making olive trees productive, and attuned to human needs: to keep the tree *away* from its original, "natural" shape (the *olivastro*), maximize the amount of nutrients that goes into actual fruit production (rather than into non productive branches) and localize fruit growth in positions best accessible by either traditional or modern harvesting techniques. Pruning is also helpful in keeping the tree "healthy": reducing canopy's internal humidity and increasing exposure to sun rays turns beneficial for both fungal disease control and productivity, and removing partially sick or completely desiccated branches reduces risk of further spread of disease, whatever the pathogen that is causing it. As a result, olive trees

acquired over the centuries peculiar shapes that are the combined result of harvest practices, "curative" interventions, as well as the specific characteristics of their most valuable by-product: olive oil.

Olive oil production in Apulia dates back centuries but it boomed in the second half of the 18th century. It's important to specify that, at that time, Italy was not a unified country but a post-feudal patchwork of reigns and dukedoms governed by aristocratic families or foreign "Emperors": the Savoia dynasty in the North-West; the Austrian Empire in the remaining parts of the North; various dukedoms in Central Italy; and the *Regno delle Due Sicilie* in the South, governed by the Bourbon dynasty (who was also exerting power over part of current day Spain and France). While a thorough discussion of the *internal* European colonialism is outside the scope of this essay, I stress this to explain why in the remainder of this article I refer to the pre-Italian nation state formation as a period of control over the Southern Italian territory by foreign powers, specifically the Bourbon (Spanish-French) Empire.

During the Bourbon domination over the region (1734–1861), olive oil production in Salento experienced significant growth and became a cornerstone of the region's economy. At that time, olive oil was not to be imagined as the high-quality olive oil we are used to seasoning our salads with, but rather as a low-quality, industrial-use product: a lubricant for oiling the gears of the machines making their appearance in the early-stages of Northern Europe industrial revolution, a fat to be transformed into soap in one of the many soap factories of Marseille, or a fuel for lightening lamps (Mazzotti, 2004). It was therefore more similar to what is called today *olio lampante* (lamp oil): a low-quality oil, made from olives collected from the ground, and crushed only after fermentation had already started, which contributed to making them softer. But fermentation increases acidity and degrades its organoleptic properties, and it was only in the 19th century that olive oil started to acquire the features that made it appropriate for human consumption, and, after a few innovations in the milling process, became what we call today "virgin" and "extra virgin" (ibid.).

During that epoch, Salento emerged as a key player in the Mediterranean olive oil trade. Trade which nevertheless remained firmly in the hands of British and Venetian merchants, who were guaranteeing for themselves most of the proceeds (Bandiera, 2019, p. 47). Gallipoli, the city from where the olive disease started to spread, was at that time one of the major Mediterranean oil harbors: "on a clear day its harbor might easily contain seventy foreign vessels waiting for a load of liquid gold" (Mazzotti, 2004, pp. 292-293). Moreover, "the oil market in Europe was run

by the British in competition with the French. In the seventeenth century, the price of Salento oil was made in London" (Spredicato, quoted in Bandiera, 2019, p. 47, my translation).

In order to fuel production, the Bourbon dynasty encouraged agricultural expansion and the intensification of olive farming in the region by subsidizing farmers—in the form of tax exemptions—to plant olive trees in their plots. This led to the establishment of extensive olive groves and the construction of many processing factories (typically in the form of underground mills - *frantoi ipogei*) to transform the harvested olives into oil. Today, olive landscapes of Apulia are characterized by vast monocultures of olive trees, most of them of the cultivars *Ogliarola Salentina* and *Cellina di Nardò*, which are, incidentally, the most susceptible to the disease. Despite protests and attempts to preserve this "traditional" landscape, very few people acknowledge that what we are talking about here is nothing more, nothing less than (traditional) *monoculture* plantation settings.

Apulian olive tree plantations, seen under the historical lens introduced above, can therefore be considered exploitative tools for capital at the expense of nature and people in similar ways as sugar cane plantations in Puerto Rico were or oil palm plantations in Indonesia are nowadays (Mintz, 1953; Li, 2021; Chao, 2022): an export-oriented extractive production, sustained by foreign capital and meant to be shipped toward the centers of consumption while leaving very little – besides the drudgery and the ecological burden – to the local population[9]. Ownership patterns in Salento also recalled some typical figures of plantation histories: during the feudal and post-feudal periods, land was mostly concentrated in the hands of noble families, religious institutions, and large landowners, and extensions easily exceeded 100 hectares per estate (Sereni, 1961). It was farmed by landless rural workers or smallholder farmers under sharecropping agreements known as *mezzadria*, an

[9]The use of the term "plantation" here is deliberately restricted and informed by ongoing debates on the Plantationocene (Chao et al., 2024), including critiques highlighting how multispecies and Plantationocene scholarship has at times insufficiently foregrounded racial slavery and colonial violence as constitutive elements of plantation regimes (see Davis et al., 2018). In this article, I do not claim historical or moral equivalence between Apulian olive cultivation and Atlantic (and other) plantation systems, Rather, I use the term analytically to draw attention to similarities in political–economic features – such as land concentration, export orientation, and the externalization of social and ecological costs – while acknowledging the profound differences in labor regimes, racialization, and violence at stake. A more comprehensive engagement with Plantationocene debates, and a systematic comparison between "plantation worlds" (Barua, 2024) across the Global North and the Global South, remains an important task for future work.

ancient legal form – originated in the 12th-13th century – that implied agricultural contract between a landowner (*latifondista*) and a sharecropper (*mezzadro*), and was based on the division of the harvest between the owner and the worker, usually on a 50%-50% basis.

The early economic boom of olive oil as an industrial commodity was thus the first economic force that shaped the anthropogenic landscapes of Apulia. Today, Apulia has over 60 million olive trees, covering about 370.000 hectares – about 30% – of the regional territory, and produces almost 50% of the olive oil produced on the Italian peninsula (ISMEA statistics). But it is not a coincidence that the current olive landscape of the southern part of the region is for the vast majority a hugely extended monoculture of olive trees between 150 and 250 years old. As shown, this is the the result of the (internal) colonial history that shaped Apulian landscapes in the form we see nowadays. Landscapes are proxies for an ancient past, and paying attention to them allows to make manifest histories of empire and capital that shape rural livelihoods and agrarian change.

2.5.2. Lamp oil

During the olive production boom in Salento (17th-19th century), olive trees became symbols of wealth and prosperity. While originally characterized by the concentration of power in the hands of large landowners, after intense agrarian struggles that characterized the South of Italy since the early 1900s and led to the agrarian reform and the abolishment of *mezzadria* in 1964, olive farming became accessible to smallholders as well. Olive cultivation became a profitable economic activity for many – at least for those who owned some piece of land – prompting rural folks to plant olive trees as a form of "retirement savings" (a farmer, from conversation). As an example, one liter of olive oil in the 1960's was typically enough to pay for the daily wage of a rural worker during the harvest season (today, it would not even equal the cost of 1 hour work wage in agriculture).This economic significance of olive cultivation likely underpins one of the most cherished cultural traditions in Southern Italy: planting an olive tree to celebrate the birth of a newborn. Because of this, olive trees usually represent an inter-generational link: as some people in Apulia say, "you do not plant olive trees for yourself. You plant them for your sons, and for those who will come after them" (Chialá, 2019, p. 69). This practice also represented a forward-looking investment: olive trees typically begin yielding substantial financial returns 20–30 years after

planting—in this way aligning with the adulthood financial needs of the next generation.

Sustained by its economic significance, the production of *olio lampante* (lamp oil) had a profound impact on local farming practices in Salento. Unlike extra-virgin olive oil, which requires shaking the trees to collect olives on nets for quick processing, lamp oil is made from olives that are left to fall naturally to the ground and then gathered, either manually or, more recently, with mechanical brooms. The harvesting process was often gendered, as women were typically hired to harvest these olives, a practice justified by the argument that their smaller hands made it easier to pick individual olives from between blades of grass.

Because the trees did not need to be shaken during harvest, pruning practices, and the shape of the trees in Salento evolved differently from other parts of Italy. Olive trees were allowed to grow exceptionally tall and expansive in order to maximize their fruit yield and adapt to the specific demands of lamp oil production. This distinctive approach to managing olive orchards in Salento resulted in significantly lower cultivation costs and comparably higher yields for many years. Allowing olives to fall naturally to the ground eliminated the need to hire labor to harvest them prematurely, reducing expenses. Additionally, olives collected at an advanced stage of maturation produce greater quantities of oil, albeit of lower quality, compared to the greener olives required for high-quality extra-virgin olive oil.

Olive cultivation in the northern part of the region, particularly in the province of Bari, followed a markedly different economic trajectory. There, olive trees are typically of younger age, pushed by European Union agricultural policies in the 1960s and '70s, and cultivated in such a way that mechanization of agricultural operations is easier. Thus, they are usually planted in denser settings, and olives are harvested to produce mainly extra-virgin olive oil (higher quality). Although a denser setting might suggest a higher susceptibility to the disease, my point here is that the management of olive trees in the province of Bari is markedly different than the ones in Salento, with the “good agronomic practices” maintained and sustained by a higher economic profitability of that cultivation *in itself*.

Younger trees, moreover, are easier to manage, as they are more flexible. Thus they can be harvested with mechanical shakers that shake the whole tree and can collect all its olives in a matter of few seconds, compared to manual harvest that lasts tenfold longer. They can also be pruned more easily, without the use of heavy (and

slow) ladders. This, together with a higher price of extra-virgin olive oil in the market, represents a higher incentive to farmers for a more constant and frequent intervention (for example in terms of pruning, but also in terms of operations of fertilization and weed control), which in turn means a "better care" for the trees. Better care that turns into a lower density of insect vectors and a lower rate of contagion. Although the distribution of the insect vectors is not only related to farming practices but also on the specific ecological conditions – there are naturally more insect vectors in Salento that in the remaining parts of the region (Almeida, 2025, personal communication) – this type of management contributes to keeping the insect vector population under check, at least to some degree.

When *X. fastidiosa* arrived, it raided a territory where both farming practices and market prices were those associated with the production of *olio lampante,* the second detonator in our story. It is the specificity of this product, with olives collected from the ground and very limited intervention in the orchard, combined with an increasingly globalized olive oil market, that created the conditions for the deep economic crisis that led to a slow abandonment of olive farming, and that will be the topic of the following two sections.

2.5.3. Globalization

The economic consequence of the distinct agrarian history of Salento, combined with the specific cultural practices of harvesting olives from the ground for producing an olive oil that is not high in quality but allows to keep production costs low, has another specific consequence in economic terms: the market price of *lampante* oil has been historically lower than that usually associated with extra-virgin olive oil. Since the 1990's, and with economic liberalization and the globalization of agrifood markets, Italian olive farmers have started to compete with countries that were able to produce olive oil at lower costs. Particularly with Spain, which since the 2000s has been the main producer of olive oil globally (followed by Italy and, until very recently, Greece). According to many farmers and agricultural experts I spoke to, Spain's prominence was a product of the modernization of the sector pioneered by fascist dictator Francisco Franco, who subsidized farmers to replant olive trees in higher density plantations. But also with other countries from the Southern and Eastern Mediterranean (notably Turkey, Tunisia, and Morocco), which more recently started to gain important market shares and have managed to outperform Italian producers - if not in terms of quality at least in terms of production costs - due to the cheaper labor.

Angelo Godini, one of the main experts of olive farming in Italy, pictured this very clearly in a conference held in 2010: "between 1966 and 2008, with an increase in price of the main [agricultural inputs] (including labor) between 21 and 100 times, there was an increase in sales price for extra virgin olive oil, depending on whether before or during the current crisis, only twelve to eight times, respectively" (Godini, 2010, p. 2, my translation). He concluded that "Italian olive farming is struggling between high production costs, low sales prices, and with the balancing of budgets arising from EU subsidies" (ibid.:1, my translation). In other words, the cost of agricultural inputs such as fuel, external labor, or fertilizers increased up to tenfold, in fifty years, compared to the market price of agricultural produce. The olive sector was thus already experiencing some deep crisis, even before the onset of the *X. fastidiosa* epidemic. Moreover, the import of substantial quantities of cheap olives - or olive oil - entering Italy from neighboring competing countries, made the livelihood of olive oil producers in Apulia hard to sustain. In line with Godini, one of the farmers I interviewed told me:

> *"The sector was already facing great difficulties. Oil prices have been declining for two decades. In Spain they mechanized everything forty years ago. The landscape was exactly like this when Franco said: here there's no profit anymore, take them out of the way, I will subsidize your income, replant intensive monocultures. Today they can produce one liter of extra-virgin olive oil for 2 euros, 2.30 euros; if the market price is 3 euros, they can definitely stay within the costs. If I sell olive oil for 3 euros, I won't even cover maintenance costs..."*

The arrival of *X. fastidiosa* was asking for *more care* and more attention to the orchards. In the past 4-5 years, for example, farmers have been experimenting with various "protocols" that—although not completely resolutive (they do not remove the bacterium completely from the tree but reduce its density and in this way help the tree to stay alive and productive)—seem to be able to achieve coexistence with the bacterium as long as they are applied with a certain frequency—usually once a month and sometimes every fifteen days.

However, in a territory used to very minimal cultivation due to the specific cultivation practices, this novel need has clashed with the tendency, by most farmers, to *reduce* costs and the amount of interventions in order to be able to remain

competitive in the global market. This is clearly expressed by Giusy, a female farmer from the municipality of Giuggianello interviewed in 2019:

> *"We were doing the conventional treatments ... and then we have slowly reduced the amount of treatments, the fertilizers ... because you could not make it [to the end of the month]. I mean, we spent twenty, thirty thousand euros a year on fertilizer and at the end of the season, we earned fifteen thousand from selling the oil. […] So gradually there was a slow abandonment, or at least a poor cultivation that favoured the Xylella even more."*

This is one of the few points where agricultural scientists (in the form of plant pathologists, entomologists, and agronomists) and social scientists/environmental conservationists agree: the spread of the epidemic was also due to "poor management" and, ultimately, to a "lack of care". For plant pathologists, this lack of care is attributed to poor management of the fields, including the less frequent removal of weeds, which in turn results in a higher density of insect vectors (because these grow in the weeds when in their nymphal stages of development), which in turn increases contagion rates. For people opposing control measures aimed at disease containment, because lack of care reflects a series of practices – insufficient frequency of pruning, use of herbicides for cheaper weed control, reduction or absence of fertilization and post-harvest/post-pruning treatments – that make trees weaker (more susceptible) to the disease.

Ultimately, the picture I'm painting is the following: on the one side, in a huge monoculture of olive trees (first detonator), where oil was historically produced by harvesting olives from the ground in the form of *olio lampante* (second detonator), and that experienced a slow but constant drop in market price and higher pressure from competitors in the global market (third detonator), the tendency of farmers was that of *reducing* inputs and management costs. On the other side, a new guest - the bacterium *X. fastidiosa* - arrived, asking for *more* interventions in the orchard (more *care*) to attempt to coexist with it.

2.5.4. Abandonment

"The bitter reality is that, for many, olive trees have become a burden" (a farmer)

The arrival of *X. fastidiosa* thus entered the scene in a landscape characterized by a general tendency toward de-peasantization. While in some cases, as illustrated earlier, farmers were trying to survive the market squeeze by reducing management costs, in other cases they abandoned olive orchards altogether. Many urban residents, either still living in the region or abroad, own inherited small plots of land that they either don't have time to manage first-hand (because they generate their income from jobs in the city) or prefer not to spend money on. In fact, until very recent times (let aside the spike in olive oil prices of the seasons 2023/2024 and 2024/2025), employing external labor for producing olive oil from your own orchard would have been more expensive than just buying it from the supermarket, or from some large producer.

Disentanglement of farmers' subsidies from actual production, a tendency which was initiated and intensified after the reforms of the Common Agricultural Policy in 1992 and 2003 respectively (Garzon, 2006), paradoxically worsened this tendency. Many farmers, who started to receive financial support based on land extension and number of olive trees rather than on the amount of olive oil generated, lost the incentive to increase – and even maintain – production, and in the absence of proper control by the state authorities and in a landscape where olive farming was in any case not profitable enough to make a living, kept their right to those subsidies but often left their fields uncultivated. Thus, a measure that was meant to sustain farmers' income and make it independent from production and market prices fluctuations, in fact incentivized rural abandonment.

Tree pruners are also in great scarcity, and finding them brings in challenges. On the one hand, abandoning of the countryside means also that there is no generational renewal, thus making it difficult to find enough qualified workforce to prune your trees properly. On the other hand, and probably most importantly, the cost of labor is so high compared to the revenues that one can get from olive oil production that it becomes necessary to tighten the belt and, as a consequence, proper, frequent pruning becomes difficult. I have tried many times to hire pruners to trim my trees in the past few years. Most of the time they are so busy (because they are so few) that they need to "book" them months in advance. Other times, they just prefer to redirect themself on more profitable activities. As one of them told me, "I started pruning already in autumn (traditionally the best period for pruning has always been late winter, first because autumn is harvest season, and second because you typically wait early spring to minimize the risk of frosts that can be lethal to recently trimmed

trees), because in spring it's better to work as a gardener in one of the many villas of some rich person."

An already weak ecosystem, originally designed to fulfill the needs of the center of the (Spanish-French) Empire, thus slowly ended up orphaned by its main care provider: the peasants. Olive plantations, ecologically simplified ecologies already more susceptible to disease, were doing more or less fine until they had a sufficient number of people taking care of them and putting energy into the system (pruning the trees, preventing or fighting disease, etc.) to counteract its fallacies. Once the actively farming population started to decline, plantations appeared for what they are and have always been: perfect playgrounds for the proliferation of pathogens.

Abandoning of the countryside on one side, reduction of "practices of care" for the trees on the other: these are further Anthropocene detonators that intensified disease susceptibility in an already weak agricultural landscape. What I want to stress here, however, sometimes gets lost in more-than-human accounts of care: such care practices were historically linked to very specific economies. Fifty years ago, engaging with olive farming was a convenient endeavor, one that could sustain peasants' livelihoods and even allow peasant families to thrive (and buy plots of land to give to their sons, for example). Today, olive farming is not even closely a profitable activity as it was a few decades ago, or large extensions of land and/or high densities of olive trees are required for it to be so.

A general trend of rural out migration implies that those people who were historically taking care of our majestic olive trees landscapes – who *made* those landscapes in the first place – are not able to take care of them anymore. There is a general narrative in Apulia regarding the fact that "millenarian olive trees are a cultural heritage of inestimable value;" they are "artworks in open space," and because of this they have to be protected. But what happens when there is nobody able to restore those artworks or keep them alive? Olive trees were not born as "artworks in open space," but rather they were born as productive trees able to sustain rural livelihoods.

2.6. More-than-human political ecology and the historical material making of plant disease

In this article, I have shown how the morphology of Apulian landscapes brings to life histories of colonization, agrarian change, and socio-ecological breakdown. I have also shown that the shape of olive trees is the result of centuries of multispecies

interactions between humans and nonhumans. These practices, however, did not appear as a result of an abstract "love for the trees", but instead developed out of a livelihood-sustaining economy that saw in the olive tree its main protagonist. Practices and policies aimed at the restoration or preservation of Apulian millenarian olive orchards, therefore, cannot ignore the importance of those humans who have engaged with those practices in the first place.

Following Tsing et al. (2021), I have then conceptualized the materializing of Apulian diseased landscapes as the result of multiple "disease detonators". First, the colonial history of the region that shaped olive trees monocultures to sustain the expansion of the center of the Empire; second, the specific cultural practices that have developed as a consequence of the specific production of *olio lampante*; third, the recent crisis of olive market prices brought by political processes of agriculture industrialization and economic globalization; and fourth, the abandoning of the countryside as a result of wider processes of depeasantization and agrarian change. All of these factors prepared the terrain for the advent of the bacterium *X. fastidiosa* that subsequently proliferated with undomesticated violence.

While much of the debate on plant disease already recognizes the co-production of disease landscapes through biological, ecological, and social processes, what is far less consistently acknowledged is the extent to which such landscapes are historically preconditioned. In the Apulian case, the devastating effects of *X. fastidiosa* cannot be understood without situating the outbreak within long-term political–economic transformations that reshaped land ownership, production practices, labor relations, and rural livelihoods well before the arrival of the pathogen. These historical processes did not merely interact with disease after the fact; they actively configured the physical and social terrain in which bacterial proliferation became possible. In this sense, more-than-human political ecology becomes analytically productive not by asserting the agency of non-humans against that of humans, but by tracing how historically sedimented political-economic arrangements become entangled with biological processes in moments of crisis. Rather than posing human and non-human factors as competing explanations, my approach calls for increased attention to how particular agrarian histories act as "detonators" that amplify biological dynamics once disease emerges. In this reading, non-human actors such as pathogens, vectors, and host plants do not operate on neutral ground, but within landscapes already shaped by centuries of extraction, market integration, and uneven rural transformation.

Ultimately, what I have attempted to do in this article is to merge multispecies studies, and their sensitivity to nonhuman life forms, with critical agrarian studies and its attunement to power relations, institutional arrangements, and struggles around the survival of peasant modes of living (and being): a more-than-human political ecology of the countryside. I have done so by grounding multispecies analysis in the material conditions of agrarian production: performing a multispecies autoethnography of everyday encounters with olive trees and the bacterium, informed by sustained attention to plant and landscape morphologies (cf. Mathews, 2022), but situating these encounters within the drudgery labor of farming. This allowed the economic pressures, labor transformations, and historical trajectories that have shaped olive farming practices and Apulian landscapes to stand out. Paraphrasing Stuart McCook and his environmental history of the coffee leaf rust, a disease that affects coffee and has influenced the global production of this commodity since the middle of the 19th century, "[disease] alone does not devastate coffee farms; the combination of disease and low coffee prices does" (McCook, 2019, p.12). In a similar way I have shown that *X. fastidiosa* alone did not devastate Apulia's olive groves; the interplay of disease, monoculture, cultivation practices, economic pressures, and rural out migration did.

One of the purposes was to strengthen the explanatory potential of critical agrarian studies and political ecology by deepening historical attention on how economic and ecological factors are always intertwined through the actions of both humans and non-humans. While political-economic analyses have long highlighted the central role of capital in shaping rural landscapes, however, I argue that political economy *alone* provides insufficient explanatory power for what some scientists have called the "perfect storm" (M. A. Miranda, entomologist, personal communication, June 2021): a highly specific convergence of biological and ecological factors that has shaped Apulia's phytosanitary crisis. A more-than-human political ecology of plant disease, as developed in this article, combines sensitivity for political economy and processes of capital flow with close attention to nonhuman processes, while at the same time insisting that these relations be situated within historically specific agrarian configurations. My answer to the question *Can a bacterium change everything?* is a firm no, at least not in the case presented here. However, I equally argue that political economy alone cannot change everything either, as it must come to terms with the undisciplined and uncontrolled proliferations of the Anthropocene.

More-than-human political ecology provides the analytical leverage needed to trace how biological dynamics and political-economic histories converge in moments of agrarian crisis. Margulies and Karanth (2018, p.155) advocate for a multispecies approach that acknowledges non-humans as subjects in the co-production of environments. In a complementary way, this article aimed to reintroduce *human* agency, conceived as political economy, into multispecies studies. By examining the *X. fastidiosa* epidemic under a more-than-human political ecology lens, and highlighting how bacterial spread intersects with economic and political processes, I have simultaneously tried to resist falling into a "romantic environmentalism" trap (Vandermeer & Perfecto, 2024) that depicts Apulian olive trees as *just* "monuments to be protected." They surely are, but the beautiful landscapes that many people want to preserve are also – and, I would dare to say, mainly – landscapes that were sustaining a peasant's life that, due to industrialization of agriculture and globalization of agricultural markets, is now threatened by extinction. The link between conservation aspirations and peasants' livelihoods is key and has to be maintained in view.

A more-than-human political ecology calls for a politics that centers *both* humans and nonhumans in dynamic and always changing multispecies entanglements. And it should be able to explore the complex web of relations between humans and nonhumans without seeking a one-size-fits all explanation that runs the risk of reducing complex socio-ecological phenomena to a single "root cause." In the Apulian case, while human economic activities facilitated *X. fastidiosa*'s spread even more, specific ecological conditions made its proliferation particularly devastating. Human and non-human factors are both necessary but only jointly sufficient in producing diseased environments.

Finally, I contend that plant health and disease should be recognized as societal, not merely agronomic, concerns. As Mansfield (2008) stated, "Seeing health and disease outside of the binary of biology versus society is a very political intervention, in that it forces us to focus on new ways of doing things. It is, as Mol puts it, the politics of "what to do?" (p.1016). "A shift in perspective regarding "nature" is also a shift in practice - a shift in doing and enacting." Today, farmers in Apulia who have rejected the "there is no alternative" narrative of plant eradications are *putting into practice* enactments of more-than-human care that are proving effective in reaching certain levels of co-existence with the bacterium. Yet a key political question remains: who will bear the economic burden of these new responsibilities? Will Apulian olive trees need to rely on non-farmers and foreign investors seeking

to preserve their “aesthetic value” as a tourist attraction in order to be “saved”? Or will the state intervene through policies that support farmers' incomes and recognize the biocultural value of ancient olive trees, even if they are not necessarily economically productive? This remains to be seen.

This contribution should also be read as a call for interdisciplinary and transdisciplinary collaborations. To date there is very little knowledge regarding the *ecology* of the disease, understood as the complex ecological interactions not only between host, pathogen, and insect vector but a broader network of actors in the environment that surrounds olive trees (which includes humans, but also other non-human entities part of the olive ecosystem). While it is well established that monoculture facilitates pathogens' spread, understanding exactly *why* Apulian landscapes have proved especially prone to disease requires serious engagement with the natural sciences beyond simplistic and narrow explanations. In the same way we need social scientists who study *political* ecologies, we equally need natural scientists to study political *ecologies*, in novel and collaborative ways. I hope this article represents a first, although small, step in this direction.

3

Chapter 3



Epistemic diversity and the politics of knowledge in plant disease management

Insights from the *Xylella fastiodiosa* epidemic in Southern Italy

Abstract

This paper analyses the epistemic and political dimensions of the conflict around the management of the *Xylella fastidiosa* epidemic in Apulia, southern Italy—one of the most contested episodes in European plant health governance. The study draws on six years of ethnographic research, combining interviews with scientists, farmers, and policymakers; participant observation at international conferences and local assemblies; and analysis of scientific publications, policy documents, and media coverage. We identify five different intersecting domains where knowledge politics unfolds: (1) the dispute over disease causality, naming and framing; (2) the tension between scientific and lay actors regarding legitimate knowledge and research hypotheses; (3) the internal disagreements within the scientific community, reflecting different disciplinary traditions; (4) the divisions amongst farmers, reflecting divergent economic strategies, cultural attachments, and visions of agricultural futures; and (5) the institutional dynamics shaping knowledge production within scientific institutions. Under high uncertainty and stakes, technocratic governance struggles to secure legitimacy. Acknowledging epistemic diversity and embracing epistemic pluralism—integrating multiple forms of knowledge—is essential for adaptive and trusted plant health strategies in an era of rapid climate change and globalized trade.

Keywords: Epistemic pluralism; Knowledge controversies; Olive Quick Decline Syndrome; Plant disease governance; Post-Normal Science; Science-society relations; *Xylella fastidiosa.*

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3.1. Introduction

Plant pathogens are spreading at an unprecedented pace, reshaping agricultural landscapes and threatening food systems worldwide (Bebber et al., 2014; Chakraborty & Newton, 2011). Increased global trade, intensification of farming, and climate change have created pathways for invasive species and pathogens to move rapidly across continents (Baker et al., 2022; EPPO, 2012; Hulme, 2021). Most of the time, their impacts are not only biological but also economic (Haubrock, 2021), socio-political (Zadoks, 2017), and ecological (Singh et al., 2023). In areas where agriculture underpins local identity and livelihoods, the arrival of an exotic pathogen can be a profound social and political event, triggering uncertainty, urgency, and, at times, conflict (Crowley et al., 2017). Such crises demand immediate responses grounded in biological research, but they also require consideration of their social, cultural, and political contexts (Almeida, 2018).

Scientific controversies often accompany these emergencies. Plant health regulations and phytosanitary measures depend heavily on risk assessments, diagnostic protocols, and containment strategies designed by experts (EFSA, 2024; Hyatt-Twynam et al., 2018; USDA, 2018). However, decisions taken under uncertainty and in emergency conditions—particularly when they entail drastic measures such as large-scale tree eradication—are rarely uncontroversial (Vicent & Blasco, 2017). Disputes may arise over the reliability of evidence, the proportionality of prescribed measures, and the socio-economic or cultural costs of compliance (Crowley et al., 2017). Understanding these disputes requires attention not only to technical facts but also to a wider "politics of knowledge" (Ludwig et al., 2022a): complex negotiations of whose voices are heard, whose knowledge is considered legitimate, whose expertise is recognized, and how these dynamics shape both policy and public debate.

The outbreak of *Xylella fastidiosa* in Europe illustrates these tensions vividly. First detected in 2013 in olive trees in Apulia, southern Italy (Saponari et al., 2013), the bacterium was previously known in the Americas for causing severe plant diseases such as Pierce's disease of grapevines (Hopkins & Purcell, 2002). Its emergence in Europe, on one of the region's most culturally significant crops, prompted the European Union to enact strict containment measures under emergency legislation (European Commission, 2015). These included the demarcation of different containment zones and the mandatory uprooting of infected trees and their neighbors within a 100-meter radius (Saponari et al., 2019). Based on scientific

assessments and precautionary principles, these measures were aimed at preventing further spread of the pathogen (Catalano et al., 2019). To date, the pathogen has been reported in France, Spain, Portugal, and in parts of the Mediterranean basin outside Europe, including Lebanon and Israel (EPPO, n.d.). Since its first detection in Apulia, it is estimated that around 21 million olive trees and around 8,000 square kilometers of groves have been affected, including extensive numbers of monumental and centuries-old trees (ANSA, 2023). Recent analyses estimate direct agricultural losses in the hundreds of millions of euros (Calderoni et al., 2025), while broader economic projections range between €0.5 and €5.2 billion over the coming decade (Schneider et al., 2020).

However, the eradication[10] of centuries-old olive trees—deeply embedded in the landscape and cultural heritage of Apulia—sparked fierce public opposition, legal battles, and waves of protest (DeAndreis, 2022; Nadeau, 2015a). For many in the region, these trees are more than economic assets; they are living monuments of identity, belonging, and history, often interwoven with deeply emotional landscapes (Gatti, 2022). The proposition of uprooting the olive trees provoked outrage, conspiracy theories (Parmigiani, 2024), and opposition movements that accused institutions and scientists of ulterior motives (Abbott, 2015). Some farmers accepted eradication as a necessary yet bitter intervention; others rejected it as unacceptable for their territory. Within the scientific community, too, disagreements emerged over the interpretation of evidence and the appropriate course of action (Colella, 2020) (see Figures 3.1 and 3.2 for two illustrations of diseased landscapes).

[10]In this paper, we use "eradication" and "uprooting" interchangeably to refer to the removal of host trees (typically through cutting and/or uprooting), in line with how these measures were commonly described in Italian public and policy debates (*eradicazione)*. In plant pathology, however, "eradication" refers more precisely to the elimination of a pest or a pathogen from a delimited area and may involve multiple measures, of which host removal is only one.



Figure 3.1. A diseased centuries-old olive tree landscape. Municipality of Gallipoli. August 2019 (Photo: Fabio Gatti)



Figure 3.2. An olive trees landscape, with uprooted olive trees in front and diseased olive trees showing symptoms in the back. Municipality of San Vito dei Normanni. June 2025 (Photo: Fabio Gatti)

In this paper, we approach the *X. fastidiosa* epidemic in Apulia as an instance of what scholars in Science and Technology Studies (STS) describe as a "knowledge controversy" (Turnhout & Gieryn, 2019; Whatmore, 2009). Such controversies arise when scientific claims, diagnostic procedures, and management prescriptions become objects of public dispute, bringing to the surface the social, political, and epistemic assumptions that normally remain hidden when knowledge production is framed as neutral and objective, or as "speaking truth to power" (Wildavsky, 1979; Turnhout & Gieryn, 2019). In the case of the *Xylella* controversy[11] in Apulia, as we will see, what was at stake was not simply whether *X. fastidiosa* existed as an entity, but how the problem was framed (Colella et al., 2019): Is the decline of olive trees the effect of a single causal agent or rather the consequence of interacting biotic and abiotic stressors? Should governance prioritize eradication, coexistence, or socio-ecological restoration? And who should be granted the authority to inform public policy decision-making and consequently guide the allocation of emergency funds? Approaching the case as a knowledge controversy allows us to examine the politics of knowledge at play—how particular framings gained authority, how others were dismissed, and how institutions, regulatory frameworks, and disciplinary traditions influenced these dynamics.

With this in mind, the aims of this paper are twofold. First, we develop a more nuanced diagnosis of the controversy surrounding the management of *X. fastidiosa* in Apulia, commonly portrayed as a binary clash between "science" and "science denialists" (Abbott, 2019; Rielli, 2023). We argue that this framing obscures more complex negotiations over different forms of expertise and their relevance for plant health governance. Second, we build on this diagnosis to argue for a pluralist approach that recognizes multiple ways of knowing in governance contexts and that takes "refused knowledge seriously" (Neresini et al., 2024). Empirically, we do this by mapping the "politics of knowledge" around the epidemic through five different domains: (1) the debate over causality, naming, and framing of the disease; (2) the boundary work between scientific and lay actors over legitimate knowledge and research hypotheses; (3) the internal diversity and disagreement within the scientific

[11]Although *Xylella fastidiosa* subsp. *pauca* is the correct taxonomic designation for the bacterium detected in Apulia, the expressions "Xylella" and "Xylella emergency" are widely used in Italian media and institutional discourse as shorthand for the outbreak and the wider public dispute surrounding its causes and management. In this paper, we use "Xylella controversy" to refer to the controversy over the governance and management of the outbreak in Apulia, not to a general scientific controversy over the pathogen itself.

community; (4) the differentiation and conflict among farmers; and (5) the institutional and funding dynamics that influenced scientific knowledge production.

Theoretically, the paper draws on key concepts and debates from Philosophy of Science and STS, particularly those of post-normal science (Funtowicz & Ravetz, 1993), epistemic diversity (Hannon, 2019; Harding, 2015; Longino, 2002), and expertise studies (Collins & Evans, 2002, 2007; Collins, 2018). These concepts are put to work to help explain why the exclusion or marginalization of certain forms of knowledge—such as local experiential knowledge—can undermine trust and fuel resistance, even when interventions are grounded in rigorous science (Turnhout & Gieryn, 2019). They also shed light on how scientific communities themselves can harbor internal pluralism, with competing hypotheses and priorities shaping both research and policy recommendations (Bschir & Lohse, 2022).

The structure of the paper is as follows. The next section (Section 3.2) outlines the materials and methods and provides a fuller account of the theoretical concepts that inform our analysis. Section 3.3 presents the findings, organized around the five interlinked domains outlined above. Section 3.4 synthesizes these findings and develops their implications for a pluralist approach to plant health governance. The paper concludes by summarizing key insights and outlining directions for policy and research.

3.2. Materials and methods

This study investigates how knowledge, authority, and decision-making interacted during the institutional management of the *X. fastidiosa* epidemic in Apulia. Unlike research focused on pathogen biology, the questions addressed here concern the *socio-epistemological* dimension of plant health governance: Who counts as an expert? How are different types of knowledge valued or excluded? Why do disagreements emerge, and what effects do they have on disease management strategies? To answer these questions, the study uses qualitative, ethnographically informed methods, widely employed tools in the social sciences to understand practices, perceptions, and conflicts that shape decision-making dynamics in complex socio-ecological systems.

Fieldwork was conducted over six years (2019–2025), primarily in Apulia, southern Italy—the first European region affected by *X. fastidiosa*. Additional observations were made in transnational scientific and policy arenas. Data collection combined semi-structured and narrative interviews, ethnographic observation in

public events and everyday farming activities, and document analysis. Interviews were conducted with olive farmers, millers, plant pathologists, agronomists, policymakers, and members of civil society organizations. In addition, the first author engaged directly with olive farming practices at his family orchard in Apulia (Fig. 3.3). In parallel, the first author conducted participant observation, attending meetings, public assemblies, and protests in Apulia, as well as two international conferences on *X. fastidiosa* organized by the European Food Safety Authority (EFSA). He also regularly joined the "*Xylella* Files," a bi-weekly online seminar series which brings together researchers from plant pathology, entomology, environmental history, and social sciences to discuss developments on *X. fastidiosa* research across the world. Document analysis covered EU legislation, EFSA risk assessments, national policy documents, scientific publications, and media reports, providing historical and institutional context and tracing how knowledge claims were formalized in official discourse. All interviews were recorded with informed consent, transcribed verbatim, and stored securely.

The analysis is grounded in conceptual tools that help make sense of governance under conditions of uncertainty. First, there is the concept of *post-normal science*, introduced by philosophers of science Silvio Funtowicz and Jerry Ravetz (1993). This concept, we believe, is particularly relevant for plant health crises as it sets out a scientific paradigm suited for situations where "facts are uncertain, values in dispute, stakes high, and decisions urgent" (1993:744). While "normal" science typically deals with highly controlled experimental settings (low uncertainty) and limited societal impact (low stakes) and therefore can be considered the realm of "core science", in the case of domains of science with high uncertainty and high stakes (as in most global disease crises, typically constituting wicked problems, see Ludwig et al., 2022b) reliance on a narrow set of accredited experts is ineffective, and instead an "extended peer-community" (Funtowicz & Ravetz, 1993:740) is needed to arrive at effective solutions. Second, the concept of *epistemic diversity* highlights how effective responses to post-normal conditions require the recognition of different forms of knowledge rather than the privileging of a single epistemic framework (Ludwig & El-Hani, 2025; Rolin, 2019). Epistemic diversity thus underpins a post-normal science approach that does not rely exclusively on formal expert systems, but instead enables inclusive governance based on extended peer communities capable of deliberation under uncertainty. Third, the field of *expertise studies* (Collins & Evans, 2002) complements these debates by stressing that different forms of expertise are distributed across different (e.g., academic and non-academic) actors, rather than suggesting a flat pluralism in which everyone is

considered an expert on everything. In particular, we draw on Collins and Evans' distinctions between "contributory" and "interactional" expertise (see Collins & Evans, 2002): the first concerns the skills necessary to contribute directly to a specialist domain, whereas the latter refers to the fluency needed to engage meaningfully with specialists without being a "contributor" oneself. We further explore these distinctions throughout the rest of the paper.



Figure 3.3. The first author pruning an olive tree in his family orchard. March 2025. Municipality of Ostuni (Photo: Sonja Ensslin).

3.3. Findings

This section examines the socio-epistemological dynamics of the *X. fastidiosa* controversy across five domains. First, we introduce debates over the causal agent and the shift from a complex of causes to a syndrome of a single cause (3.1). Next, we examine multiple levels of boundary work between scientists and lay actors (3.2), followed by an examination of the internal disagreements within the scientific community (3.3). Fourth, we present farmers' internal differentiation and their conflicting attitudes toward the most appropriate management measures (3.4). Finally, we explore the politics of knowledge production within scientific research institutions (3.5), showing how institutional incentives, funding mechanisms, and plant protection regulations influenced both research and governance.

3.3.1. The conflict over causality, naming, and framing

> *"Naming is a powerful, formative work. [...] The effort to identify and name [...] is a vital part of contemporary conservation efforts. But naming is more complex than this. Amongst other things, it is frequently also an act of dominion, one that more or less intentionally asserts the authority to categorize and order reality."* (van Dooren, 2022:98)

The act of naming does not simply describe an external reality; rather, it orders it, assigns authority, and shapes the field of possible interventions. In plant pathology, identifying a causal agent is not only a technical exercise but a decisive step that co-produces management strategies and legal frameworks. In the case of the *X. fastidiosa* outbreak, the discovery of the bacterium's presence (subsp. *pauca*) in symptomatic olive trees in Apulia in 2013 quickly became the cornerstone of the official narrative of causality. Within a couple of years, the name given to the disease shifted from *Complesso del Disseccamento Rapido dell'Olivo* (CoDiRO)—a term conveying the idea of a complex pathology caused by multiple interacting factors—to *Olive Quick Decline Syndrome* (OQDS)—a condition whose manifestation could vary but that was imputable to a single cause: the bacterium *X. fastidiosa*. This linguistic shift marked more than a semantic change: it was at the core of the epistemic conflict that unfolded in the region from that moment on.

The identification of *X. fastidiosa* as the etiological factor of the disease—published in the journal *Scientific Reports* (Saponari et al., 2017)—was presented as a scientific breakthrough, both in scientific accounts and in media coverage. The results explained a devastating phenomenon, were aligned with established models

of plant pathology, and offered a clear course of action. This framing, however, was not exempt from contestation. Critics—from individual farmers to grassroots organizations such as "Il Popolo degli Ulivi" and "Ulivivo"—challenged both the epistemic assumptions and the political implications of this causal attribution. As one activist argued on social media:

> *"If the so-called "science" had wanted to discover the true cause of desiccation, instead of isolating only what interests them (Xylella), it would have been enough to isolate ALL the pathogens present on a numerically high sample of olive trees, and verify the only common denominator present in all the samples, and the true ones would have been discovered immediately."*

This critique highlights a fundamental disagreement over what counts as rigorous scientific inquiry. For plant pathologists, isolating a single variable under controlled conditions—following the logic of Koch's postulates—has long represented the gold standard of proof (although recent work has started to question their validity for complex diseases—see Bonello, 2024). For critics, including a number of scientists (see subsection 3.3), this reductionist approach was perceived as overlooking the complexity of agroecosystems and the simultaneous contribution of multiple stressors—biotic, abiotic, and socio-economic—in shaping plant health. According to them, fungal pathogens, other insects, as well as the abandonment of the "good agronomic practices" ("le *buone pratiche agronomiche"*) and water stress due to desertification and overexploitation of underground water, should be considered as co-constitutive factors in the decline. Accordingly, the condition had to be called by a name that conveyed the idea of a complex syndrome resulting from multiple interacting stressors: CoDiRO. In Italian public debate, instead, the disease was generally simplified to "*Xylella*": a phytopathological case of synecdoche in which the pathogen came to signify the entire condition.

In fact, many antagonistic farmers and activists continue, up to the present day, to use the term CoDiRO as an overt form of resistance: a way to stress the complexity of the disease and to reject the reductionist narrative embedded in *OQDS*. As James Scott (1998) argues, modern scientific practice has the tendency to simplify ecological complexity to make it legible and controllable, privileging isolated causal chains over systemic interactions. Most importantly, it is the *consequences* of this simplification that can cause societal harm, especially when it goes hand-in-glove

with forms of state control. The case of *X. fastidiosa* exemplifies this tension: once the bacterium was detected, it quickly became the central figure—along with its insect vector *Philaenus spumarius* (Hemiptera: Aphrophoridae) (Cornara et al., 2016)—in the epidemiological narrative, and in the consequential containment strategy. Conversely, other potential factors—soil degradation, water stress, and land-use changes (as well as other nonhuman actors interacting with the triad olive-pathogen-insect vector)—were not prioritized in the official causal framing of the disease. In part, this can be explained by the fact that the outbreak involved a little-known pathogen—at least on the Apulian territory—requiring urgent efforts to establish basic diagnostic and epidemiological knowledge. However, as the following sections show, failure to engage with stakeholders' demands for greater attention to ecological complexity generated epistemic friction and, ultimately, some degree of misunderstanding.

The contestation over naming and framing is not purely epistemological; it is also political. Under the European Union's plant health regime, the mere detection of *X. fastidiosa*, classified as a quarantine organism following the adoption of Regulation (EU) 2016/2031 (European Commission, 2016), automatically triggered specific emergency measures—most notably, compulsory eradication within demarcated zones (European Commission, 2015). These measures were based on scientific advice provided by the EFSA Panel on Plant Health. EFSA offered the evidentiary basis for the Commission's action through two key reports (EFSA, 2015, 2019), and thereby played a prominent role in shaping policy decisions. It is important to emphasize that these obligations apply *regardless* of whether the bacterium is the primary causal agent of olive tree decline. In practice, however, the regulatory link between detection and eradication reinforced a narrative that framed *X. fastidiosa* as the sole culprit, narrowing the space for holistic interpretations and management strategies. While farmers and some scientists advocated for systemic approaches (Section 3.2), these proposals were sidelined by a governance framework centered around the containment of a single pathogenic threat. But the regulatory framework itself is not exempt from politics: for instance, the original requirement to uproot all host plants within a 100-meter radius of an infected tree was later reduced to 50 meters (European Commission, 2020). This adjustment shows that plant health regulation, while grounded in scientific expertise, is not static but responsive to political pressure, scientific evidence, and feasibility concerns. Currently (as of late 2025), EFSA is working to produce a new update on the risk assessment for *X. fastidiosa* based on new evidence that has emerged after more than 10 years of research (G. Stancanelli, personal communication).

What is at stake here is not epistemic reduction *per se*—often necessary in early outbreak response when actionable knowledge is required quickly—but the progressive closure of the problem frame, through which complementary research questions, causal hypotheses, and management strategies became institutionally marginal. For most critics, the issue was not whether *X. fastidiosa* existed—its presence was, with a few exceptions and increasingly so, acknowledged—but whether it should be treated as the sole, or even primary, cause of decline. By contrast, leading plant scientists regarded this pluralistic view as scientifically unfounded. This asymmetry in epistemic authority—where one causal explanation came to dominate policy—became a major fault line in the controversy. Significantly, these disputes have not disappeared. More than a decade after the initial outbreak, debates over the name and nature of the disease remain alive. Recent studies revitalized the old controversy regarding whether *X. fastidiosa* alone can account for the observed patterns of decline, pointing instead to possible interactions with *Neofusicoccum spp.* (Scortichini et al., 2023). Another study (Ciervo & Scortichini, 2024) claims that the actual incidence of infection by the bacterium is much lower than the official estimates, and proposes to eliminate the rule requiring the uprooting of all host plants within a 50-meter radius of an infected tree.

Acts of classification constitute a first layer of knowledge politics. The debate over what to call the disease foregrounds a deeper conflict about the appropriate boundaries of inquiry: whether research should remain narrowly focused on the pathogen itself or expand to address the broader ecological and socio-environmental conditions shaping decline. Crucially, this politics of naming and framing does not unfold only at the local level. In fact, it "trickles down" from a more international level, as it also involves transnational institutions such as EFSA and the European Commission's Plant Health Unit, whose assessments and regulatory power carry significant authority. Yet their institutional distance from the affected territories complicates the matter. As one EFSA representative remarked during a public event on biocontrol for *X. fastidiosa*: "*We focus on evidence and data; we don't have the capacity to go among farmers.*" Such detachment, combined with the need to rely on local experts for context-specific knowledge, creates an uneven epistemic landscape—one that can inadvertently fuel conspiracy thinking and distrust toward EU institutions perceived as remote from local concerns.

As the following sections show, this initial politics of classification did not merely precede later conflicts; it actively structured them. By consolidating a particular causal narrative as the authoritative frame for intervention, it set the

stage on which farmers, activists, and dissenting scientists would subsequently contest expertise, credibility, and the legitimacy of specific management measures.

3.3.2. Boundary work between scientific and lay knowledge holders

> *"Look, [...] it is the presence of the bacterium that makes the difference. The condition of the terrain [or] the fact that the territory of Salento has been abandoned for a long time, with herbicides or products that have decreased the "immune defenses" of the olive tree, as some madman calls them, [...] does not make any sense."* (a plant pathologist, from interviews)

> *"I have just attended primary school… but I have experience! You have education, which is useful. Let's join forces and move on—but you don't have to attack me. I'm proud of being a farmer. And I'm proud of the education and the sense of respect for things, for people, and for trees, which my dad gave me."* (a farmer, from interviews)

The conflict surrounding *X. fastidiosa* in Apulia has often been framed—both by the media and by some of the scientists interviewed, as the opening quote shows—as a confrontation between scientific rationality and irrational, "madman" resistance. Institutional discourse reinforced this binary, casting opponents of eradication as "denialists" obstructing evidence-based measures (Abbott, 2019). It is true that elements of conspiracy thinking have been present at times—for example, in claims that the bacterium was deliberately introduced to "turn Salento into a desert" for speculative development or to benefit AgTech companies such as Monsanto (Parmigiani, 2024; Rielli, 2023). Brandmayr (2025) interestingly observes that the "wave of resistance against science-based containment measures" (p.1) was rooted in left-wing political values, rather than in the more commonly accepted—and discussed—right-wing populist distrust in science (Krämer & Klingler, 2020; van der Meer & Hameleers, 2026). Yet, interpreting the controversy primarily through the lens of denialism, or depicting opposition to policy measures as irrational, obscures a more nuanced picture and prevents a deeper understanding of the epistemic and political complexities at play. Following Collins (2023:145), we

contend that "terms like irrational rarely have a useful explanatory function"[12] (see also Neresini et al., 2024).

In what follows, we structure the interaction between leading scientists and non-scientific practitioners, which is the main focus of this section, through different levels of "boundary work" (Gieryn, 1983): the practices through which actors draw, defend and contest the lines between legitimate and illegitimate knowledge, between credible and non-credible experts, and between admissible and non-admissible forms of evidence. Specifically, we identify four types of boundary work: discursive, institutional, epistemic, and disciplinary.

Discursive boundary work operated through the linguistic processes through which actors named and framed dissent, using labels that positioned some claims and speakers as irrational, unqualified, and therefore outside the bounds of legitimate debate, and others not. This is evident in the plant pathologist quote reported in the opening of this section, as well as in the mainstream representations of the crisis as a conflict between "science" and "science denialism" mentioned above. Our ethnographic findings, however, show that opposition was rarely rooted in the wholesale rejection of science. Instead, it focused on what counted as relevant science, whose expertise mattered, and how research priorities were set. As one of the farmer-activists explained to the first author:

> *"We never rejected "Science". On the contrary, we asked for research to be made accessible to all possible universities with the relevant expertise. Instead, scientific research in the region has been hindered: the monopoly on research has, since the beginning, been in the hands of the CNR in Bari."*

As this statement shows, critique frequently was targeted at what was perceived as the monopolization of research capacity by a few specific research institutions.

[12]From an STS perspective, describing actors as "irrational" has limited explanatory value. The term tends to place disagreement outside the realm of meaningful reasoning, rather than investigating why and how people mobilize different forms of evidence, experience, or expertise. Instead of clarifying the roots of conflict, it forecloses inquiry by assuming that non-compliance results from a cognitive deficit rather than from legitimate differences in epistemic perspectives, values, or lived experiences. For this reason, we prefer to analyse how knowledge claims are constructed, negotiated, and mobilized, rather than attributing dissent to irrationality.

This points to a second—*institutional*—form of perceived boundary work that operated through formal governance arrangements that limited who could participate in knowledge production processes. After *X. fastidiosa* was detected and reported to the EU, in fact, only a few authorized laboratories—primarily the National Research Council (CNR) in Bari and the "Basile Caramia" laboratory of the Regional Phytosanitary Observatory in Locorotondo—were allowed to handle infected plant material. This was due to the fact that, by virtue of its status as that of a quarantine pathogen, not only was the organism subject to strict eradication and monitoring measures, but also the movement of infected material was confined to accredited facilities. Yet, *how* and *why* these—and only these—facilities were selected and accredited were considered by some to be insufficiently transparent. As such, they became a source of mistrust. Rumors circulated locally that the research groups who first isolated and sequenced the pathogen's DNA did not share genetic material with other laboratories, both to maintain a leading position in the plant pathology research ecosystem and to limit the ability of other groups to contribute to knowledge production. Whether or not such suspicions were empirically warranted, they mattered politically, as they fed a perception that research opportunities were limited to a closed institutional circuit. For many activists, this concentration of control distorted research agendas. Ultimately, the question was not whether science should guide and inform policy, but whether policy was being shaped by a narrow and opportunistic science serving specific institutional interests rather than the wider public good.

The prioritization of *X. fastidiosa* as a narrow domain of inquiry was also perceived to be linked to financial incentives, sidelining investigations into other potential co-factors. As one activist put it: *"They focused on Xylella because it was the one that would bring more money for research. Other pathogens were overlooked because they were not profitable."* Some farmers and social movements, conversely, advanced an alternative interpretation of the underlying causes of the epidemic. While acknowledging, with a few exceptions, the presence of the bacterium, they refused to accept the notion that olive decline could be attributed to a single pathogenic agent. Instead, as noted in Section 3.1, they pointed to a constellation of biotic and abiotic stressors as contributing pathogenic factors (Colella et al., 2019). Importantly, these actors did not remain passive observers: many engaged in bottom-up experimentation and mutual exchange. In November 2023, for instance, farmers and activists convened in Ostuni for the event *"CoDiRO – Esperienze di cura e adattamento" ("Experiences of care and adaptation")*. Although the specific practices and products documented in that meeting to some extent varied, the

message of the gathering was clear: with attentive management—in some case simply based on traditional methods—and enough care, olive trees could survive. Based on their practical experience, participants explicitly challenged the dominant narrative according to which infection by *X. fastidiosa* rendered trees inevitably doomed and eradication, therefore, a non-debatable and unavoidable intervention. While it is important to stress that there is a non-negligible difference between keeping a tree *alive* and keeping a tree *productive*, this "proof of principle" that olive trees could be kept alive despite infection was in many cases sufficient to call into question the dominant narrative of inevitable decline.

The experiences presented during that meeting articulated a different paradigm—one giving priority to care, soil health restoration, and attentive management to strengthen the ecosystems' resilience to pathogens. Lorimer (2017) calls this a "probiotic environmentality," an ethos of coexistence rather than eradication. As one farmer put it: *"We need to learn to coexist with the bacteria, rather than eliminate it."* Or in the words of another farmer-activist: *"We have created a culture of war. We do not need to wage war on anyone; we simply need to restore a balance that we have destroyed.* (from interviews, our translation) Despite an excessive idealization of "*the way things were done in the past*" and an often oversimplistic equation of traditional knowledge with intrinsic wisdom ("*We mistreated a wise generation that brought us knowledge; we belittled them and called them ignorant*"), the value of these positions lies less in the empirical accuracy of their historical narratives than in their performative and mobilizing effects, namely counteracting a widespread attitude of resignation—"there is nothing to be done"—which had led many farmers to abandon their groves without attempting any intervention, thus leaving space for speculative land acquisitions or, simply, for the further spread of the disease[13]. In this sense, these grassroots initiatives were actively working to maintain a sense of possibility and hope that olive trees could still be saved, and in this way, were contributing to an active management of the disease.

Yet, when asked to provide "proof" of alternative explanations, they encountered *epistemic* boundaries. As one regional official explained: *"I need the proof. Where*

[13]The epidemiology of the disease is strongly influenced by the density of insect vectors in a given field. Because the vectors' nymphal stages develop on herbaceous grounds, weed and groundcover management is key to keeping vector populations under control. Consequently, farmland abandonment and failure to apply basic agronomic practices (e.g. tillage or mowing/grass trimming in early to late spring) are considered important contributors to high vector densities.

is the proof? You can say whatever you want, but until I see the proof I cannot, as a public policy maker, grant you any grant or subsidy for what you are saying." Despite philosophers of science having long argued that "the idea that science ever could provide proof upon which to base policy is a misunderstanding (or misrepresentation) of science" (Oreskes, 2004, p. 369), this exchange shows a form of boundary work centered on what counted as valid proof and which methods were recognized as legitimate in policy-relevant knowledge production. In reality, however, farmers repeatedly sought scientific validation for their holistic hypotheses, by trying to create alliances and convergences with scientists who were sympathetic to different interpretations of the disease (see subsection 3.3), or with the regional government. During a convention in Carovigno, for instance, one farmer explicitly asked the Apulian region representative present in that meeting to create an experimental field where different "protocols"—codified in a variety of bottom-up experimental practices—could be tested side-by-side to determine which treatment was most effective. However, with a few minor exceptions (Bruno et al., 2021; Bruno, 2024) their proposals remained part of what STS scholars call "undone science"—areas of inquiry recognized as socially valuable but left underexplored because they do not align with dominant political or economic priorities (Frickel et al., 2009; Hess, 2016; also Colella et al., 2019 for the specific case of *X. fastidiosa* in Apulia). Alternative management practices failed to gain sustained scientific and institutional support, and resources remained concentrated on containment strategies that reinforced an "antibiotic" model of governance: a linear, reductionist approach focused on eradicating a pathogen rather than addressing systemic vulnerabilities.

Not being translated into official (and properly funded) research agendas, alternative hypotheses and their related experimental practices could easily be disqualified for lacking the forms of evidence privileged by "normal" scientific paradigms, thereby reinforcing epistemic boundary work in practice. While it is worth noting that past research on *X. fastidiosa* pathologies affecting other crops (almonds, grapevine, citrus) has not as yet provided strong evidence that alternative management practices can fully replace eradication-based containment, proposals that foreground socio-ecological complexity nonetheless draw attention to causal factors—such as farmers' structural vulnerabilities, land-use practices, and ecological degradation—that remain marginal in dominant containment narratives but that could be taken into account in more comprehensive management strategies. Furthermore, the fact that *X. fastidiosa* had never before been detected on olives—and had never produced an outbreak of such a magnitude—could still have justified exploratory ecological investigations alongside urgent containment efforts. From the

farmers' perspective, eradication became thus not just a technical measure but a political imposition—an effort to make complex ecologies legible and governable through simplification, a process Scott (1998) identifies as central to modernist projects. This framing seems to remain dominant today: all major government-funded projects currently underway in Apulia—OMIBREED, RIGENERA, NOVIXGEN—focus on breeding resistant varieties, widely portrayed as the most promising pathway for the "rebirth" of olive farming in the region.

Farmers' demands were not only socio-political; they also pointed to legitimate scientific questions about soil health, biodiversity loss, and ecosystem interactions. Yet ecological expertise was largely absent from institutional research agendas: a last form of (*disciplinary)* boundary work that shaped which questions and forms of expertise were treated as relevant to the emergency, privileging certain scientific repertoires while relegating others to the margins of institutional research and policy. Part of this absence was related to the fact that ecological research—which tends to investigate complex, multi-scalar interactions—typically requires time and longitudinal data, both incompatible with the urgency to "act fast" and show control during an emergency of such magnitude. Moreover, the research groups who led the official response lacked specific training or expertise in ecology, thus reinforcing a disciplinary focus on pathology and containment. In practice, questions that could have overlapped with farmers' and social movements' holistic proposals—such as the role of soil and plant microbiomes, water stress, ecological simplification, landscape structure—remained underexplored, and were broadly relegated to the realm of undone science.

Taken together, these dynamics illustrate a second layer in the politics of knowledge around the epidemic, namely the forms of boundary work through which authority over legitimate knowledge was actively established. Boundary work operated by defining: (i) who counted as a legitimate expert (discursive boundary work), (ii) who could participate in authoritative knowledge production (institutional boundary work), (iii) what counted as acceptable proof and fundable questions (epistemic boundary work), and (iv) which disciplinary perspectives were treated as relevant to governance (disciplinary boundary work). In this contested space, eradication measures came to signify more than disease control. For regional and international institutions, they embodied rational, science-based governance. For critics, they symbolized a technocratic model of plant health governance that privileges institutional science and regulatory authority while marginalizing different types of expertise and bottom-up initiatives. The *Xylella* controversy,

therefore, was not a simple clash between science and ignorance; it was a struggle over the politics of knowledge, expertise, and authority under conditions of uncertainty.

3.3.3. Intra-scientific disagreement and diversity

"It's not in their mindset to treat plant bacteria, because they are virologists and they are used to viruses. For plant viruses there are no cures, and then you bring that way of thinking to a bacterial disease."
(a plant bacteriologist, from interviews)

The disagreement surrounding the management of the *X. fastidiosa* crisis did not only divide scientists from non-scientists; it also exposed fractures within the scientific community itself. While the dominant position in European plant health governance framed *X. fastidiosa* as the primary cause of Olive Quick Decline Syndrome (OQDS) and endorsed eradication as the default strategy, some scientists contested both the interpretation of evidence and the management paradigm that followed.

Part of this stems from the biological and epistemic ambiguity of *X. fastidiosa* itself. For decades, the organism puzzled researchers. It was initially considered to be a virus before being conclusively identified as a bacterium—a shift that reconfigured how scientists approached this biological entity (Purcell, 2013). Even after this reclassification, however, *X. fastidiosa* retained its peculiarities: it is slow-growing, nutritionally demanding, and notoriously difficult to manipulate in vitro. These traits complicated early European research efforts and created openings for disciplinary negotiation. Virologists, bacteriologists, and microbiologists each brought their own conceptual and technical toolkits to a pathogen never before studied on olive trees—or anywhere in Europe. Maria Saponari, a leading plant pathologist at the CNR in Bari and now head of major EU-funded projects exceeding €20 million, recalled in a scientific meeting how her training in virology was considered an asset by other colleagues: "*When I was in Brazil, they were happy that I was not a bacteriologist because of the specificities of manipulating Xylella in the lab*." Her expertise with viruses, she argued, provided advantages for handling a bacterium resistant to cultivation. It is precisely this transfer of logic that Marco Scortichini, a senior plant bacteriologist, sought to challenge. From his perspective, "*Virologists are not used to treating plants, because there is no cure for viruses. [...] With viruses, you don't have cures—you have eradication and monitoring.*" In his

argument, because *X. fastidiosa* is a bacterium, the epidemic should have been dealt with by plant pathologists with training in bacteriology:

> *"With viruses, you don't have cures—you have eradication and monitoring. For bacterial diseases in plants, you do have cures. [...] For 35 years, I've been working to understand how bacterial diseases work, to try and see what [solution] works and what doesn't. [...] The virologist has no cures at their disposal. Right now, in plant pathology, nothing is effective against viruses. And so, you transfer this mental framework to a bacterial disease."*

According to Scortichini, this disciplinary lens influenced how the epidemic was approached and governed in ways that, from his perspective, prematurely foreclosed curative or integrative approaches: as Saponari's research group assumed leadership in the official research response, eradication became the natural template—mirroring established practices in plant virology. In truth, there is no intrinsic reason why a plant pathologist trained in virology should not be able to work effectively with bacteria, as long as sufficient time is spent engaging with the specific object of inquiry. As Collins and Evans remind us, contributory expertise develops through sustained engagement with specific entities and practices, not through disciplinary labels alone. At the same time, science studies show that disciplinary traditions and expertise trajectories do influence actors' "epistemological affinities and chauvinisms" (Oreskes, 2004:275), orienting attention toward certain causal models, methods, and intervention logics, while rendering others less readily mobilized (Hacking, 1994).

In the Apulian controversy, Scortichini positioned himself against what he perceived as an overly narrow framing of the epidemic, insisting that olive decline should be treated as a *complex disease* (cf. Section 3.1), and that the use of specific chemical compounds could help keep infections under check. In 2018, he co-authored a widely debated study proposing a treatment protocol aimed at mitigating infection while maintaining olive production (Scortichini et al., 2018). Although his in-field trials showed promising results, the study was criticized for lacking in methodological rigor. After being brought to the attention of the Apulian regional government, the study was formally evaluated and subsequently rejected by regional authorities as "ineffective or paradoxically making things worse" (Consiglio

Regionale della Puglia, 2019). On the same official communication, the Apulian Regional Council states:

> *"After the filing of the final report, which refers to an article published in Phytopathologia Mediterranea ("A zinc, copper and citric acid biocomplex shows promise for control of Xylella fastidiosa subsp. pauca in olive trees in the Apulia region – southern Italy"), we cautiously asked three experts to provide their assessment. The result confirmed our initial impressions, both regarding the sample used in the protocol (the effect of the bacterium was measured only in two treated olive trees and in two controls) and the lack of sufficient evidence to support conclusions about the antibacterial usefulness of the tested compound (Dentamet)." [...] "We are nevertheless making the consultancy work provided by [...] available to the scientific community and the public," [...] "so that the scientific method—grounded in evidence and focused on substance rather than discredit—may prevail at all times, especially when such evidence forms the basis of political decisions."*

This quote is notable in how it shows institutional authority mobilizing a specific vision of "the scientific method" to police the boundaries of legitimate knowledge, privileging controlled experimentation over situated, field-based inquiry. What is presented as a neutral appeal to evidence thus also functions as a mechanism for excluding alternative epistemic dispositions from policy relevance. From his side, Scortichini defended his approach by contrasting the ecological complexity of field studies with the artificiality of laboratory experiments: "*Fieldwork is not like laboratory work, where everything is controlled. [...] You're not working with potted plants in a lab, where not a breath of air gets in, where you decide the temperature and humidity levels, you understand?*" While his critics focused on potential invalidating factors, Scortichini emphasized that ecological complexity cannot be fully captured in controlled lab conditions. For Scortichini, overall, the controversy extended beyond a technical disagreement: it also reflected a clash of epistemic cultures. Virologists—accustomed to pathogens for which no cure exists—gravitate toward eradication and containment. Bacteriologists, by contrast, tend to work within traditions that explore curative or integrative strategies[14].

[14]It is important to clarify that no "curative" treatment exists anywhere in the world for diseases caused by *X. fastidiosa*, intended as a phytopharmaceutical intervention that

On the ground, farmers who experimented with the so-called "Scortichini protocol" reported noticeable reductions in symptoms. One of them, Donato Minosi, stated that *"at the beginning people were calling him mad"* for trying to do something with his trees. But he persisted, calling himself stubborn ("*capatosta*") and not borne to listen to the discouraging comments from the other villagers. When the first author visited his orchard, his trees appeared greener than his neighbours', and he was still able to harvest olives, although not at the same levels as before, and at somewhat higher production costs. Meanwhile, subsequent research from the CNR in Bari—including scientists who had been among the main critics of Scortichini's earlier work—recognized the antibacterial activity *in vitro* of the product used in his trials (Del Grosso et al., 2025), as well as that of some other chemical compounds. While this later recognition did not validate the original protocol as such, it contradicted earlier claims that the product used lacked any efficacy.

These disputes reveal a third dimension of knowledge politics, this time internal to the scientific community. The controversy did not arise solely from a clash between scientific and non-scientific forms of expertise, but rather from *within* science, in the midst of divergent epistemic cultures, methodological commitments, institutional positions, and fights to gain hegemonic positions in the broader landscape of scientific research on the topic (more on this in Section 3.5). Disagreements over appropriate experimental protocols, disciplinary habits, and

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removes *completely* the pathogen from within the host plant. Management strategies worldwide—whether in the United States, Brazil, or Europe—mostly rely so far on vector suppression and on the removal of infected plant material (R. Almeida, personal communication). Pruning has been shown to work effectively in citrus plants (Beretta et al., 1996) but not in olives (Camposeo et al., 2022). At the same time, a range of chemical compounds has been observed to reduce symptom severity and improve vegetative activity, thereby increasing the rate of resprouting with respect to the rate of decay. While such approaches seem to have only partial bactericidal effects (Del Grosso et al., 2025) and do not appear to fully eliminate the bacterium from infected hosts, they show promising effects in keeping trees alive and, in most cases, maintaining a degree of productivity. A similar misunderstanding characterizes the widespread reference to "resistant varieties." In plant pathology, resistance denotes full *immunity* to infection by a pathogen. The olive cultivars currently promoted for replanting in Apulia (*Leccino*, *FS-17*, *Lecciana*, *Leccio del Corno*) are not resistant in this technical sense: they can be infected by *X. fastidiosa* but generally develop milder symptoms and maintain higher levels of productivity. They are therefore more accurately described as "tolerant" rather than "resistant", as they can still host and potentially disseminate the bacterium. Accurately distinguishing between cure vs. symptom mitigation, and resistance vs. tolerance, is essential to avoid creating unrealistic expectations and to ground management strategies in established plant pathological terminology.

feasible intervention strategies thus show how scientific authority is itself negotiated under uncertainty. Importantly, these fractures do not weaken the argument for epistemic diversity; rather, they underscore how pluralism already operates within science and how efforts to impose a single authoritative framework risk obscuring legitimate forms of disciplinary dissent.

3.3.4. Differentiation and conflict amongst farmers

Just as scientists diverged over causal explanations and management strategies, farmers, too, held conflicting views, shaped by varying economic interests, cultural attachments, and visions of agricultural futures.

Large-scale, market-oriented farmers—especially those managing intensive groves or diversified agricultural enterprises—tended to view eradication as a pragmatic necessity, provided that compensation and subsidies for replanting resistant varieties were guaranteed. For these farmers, olive trees were primarily economic assets, and their priority was to restore olive production within an acceptable timeframe. As one large-scale farmer put it: *"If they compensate us and let us replant resistant varieties, we can move on. We can't afford to lose years of income."* Their position was further supported by farmers' organizations (*associazioni di categoria*), which largely endorsed eradication and replanting programs. These organizations framed the epidemic as an opportunity to modernize the olive sector through high-density and super-intensive plantations, arguing that such systems would enhance competitiveness in global markets. In this sense, institutional science and research policies, that framed the disease as incurable and that prioritized the breeding of resistant cultivars, aligned well with the (economic) modernization agenda advocated for by sectoral associations and large commercial farms.

Importantly, some of these large-scale farmers also actively collaborated with hegemonic research institutions. One example is Giovanni Melcarne, a large-scale farmer from Salento with a degree in agronomy, who had partnered with CNR scientists in Bari since the early days of the epidemic. Melcarne championed, and personally contributed to, the search for naturally tolerant or resistant local olive varieties (Rielli, 2023). Today, he has replanted large areas of his farm with high-density orchards of Leccino and FS-17 (Favolosa), two of the cultivars officially recognized as resistant to the disease, while continuing to support breeding research programs for new varieties. Around his *frantoio* (olive mill), he proudly showcases

an experimental field developed in collaboration with CNR scientists and the regional government.

Smallholders, by contrast, often opposed eradication not only for economic reasons but also because of their deep emotional attachment to the trees (Gatti, 2022). Many of them were centuries old, inherited, and intertwined with family history and local identity. In Apulia, olive trees are sometimes planted to celebrate the birth of a newborn, or simply as a form of investment for the future. Witnessing dead olive trees all around is commonly described as a form of grief. This is the testimony of one of the farmers interviewed:

> *"When I was young I used to cycle amongst the trees, on our land. I loved to cycle, and I went there very often. I was calm and peaceful as that was our land and nothing could happen to me. Also when I grew up, I kept cycling amongst them. Now, it has been two years since I held my bike: it's now full of rust. [...] I can't bring myself to be amongst the olive groves that are all dried up… It hurts too much to look back and remember what it was: the family, the farm...".*

For these farmers, uprooting a tree was not seen as a routine agronomic practice but as an act of cultural and emotional violence. As one farmer expressed the sentiment: "*Your heart aches seeing centuries-old olive trees being cut down.*" These emotions persist despite many of these farmers relying only partially on olives for their income, as they now embrace a more diversified set of activities, often including agro-tourism as additional forms of non-agricultural income. This aligns with what agrarian scholars refer to as peasant economies, where decisions are informed by wider considerations of care, balance, and reciprocity rather than purely on market-based logic (Scott, 1976; van der Ploeg, 2013). Moreover, diversification in such enterprises has become key for their survival (van der Ploeg, 2018). Such attachments thus challenge governance models that treat olive trees solely as substrates for economic production.

However, even farmers who accepted eradication did so with hesitation. Mimmo, for example, a farmer managing 40 hectares near Francavilla Fontana, described lighting candles and praying for his trees while carefully monitoring them for signs of infection. He regularly contacted plant pathologists to perform molecular tests on suspicious branches. Yet, unlike anti-eradication activists, Mimmo declared that he would immediately uproot infected trees if required: *"If they tell me to cut, I cut. I*

can't risk losing everything." His stance contrasts sharply with that of farmers like Salvatore, who owns 4 hectares of centuries-old trees in the surroundings of Sava, for whom trees "*were like part of the family*" and "*like elders, they need company. That's why sometimes I go to the countryside, sit under a tree, and we talk*". This difference in views reflects divergent agricultural styles and agrarian trajectories: Mimmo's orchard, planted 30 years ago as a business investment ("*when I was young, my father-in-law encouraged me to plant these trees; he said they would be my pension*"), embodied what we would call an *embedded instrumental view*—an attachment to the trees that is still function of their productive role—, whereas Salvatore's secular trees represented more a transgenerational heritage.

These divergences fuelled tensions amongst farmers as well as between farmers and activists. The perception of contagion created hostility toward those accused of delaying eradication. For example, one farmer criticized neighbours for failing to comply with mandatory agronomic measures: *"He doesn't live off olives, so he doesn't care. Then, because of him, my field gets infected".* Others blamed environmental activists for being too far removed from the pragmatic needs of actual agricultural producers: *"These are Greens. They care about politics, but they don't know what it means to make a living from olives,"* another farmer told me, adding: *"In that area, all those who live from olive farming uprooted their trees when told."* Such statements illustrate a widespread narrative that social movements—and some absentee landowners—were co-responsible for the epidemic's spread by obstructing containment measures. This narrative recasts refusal to uproot olive trees not as a moral or cultural defence but as irresponsibility, amplifying divisions within rural communities and reinforcing institutional discourses that equated compliance with rationality.

The narrative of the "bad" or "lazy" farmer—often articulated along a north–south axis within the Apulia region and frequently invoked in institutional and media discourse—added another layer of tension. The Salento area has historically been devoted to the production of *olio lampante* (lamp oil), a low quality form of oil produced by collecting olives from the ground in partial or complete degradation. As a consequence, olive orchards in the area are typically kept under lower-intensity maintenance regimes than those in the northern part of the region. Even today, it is not uncommon to hear remarks such as: "*In Salento they collect olives from the ground, this is why the trees are poorly managed, left to grow tall, and rarely pruned*". Resistance to eradication was thus often attributed to ignorance, backwardness, or negligence, specifically with regards to keeping the field free of

grass in order to reduce the density of insect vectors. Such narratives, however, tended to overlook the structural (i.e. economic) conditions that limit farmers' choices—such as the fall of olive oil prices in the marketplace or the lack of state incentives to pay for tree removal.

Finally, resistance amongst small farmers was rarely confined to rejecting eradication alone. As we have seen, many advocated an alternative response model: agroecological strategies aimed at restoring soil health, enhancing biodiversity, and rebuilding resilience in olive agroecosystems. Such proposals directly contested the logic of eradication by reframing the epidemic not as an isolated phytosanitary emergency but as a symptom of deeper vulnerabilities in both local and global agri-food systems. Although one might argue that this kind of response is feasible, and to be expected, at later stages of an epidemic of such proportions, the dismissal of such hypotheses—rather than treating them as potentially relevant for later stages of the epidemic—reinforced existing polarizations. In this sense, the conflict was not only about trees; it was about competing agricultural futures—one oriented toward competition in the global markets, economic modernization, and genetic resistance, the other toward ecological restoration, territorial autonomy, and a wider transformation of the global food system.

Farmers' heterogeneous responses constitute a fourth dimension of the knowledge politics at play. Their divergent positions—shaped by economic strategies, cultural attachments, and agrarian identities—show that, as with "scientific knowledge," "local knowledge" is not unified but internally plural. This complicates simplistic narratives that position farmers either as irrational opponents or as passive victims. Instead, they reveal competing visions of the future of agriculture and rural life.

3.3.5. Institutional politics of knowledge production

The previous sections examined how knowledge politics unfolded between and within knowledge communities. This last subsection steps back to consider how those conflicts were embedded in larger institutional structures—highlighting the broader politics of knowledge within scientific and governance institutions that shaped the trajectory of *X. fastidiosa* research and policy. Rather than introducing new actors or positions, this section shows how the disagreements documented in Sections 3.1–3.4 were structured, amplified, and stabilized by institutional arrangements governing scientific research and plant health policy.

During a short stay in California, the first author interviewed a plant pathologist in Berkeley who had been heavily involved in the early research on *X. fastidiosa*. When asked why he was no longer engaged with most of the current European research projects on the pathogen, one remark stood out: *"There's too much politics."* The comment was striking because it came from someone whose career had been dedicated to plant disease research—a domain often imagined as distant from the messiness of politics. Even today, in the corridors of scientific research institutions in Apulia, one can sense a widespread reluctance to discuss, engage with, or speak out on the topic. The polarization of positions and the intensity of debate has created fear, tiredness and demotivation among many members of the scientific community. Still, these perceptions capture a key dimension of the *Xylella* controversy: the entanglement of scientific work with competing institutional incentives, funding priorities, and policy frameworks. The controversy surrounding *X. fastidiosa* has to be understood not only as a dispute over biological facts; it was equally a fight over the politics of knowledge production within research and policy-making institutions.

As science studies has long emphasized, scientific knowledge is never created in isolation from its social context (Haraway, 2013; Harding, 2015). It emerges within networks of institutions, financial incentives, and disciplinary hierarchies that influence which questions are asked, what methods are prioritized, and whose voices carry authority. The *X. fastidiosa* case is a striking example of this. When asked why the controversy unfolded as it did, one CNR plant pathologist explained:

> *"Everything happened for two reasons. First, there was human weakness—the envy for the colleague who managed to do this work on his own. At the beginning, the fact that a single researcher, or a small group, was able to solve a problem of this kind in Italian plant pathology created some resentment. There were colleagues who, I would not say became denialists, but were very critical about the scientific certainties being proposed. Why? Because Italian research in plant pathology, like in agriculture in general, has been neglected for many years. Finding such an important pathogen meant the possibility of obtaining funing."*

This quote is revealing in two respects. First, it highlights how emotions such as resentment and competition—rather than neutrality alone—shaped relationships and interactions amongst researchers. Second, it situates early scientific disputes within

the structural conditions of Italian agricultural research, marked by chronic underfunding, competition for prestige, and the strategic importance of securing visibility in a historically neglected field. The identification of *X. fastidiosa* thus must be seen not only as an epistemic event but also as an institutional opportunity, shaping incentives that amplified rivalries and hardened positions. After decades of underinvestment, the identification of such a pathogen offered not only a scientific breakthrough but also a rare opportunity to secure resources, visibility, and institutional relevance. Against this backdrop, disputes over causal inference and management strategies were inseparable from struggles over recognition and survival within academia.

Beyond these interpersonal dynamics, interviewees also emphasized broader institutional and financial constraints shaping what questions could realistically be addressed *in general*. As the plant pathologist from Berkeley put it: *"If we were doing research on human health, we would have the money to ask a lot of questions. But we don't."* And when asked why the ecological complexity of agroecosystems had not been addressed (yet), he added: *"The question is who is going to do [the research on complicated stuff]. As a researcher you don't want to do that."* These remarks point again to the interplay between funding priorities, career incentives, and research design. *Xylella fastidiosa* was an unfamiliar pathogen in Europe, and the emergency context created strong pressure for rapid, actionable results. As a consequence, resources and attention coalesced mainly around diagnostic protocols, pathogenicity tests, and containment strategies (Serio et al., 2024)—lines of inquiry that could deliver publishable outcomes quickly and align with EU biosecurity mandates—rather than around the search for a solution that would not imply the eradication of diseased trees.

Ecological or systemic research therefore remained marginal, not due to simple oversight, but because of institutional and temporal constraints. Academic incentive structures reinforced this pattern: short laboratory experiments with clear and quick results are far more advantageous for career advancement than multi-year ecological studies requiring long-term observation, complex modeling, and targeting uncertain outcomes. In a system dominated by productivity metrics, the temporal logics of academic careers and emergency governance converged, privileging approaches capable of producing immediate and highly rewarded results over more complex and "slow" forms of science. This pattern remains visible today: the recent identification of *X. fastidiosa* subsp. *fastidiosa*—a subspecies affecting grapevine and almonds rather than olive trees—in areas of the region previously considered pest-free

(Cornara et al., 2025) is triggering a marked shift in research priorities toward viticulture, a sector with far greater economic weight and, consequently, stronger incentives for funding and scientific attention.

3.4. Discussion

"Science is dead; long live *research and long live the sciences!"*
(Latour, 2004, p. 52)

The *X. fastidiosa* epidemic in Europe offers a critical lens for examining how scientific knowledge, governance structures, and societal values interact under situations of uncertainty and urgency. Although often portrayed as a technical problem requiring rapid, evidence-based action, our findings show that the conflict around the *X. fastidiosa* outbreak in Apulia is not solely technical: it is also epistemic and political. At first glance, the controversy might appear to fit familiar narratives of "experts versus laypeople" (Wynne, 1996) or even to be an example of anti-science populism (Brandmayr, 2025). Yet this paper aims at complexifying this picture. In effect, our research shows that the socio-epistemic contestation amongst actors reflects a series of layered disagreements that cut across multiple communities: between scientists and non-scientists, but also amongst scientists themselves and amongst farmers. These disagreements are shaped by different epistemic commitments, material interests, and normative visions for the future of farming and rural landscapes in Apulia.

To substantiate this argument, we have described five interlinked domains of "knowledge politics" with their distinct role in shaping the dispute: (1) the conflict over the identification of the causal agent; (2) the boundary work between scientific and lay actors over legitimate knowledge, credible expertise, and policy-relevant evidence; (3) the internal disagreements within the scientific community; (4) the disagreements between (different kinds of) farmers; and (5) a form of knowledge politics operating within and among scientific institutions, where competition for funding and prestige can inhibit collaboration and ultimately hinder the production of knowledge for the public good. Taken together, these layers show how the controversy around the management of *X. fastidiosa* epidemic in Apulia does not follow a simple fault line between "science" and "society". Rather, it mobilizes a complex epistemic landscape shaped by a "politics of knowledge" unfolding between and amongst scientists trained in different disciplines, farmers relying on different economic strategies and cultural attachments, and institutions privileging

certain types of expertise over other forms of knowledge. These fractures expose a central and well-established insight from Science and Technology Studies (STS): science is not a monolithic voice but a heterogeneous field structured by epistemic cultures, institutional incentives, and normative commitments (Harding, 2015).

The tensions between and within these different layers gave rise to forms of epistemic injustice (Fricker, 2007). As Bruno Latour argues, science has often been used in order to "render ordinary political life impotent through the threat of an incontestable nature" (2004, p. 10). Reinterpreting Plato's myth of the cave, Latour claims that by separating society into a small group of enlightened actors about to access the "secrets of Nature", and a broader public relegated to the chains of darkness and ignorance, modern science was foundational to "the most fabulous political capacity ever invented: [the possibility to] make the mute world speak, tell the truth without being challenged, put an end to the interminable arguments through an incontestable form of authority that would stem from things themselves" (Latour, 2004, p. 14). In the case of the *X. fastidiosa* controversy, boundary work operationalized such separation, reinforcing forms of authoritative science that clashed with alternative ways of understanding the disease and proposing solutions. Yet, the history of knowledge controversies suggests that claims to truth rarely produce legitimate or durable governance arrangements (Hajer, 2009), nor help in solving science-based conflicts (Turnhout & Gieryn, 2019).

To interpret our findings, we mobilize three interrelated strands of theory: post-normal science, epistemic diversity, and expertise studies. These frameworks help clarify how conflict and uncertainty can be approached not as barriers to action but as conditions that demand broader forms of inclusion and accountability. Funtowicz and Ravetz's (1993) notion of *post-normal science* emphasizes the need for new governance approaches when urgent, high-stakes decisions become contested in light of uncertainty and conflicting values. Under such conditions, scientific consensus is often elusive, and decisions cannot rely on technical expertise alone. The *X. fastidiosa* outbreak illustrates why: even when the bacterium's presence was acknowledged, its pathogenicity, interactions with other stressors, and debates on the most effective management strategies remained under debate. These uncertainties intersected with deep value disputes: should the priority be to preserve cultural landscapes, maintain economic viability, or enforce strict biosecurity protocols to safeguard European agriculture? These are not questions science can answer on evidentiary grounds alone because they involve normative judgments about what is worth protecting and at what cost.

Addressing post-normal conditions requires a robust account of epistemic diversity (Hannon, 2019; Rolin, 2019). Much of this debate draws from standpoint epistemology (Haraway, 2013; Harding, 2015), which argues that knowledge is always situated—shaped by the cultural, economic, and social positions from which it is produced. While standpoint theory makes a general case for epistemic diversity, its relevance becomes clear when tackling complex, contested problems that involve both interdisciplinary diversity (e.g., bacteriology, ecology, virology) and transdisciplinary diversity (e.g., contributions from farmers, activists, and policymakers). In such cases, no single standpoint captures all relevant factors; diverse forms of knowledge must converge to address complexity. In our case study, this irreducibility mattered within science as well as between science and non-scientific actors. Amongst scientists, disciplinary training shaped divergent framings: virologists, used to pathogens for which no cure exists, tended to endorse eradication as the way forward, while bacteriologists claimed to be more inclined to imagine coexistence and integrated management as possible alternatives[15].

Yet ecology—a discipline with arguably greater sensitivity to the multi-scalar and relational processes that shape ecosystem functioning and influence plant health (soil–plant–microbe interactions, biodiversity dynamics, climatic stressors, etc.)—was largely absent from institutional responses. Despite its relevance to resilience and disease emergence, ecological research on soil microbiomes, biodiversity, or landscape effects remained marginal. This omission was not due to mere neglect. First, the pathogen was unfamiliar in Europe, necessitating the establishment of basic diagnostic and epidemiological knowledge before moving to broader inquiry. Second, ecological research typically requires long-term observation and complex modeling—hard to reconcile with the emergency logic of phytosanitary governance that demands rapid, visible action. Third, research consortia were led mainly by plant pathologists and virologists, underrepresenting ecological competences. These structural and temporal constraints show how emergency governance can unintentionally foreclose interdisciplinary approaches, even when such approaches arguably better align with local stakeholders' demands and could lead to long-term resilience. Notably, however, the epistemic landscape is changing. At the BIOVEXO

[15]These tendencies refer specifically to the institutional and historical configuration of the scientific communities involved and interacting in the study and governance of the Apulian *X. fastidiosa* outbreak. They should not be interpreted as generalisations about virology, bacteriology, or other disciplines as such. Individual positions varied, and the pattern described here reflects dynamics observed in this particular case rather than stable or generalizable disciplinary divides.

project final conference (Locorotondo, 13 November 2025), an 8 million euro EU-funded project aiming at finding biocontrol solutions for *X. fastidiosa*, researchers emphasized that the future of *X. fastidiosa* management lies in integrating multiple approaches—genomic improvement, changes in EU regulation and risk assessments, integrated best management practices, and biological control. This represents a significant shift from the early years of the epidemic, when research and governance focused almost exclusively on emergency containment. This convergence suggests that institutional research agendas are beginning to acknowledge the need for more plural and systemic strategies.

Some of the disagreements documented above also rest on fundamental definitional misunderstandings—for example, about what a "cure" means, what counts as a "resistant" cultivar (points clarified in footnote 5), or, ultimately, what the goal of a successful intervention should be. In particular, the distinction between keeping a tree alive and keeping a tree productive is analytically and politically consequential, and we return to it here, as it remains relevant to more recent developments in the debate. In recent years, in fact, contestation has resurfaced in debates around the so-called "resilient olive groves" (Scortichini & Ragno, 2024). In several parts of the infected area, in fact, some trees—often left unmanaged—have begun to resprout spontaneously, a phenomenon that some stakeholders have taken as further evidence that the original narrative of inevitable decline was flawed from the outset. Yet the fact that olive trees are resprouting does not automatically imply a return to pre-infection levels of productivity, nor does it mean that such behaviour could have been anticipated within the current state-of-the-art scientific knowledge. Nonetheless, the phenomenon is scientifically intriguing, and it has only recently begun to receive systematic attention (Scala et al., 2024). Persistent polarization, however, coupled with mutual suspicion over the intentional (mis)framing of the disease and its management, is preventing sustained and collaborative efforts to understand what appears to be a highly relevant "anomaly" in the scientific account of the disease as it has been consolidated to date. As a result, a potentially important object of inquiry—one that could help clarify the conditions under which olive trees survive infection—risks becoming yet another casualty of epistemic conflict.

The consequences of disregarding epistemic diversity are both epistemic and political. When governance relies on a narrow set of standpoints, it risks overlooking factors that shape disease emergence and resilience, on top of eroding trust amongst stakeholders whose knowledge remains excluded. In our case study, resistance to

eradication was not a symptom of irrationality but a reaction to governance models that conflated scientific authority with democratic legitimacy. In contrast, a framework informed by post-normal science suggests that under conditions of deep uncertainty, such as that of a novel pathogen that requires novel scientific efforts, robustness is achieved not by narrowing debate but by expanding the deliberative community—the extended peer community—to include all relevant knowledge holders in the decision-making process. This methodological choice should not be equated with the abandonment of scientific rigor; rather, it derives from the recognition that, in complex socio-ecological systems, no single epistemic framework can capture the full range of relevant variables or values at play.

Negotiations of epistemic diversity highlight a politics of knowledge operating within science as much as it does between science and society. As one researcher admitted, early disputes were entangled with structural pressures in Italian agricultural research: chronic underfunding, competition for prestige, and the strategic importance of securing visibility in a historically neglected field. The discovery of *X. fastidiosa* was not only an epistemic event but also an institutional opportunity, shaping incentives that amplified rivalries and consolidated academic positions. Acknowledging these institutional realities does not delegitimize science; it situates it as a social practice embedded in institutional ecologies, where problem framings reflect career dynamics and funding structures as much as empirical evidence. These dynamics help explain why certain narratives—particularly those aligning with EU regulatory frameworks—gained dominance, while alternative strategies remained peripheral.

While epistemic diversity is an essential ingredient in shaping robust and legitimate interventions, it also raises questions about the distribution of expertise. Different ways of knowing generate different forms of expertise, but not everyone is an expert on everything. Rather than endorsing epistemic relativism, our results underscore the need to articulate diverse forms of expertise in governance and research. In the case of *X. fastidiosa*, actors expressed what Collins and Evans (2007) call contributory and interactional expertise. Contributory expertise enables full participation in a specialized domain, acquired through extensive training and developed through extensive interaction with a specific object of inquiry. Interactional expertise refers to the ability to converse fluently in a domain without full technical competence, enabling meaningful engagement across boundaries. While monodisciplinary research typically involves contributory experts, both

interdisciplinary inquiry and policy arenas are meeting grounds for varied contributory and interactional experts.

Under post-normal conditions, this distinction does not imply a fixed hierarchy (e.g., scientists as contributory experts and farmers as interactional experts) but rather a multidimensional picture in which actors can be both contributory and interactional experts in different situations and on different issues. Farmers, for instance, may lack access to molecular tools but bring decades of observational knowledge and interactional expertise critical for adaptive governance. Similarly, some scientists hold contributory expertise in plant pathology but limited engagement with actual farming practices. Distinguishing between different forms of contributory and interactional expertise allows for a nuanced account of epistemic diversity rather than suggesting a flat approach in which everyone is considered an expert with equal epistemic authority on everything.

While such a nuanced account distinguishes epistemic pluralism from epistemic relativism, it also raises novel questions about the attribution of different forms of expertise under post-normal conditions: who decides which expertise counts? In multidimensional controversies over plant health governance, there is no simple mechanism for such a determination. Top-down demarcation and identification of experts risk reproducing epistemic inequalities by centering on domains of inquiry with the most institutional prestige, thereby privileging certain forms of expertise over others. In contrast, the multidimensionality of the X. fastidiosa epidemic requires an inclusive approach that foregrounds the contributory or interactional expertise of actors in marginal institutional positions in both academic and governance debates. Yet, the fluidity of contributory and interactional expertise does not eliminate the continual efforts to "close down" the controversy by consolidating a specific epistemic framework as the only legitimate one. As Collins and Evans (2002, 2007) note, core sets—groups of specialists who control problem definitions, methodological standards, and legitimate interpretations—form around particular approaches or objects of inquiry. In the case of *X. fastidiosa* epidemic, the core set coalesced around laboratories and research teams specializing in diagnostic protocols, pathogenicity tests, and eradication-oriented strategies, thereby stabilizing a reductionist interpretation of the epidemic. This closure was reinforced institutionally: only certain laboratories were authorized to handle infected material; only specific methodological standards were deemed valid; and funding streams disproportionately rewarded research that fitted within the agricultural modernization paradigm. As a result, more holistic or multifactorial approaches—

such as those emphasizing ecological interactions, soil dynamics, or coexistence strategies—struggled to achieve core-set status, not necessarily because they lacked epistemic merit but because multiple-level boundary work privileged approaches consistent with regulatory imperatives and existing expert networks. These dynamics mirror the struggles described in Sections 3.1–3.5, where the interplay of epistemic legitimacy, institutional authorization, and funding priorities continually shaped which actors could speak as "experts" and which visions of the epidemic became actionable.

These insights point to four key implications for pluralist plant health governance. First, uncertainty is not an anomaly to be eliminated but an enduring feature of biosecurity in a globalized world, requiring governance models oriented toward learning and adaptation rather than rigid control. Second, inclusivity is not a barrier to timely responses but a condition for legitimacy and effectiveness. Mechanisms that incorporate epistemic diversity—such as participatory risk assessments, multi-stakeholder advisory panels, and co-designed interventions—can reduce conflict and enrich the evidentiary base for decision-making. Third, internal pluralism within science should be treated as a resource rather than as a threat. Structured deliberation across disciplines can foster hybrid strategies that combine containment where necessary with long-term resilience measures grounded in agroecological principles. Fourth, epistemic pluralism does not suggest that everyone is an expert on everything but rather points to the distribution of diverse forms of expertise across equally diverse actors who need to be included in plant health governance.

Epistemic pluralism is not only an epistemological imperative; it is also a democratic one. When governance frameworks privilege a narrow technocratic vision, they reconfigure the "landscapes of possibilities" in ways that serve the interests of some actors (such as large-scale farmers and research institutions) while marginalizing others, including smallholders and those with deep cultural and affective ties to the land. These interventions entail normative decisions about what forms of agriculture, livelihoods, and ecologies are valued; yet such decisions rarely undergo public deliberation. Instead, they are framed as technical necessities, foreclosing democratic debate under the guise of "following the science." Democratizing science means recognizing that knowledge-making is inseparable from questions of justice, authority, and social order (Jasanoff, 2003, 2017). From this perspective, the *X. fastidiosa* outbreak underscores the need to embed plant health governance within deliberative processes that include diverse voices, not only

to enhance legitimacy but also to ensure that competing visions of rural futures are explicitly negotiated rather than implicitly imposed.

The *X. fastidiosa* epidemic is unlikely to remain an exceptional case. Climate change and global trade continue to accelerate the movement of pathogens and pests, confronting plant health systems with crises that are not only biological but also social and political. Meeting these challenges requires more than technical preparedness; it calls for institutional reflexivity and a commitment to integrating multiple forms of expertise into governance frameworks. In this sense, the future of plant health is not only a question of better prevention, more efficient diagnostics, or faster eradication protocols; it is also a question of how we collectively negotiate knowledge, values, and responsibilities in the face of uncertainty. A robust pluralist framework is needed not only for a better understanding of the *Xylella* controversy but also for improving plant health governance in an era of rapid global change.



Chapter 4



Saving the olive trees?

Ontological politics and plant disease governance in Apulia, Southern Italy

Abstract

In Apulia, everyone wants to "save the olive trees"—yet what is to be saved is far from clear. Since 2013, the spread of *Xylella fastidiosa* and Olive Quick Decline Syndrome (OQDS) has devastated Southern Italy's groves and triggered a highly contested phytosanitary crisis. This paper argues that the controversy cannot be reduced to technical uncertainty, knowledge disagreement, or economic interests alone; it is also an ontological conflict—a struggle over the nature of the entities at stake. Drawing on qualitative interviews, documentary analysis, and ethnographic observation, the study follows two domains of contestation: the olive tree and the plant disease. Olive trees appear as relational beings, productive assets, or landscape elements to be preserved; the disease is variously enacted as a pathological invasion, a socio-ecological syndrome, or a political construct. Situating the case within broader debates on ontological politics, the paper brings conversations typically centered on extractivist and Indigenous settings to the governance of a plant disease in Southern Europe. Moreover, it advances two additional arguments for rethinking political ontology's engagement with socio-environmental conflicts. First, political ontology does not stop where science starts: ontological plurality runs through scientific practices in similar ways it does between science communities and other stakeholders. Second, ontology does not *reduce* to politics: disease claims still require robust empirical research and evidence from—to be constructed with—the natural sciences. The paper concludes with implications for plant-health governance in biocultural landscapes, including procedures that surface and negotiate ontologies and instruments that recognise cultural landscapes as collective goods.

Keywords: Ontological politics; Political Ontology; Plant health governance; *Xylella fastidiosa*; Olive Quick Decline Syndrome; Biocultural landscapes; Southern Europe.

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4.1 Introduction

> *"In the 1990s, just as I was becoming aware of my social, political, and ecological surroundings, salmon runs hit all-time lows, and fishing seasons were canceled. The situation was so dire that several salmon populations hovered on the brink of extinction. [...] Although almost everyone agreed that we needed to "save the salmon" in order to revitalize our region, no one could agree on what to do. A big part of the problem, we soon realized, was that there was no consensus about what should be "saved" – and no consensus about what counted as a salmon."* (Swanson, 2013, pp. 2–3)

> *"There are profound differences in the way we tell stories about nature depending on what nature we are talking about, physics being quite different from biology and psychology quite different from geology."* (Lewontin, referred to in Vandermeer and Perfecto, 2024, p. 61)

Between 2008 and 2010, in the southern Italian region of Apulia (Puglia), olive trees—a centuries-old symbol of cultural heritage, rural livelihoods, and ecological identity—began to show alarming symptoms of decline (Saponari et al., 2019a). Leaves turned brittle, branches dried, and groves that had for centuries shaped the local landscape began to dry out. Initially perceived as scattered episodes of wilting, these symptoms soon escalated into a full-scale agricultural crisis. In 2013, scientists detected the presence of the bacterium *Xylella fastidiosa subsp. pauca* (*X. fastidiosa* from now on), later associated with what became known as Olive Quick Decline Syndrome (OQDS) (Saponari et al., 2017). Known for decades in the Americas (Davis, Purcell, & Thomson, 1978; Sicard et al., 2018), *X. fastidiosa* is classified by the European Food Safety Authority (EFSA) as a quarantine pest of the highest risk category (EFSA, 2019). The pathogen's detection in Apulia—its first confirmed presence on any type of crops in European territory—immediately triggered compulsory containment measures.

In 2015, the European Commission approved Decision 2015/789, mandating the eradication of infected trees, vector control, and zonation (European Commission, 2015). Given the latency time between infection occurrence and symptom expression, together with the difficulty of early detection, plant removal was presented as the only viable solution to halt—or at least slow down—the spread of the infection (EFSA, 2015). Yet, what appeared to be a technical response to a phytosanitary emergency quickly evolved into a profound social and political crisis. The most controversial intervention—the compulsory removal of every infected

olive tree and those within 100 metres, including centuries-old ones—sparked widespread outrage (Nadeau, 2015b). For many, this eradication policy was not only ecologically and economically disruptive but symbolically unthinkable: how could one justify destroying trees that were so integral to Apulian cultural heritage and collective identity? The crisis unfolded amid protests, lawsuits, and counter-narratives that in public discourse were often reduced to a clash between "science" and "science denialism" (Abbott, 2019; Rielli, 2023). As we have argued elsewhere (Gatti et al., 2026), such framings obscure the complexity of this conflict, which cannot be reduced to a controversy between experts and laypeople alone.

This paper takes a different direction. It contends that the controversy surrounding *X. fastidiosa* is not only a technical or epistemic problem but also an ontological one—a struggle over what constitutes the very entities at stake (Flemmer et al., 2024). While "ontology" has been traditionally defined as the philosophical study of being (Hacking 2002), and the wider "ontological turn" in the social sciences has generated heated debates and substantial critique (see Bessire & Bond, 2014; Graeber, 2015; Todd, 2016; Boelens et al., 2024 for a non-exhaustive list) in what follows we align with a broader anthropological use of the term (Kohn, 2015) understood as the study of competing claims about the nature of entities and the ways in which they are socially enacted (Turska & Ludwig, 2023). In Apulia, everyone wants to "save the olive trees," but what exactly is to be saved is far from clear. Are people trying to save a productive crop central to some household incomes and regional markets, a companion species tied to family memory and place, or a landscape monument whose value lies in aesthetic beauty and fuels idyllic countryside-friendly tourism? Similarly, what is the disease? An incurable pathogenic invasion that warrants plants uprooting and vector control; a socio-ecological syndrome intertwined with long-term stressors such as drought, soil fatigue, and farm abandonment, and that calls for renewed care and co-existence protocols; or an artificially constructed political problem produced by emergency framings and exceptional measures to serve the interests of minority powerful groups?

The paper contributes to scholarly debates on ontological politics and political ontology in three ways. First, it applies a political ontology framework to a European plant-health controversy, challenging the tendency to treat "Western" or "European" ontology as monolithic, and extending a literature often centered on extractivist and Indigenous settings to the Southern European context. Second, it brings political ontology into scientific practice: the multiplicity of disease is not only a society-

versus-science phenomenon but also an intra-scientific one, where different "scientific ontologies" compete, interact, and inform policies (or not). Third, it advances a non-relativist, evidence-attentive account of ontological politics: while realities are enacted and therefore political, disease claims have nonetheless to be weighed against converging evidence from the laboratory, the field, and the whole body of (new and existing) empirical knowledge.

The argument unfolds as follows. The next section outlines the theoretical framework, situating the paper within broader debates on ontological politics, political ontology, and environmental conflicts. Section 4.3 introduces the context and the case study, and Section 4.4 describes the research design and methods. Section 4.5 then examines the multiplicity of the olive tree and the attachments through which trees are enacted as economic assets, relational beings, or landscape monuments. Section 4.6 turns to the multiplicity of disease, tracing how pathogenic, socio-ecological, and political enactments are assembled and authorized. Section 4.7 discusses the implications for political ontology and plant-health governance in cultural landscapes, proposing a pluralist framework to navigate and negotiate between different ontologies. The conclusion summarizes contributions and identifies directions for further research on plant disease governance and biocultural conservation.

4.2 Theoretical framework: ontological politics, political ontology, and environmental conflicts

Environmental conflicts are often framed as disputes over the access, use, and distribution of natural resources (Martinez-Alier, 2002; Robbins, 2012). This framing commonly treats nature as a pre-given domain—a universal substrate upon which human struggles unfold—while the objects at stake, whether rivers, forests, mountains, or lakes, are understood as passive resources to be managed, exploited, or preserved (Peet et al., 2010). Yet recent political ecology and anthropological scholarship has questioned this assumption, showing that socio-environmental disputes are often not only about interests, values, or representations, but also about what is considered to be real, who or what has agency, and how relations between humans and nonhumans are configured (Viveiros de Castro, 2014; Kohn, 2013; Holbraad & Pedersen, 2017; Tsing, 2018). Put differently, what is contested is not just who gets what, but what—or whom—there is to get.

Escobar (2010) outlines this evolution through three different "waves" of political ecology. The first, structuralist and "pre-constructivist," brought Marxist political economy into dialogue with questions of natural resource management and nature–society relations. The second, post-structuralist and constructivist, shifted attention to how "nature" is constructed in and through discourse, knowledge, and practice. The third, post-constructivist, foregrounds ontology alongside epistemology, asking how worlds are enacted and what political effects this entails. It is within this third wave that our interpretation of the *X. fastidiosa* controversy in Apulia is situated: a conflict that has to do not only with who benefits from particular policies, or how evidence is constructed, but, more fundamentally, with what "olive trees" and "disease" are understood to be in the first place.

Alongside political ecology, growing attention to the ontological dimensions of environmental conflict and natural resource management has influenced a range of fields in the social sciences and humanities, as part of a broader shift that some describe as an "ontological turn" (Escobar, 2007; Holbraad & Pedersen, 2017). Human geography is no exception, with empirical work tracing how policy and management stabilize some realities while sidelining others in a variety of domains of environmental governance: water (Yates et al., 2017), food (Evans et al., 2022), floods (Whatmore, 2013), rivers (Rickard & Ludwig, 2025), and mining (Adomako, 2024), just to mention some. Related debates on resilience similarly highlight the coexistence of multiple, often conflicting ontological assumptions embedded in policy frameworks (Simon & Randalls, 2016). This work positions itself within this growing body of literature, and expands it to the contested governance of a plant disease.

Specifically, in this work we draw on Annemarie Mol's formulation of "ontological politics": "the way in which the "real" is implicated in the "political" and vice versa" (1999, p.74). In this framework, reality is enacted in practice rather than given in advance: it is done, historically and materially situated, and therefore multiple. In *The Body Multiple* (2002), for example, Mol shows that atherosclerosis is not a single disease described in multiple ways, but multiple diseases enacted differently across heterogeneous clinical practices. Her idea of multiplicity thus suggests "a reality that is done and enacted, rather than observed" (Mol, 1999, p. 77). When heterogeneous enactments coexist, decisions about which versions are stabilised are political—even if framed as technical. Multiplicity, however, is not relativism. As Mol famously puts it, objects are "more than one but less than many" (2002, p. 55): coordinated multiplicities that resist both singularism and "anything

goes" relativism. Coordination is then the practical work through which different versions are aligned, translated, or made compatible—so that they can function together without becoming identical (2002, pp. 53-85). It is in these processes of coordination that politics enters most subtly, shaping which realities are allowed to cohere and which are left aside.

Political ontology, by contrast, places emphasis on clashes between worlds rather than multiplicities within them (Blaser, 2009, 2013; De la Cadena & Blaser, 2018; Escobar, 2018). Where Mol shows how realities are multiple and coordinated in practice, political ontology highlights the moments when coordination breaks down and different worlds confront each other. In this view, disputes over land, water, or disease are not struggles within a shared reality but confrontations between different realities (De la Cadena & Blaser, 2018). Modern environmental governance is typically anchored in a naturalist ontology in which nature is a universal domain governed by scientific expertise (Descola, 2014). Yet a variety of "relational ontologies" persist in many parts of the world, giving rise to worlds where forests, mountains, rivers, or trees are living beings embedded in webs of care and reciprocity (De la Cadena, 2015; Kohn, 2013; Kramm, 2020; Chao, 2022; Ressiore et al., 2024). Politics, therefore, concerns not only diverging interests but also which realities are "authorized as real" in policy, law, and science.

De la Cadena (2010; 2015) adds further nuances to the debate, and calls attention to "ontological openings" (2014)—moments when entities that do not fit within dominant ontologies nevertheless insist on their presence in political life. Her analysis of "earth-beings" in Andean anti-mining struggles shows how the public is unsettled when beings that challenge productivist classifications—mountains as living, agentive entities—demand recognition. In a similar vein, Ludwig (2016) suggests moving beyond the dichotomy between coordination and clash and instead focusing on *ontological overlaps* (see also Ludwig and El-Hani, 2025). Diverse ontologies, he argues, are rarely either fully aligned or wholly incommensurable. On the contrary, they often intersect partially, creating spaces where communication, translation, or hybridization becomes possible without erasing difference.

A clarification is needed here. The expressions "ontological politics" and "political ontology" are often used interchangeably. In fact, they point to different directions: ontological politics emphasizes the situated practices through which realities are enacted and coordinated, highlighting multiplicity and its stabilization. Political ontology, instead, focuses on how communities institute *different worlds* and how differences in their constitution become a site of political conflict (Blaser,

2013; de la Cadena, 2013). Put differently, "while in the framework of political ontology ontological pluralism is inseparable from [...] "disagreement" – a fundamental divergence about the constitution of reality, its ontological status, hence about the matter of contention; [...] – for ontological politics ontological pluralism does not necessarily entail antagonism or agonism, admitting instead pacific, even friendly compresence." (Pellizzoni, 2016, p. 77).

Each of these strands has its limits if taken alone: the former risks underplaying strategic power asymmetries by treating politics as an exclusive property of practice, while the latter risks underplaying materiality by treating politics as an exclusive property of discourse. This paper, therefore, treats them as complementary but distinct. Mol's account of multiplicity helps trace how olive trees and disease are enacted differently across scientific, political, and everyday practices, while political ontology clarifies how some enactments are authorized while others are marginalized or excluded. Taken together, they help make sense of the phytopathological crisis in Apulia as both a matter of situated multiplicities and a struggle over worlds—processes of coordination on the one hand, and confrontations between incommensurable realities on the other.

4.3 Research context and case study

Olive trees in Apulia are key socio-ecological entities. With around four million inhabitants and 60 million olive trees, the region's olive groves have co-evolved with local populations since pre-Roman times (Primavera et al., 2017). The region produces almost half of the whole national olive oil production (ISMEA, 2025), and olives have played a particularly prominent economic role since the eighteenth and nineteenth centuries, with the widespread production of low-quality oil for industrial use known as *olio lampante* (literally: lamp oil) (Ipsen, 2020). This past economic relevance is such that olive trees maintain, in Apulia as well in the whole Mediterranean basin, a highly cultural status, as symbols of wealth and prosperity (Loumou & Giorga, 2003; Grego, 2022).

In 2010, some of the olive trees in the surroundings of the Gallipoli area, in the southern part of the Apulia region, began to show unusual symptoms of canopy desiccation and branch dieback. Initially, the condition was described as a "severe olive decline of unknown etiology" (Nigro et al., 2013:668). Possible causes were considered to be the insect *Zeuzera pyrina*, several fungal pathogens, as well as the bacterium *X. fastidiosa* (Nigro et al., 2013; Saponari et al., 2013). By 2017, the fulfillment of Koch's postulates in the lab consolidated *X. fastidiosa* as the

etiological agent of the disease (Saponari et al., 2017). At the same time, spittlebugs—most notably *Philaenus spumarius* but also, in smaller degree, Neo*philaenus campestris*—were identified as insect vectors for the bacterium (Cornara et al., 2016).

Xylella fastidiosa is a well-known plant pathogen in the Americas, where it is associated with various diseases affecting a wide range of crops, e.g. almond leaf scorch, Pierce's disease in vineyards, and Citrus Variegated Chlorosis (Sicard et al., 2018). The detection of this pathogen in Apulia back in 2013 represented the first confirmed occurrence of *X. fastidiosa* in the European Union (EU). Later, further outbreaks were reported in Corsica, France, Spain, other parts of Italy, and Portugal (EFSA, 2019). Phylogenetic studies have shown that these introductions were mostly independent, as detected pathogens belong to different strains (Sicard et al., 2021; Saponari et al., 2019b). Given its wide host range and epidemiological characteristics, *X. fastidiosa* was classified as a high-risk quarantine pest, prompting the rapid mobilization of EU phytosanitary governance (European Commission, 2015; European Parliament & Council of the European Union, 2016).

In 2015, the European Commission adopted Decision 2015/789, which established a set of emergency measures to limit the further spread of the pathogen within EU territory (European Commission, 2015). These measures mandated the establishment of demarcated areas around infected sites, territorial monitoring, compulsory vector control, and the removal of infected host plants, along with surrounding host plants, within a prescribed radius. Plant removal was justified by reference to the disease's latency period—estimated at 12–18 months—during which infected trees may remain asymptomatic while already hosting the pathogen (Saponari et al., 2017).

In Italy, these requirements were implemented through national decrees—most notably D.M. 4999/18—which complemented EU provisions with additional containment prescriptions consisting in: (1) compulsory phytochemical interventions to suppress insect vectors; (2) mandatory agronomic practices, such as ploughing and weeding targeting early stages of vector life cycles; and (3) the division of the Apulian territory into infected, containment, and buffer zones. The implementation of these measures in Apulia—particularly compulsory plant removal and, to a lesser extent, chemical treatments—was accompanied by public demonstrations, legal challenges (including appeals to administrative courts and criminal complaints), and broader debates over the appropriateness of such interventions (Abbott, 2015).

By 2025, the pathogen has profoundly transformed the olive landscape in large parts of the region (Fig. 4.1). The infected area now extends across most of the Salento peninsula and continues to advance northward, affecting a territory where olive cultivation has historically been both a dominant land use and a central socio-economic activity. Approximately 21 million olive trees are estimated to have been affected since the first outbreak (Saponari et al., 2019a), including a substantial number of centuries-old individuals, while olive oil production in the region—while still representing the highest contributor of the whole national production (ISMEA, 2025)—has experienced a marked decline compared to pre-2010 levels (Calderoni et al., 2025).



Figure 4.1. Diseased olive trees landscape in the countryside of Maglie (Lecce province). Photo: first author.

4.4 Methodology

The analysis presented here is based on qualitative research carried out between 2019 and 2025 in Apulia, Southern Italy. Fieldwork, performed by the first author, combined semi-structured interviews, ethnographic observation, and documentary analysis, designed to follow the controversy across scientific, political, and everyday domains.

Interviews - A total of 40 semi-structured interviews were conducted with actors involved at different levels of the crisis. These included scientists (plant pathologists, entomologists, agronomists), policy-makers and civil servants at European, national, and regional levels, representatives of farmers' unions and cooperatives, members of local heritage and environmental associations, and individual farmers. Interviews explored perceptions of the disease and its causes, understandings of olive trees and their value, and positions on appropriate governance measures. Participants were recruited through snowball sampling and contacts established during field visits. Most interviews were conducted in Italian, recorded with consent, and transcribed; notes were taken when recording was not possible.

Ethnographic observation: Observations were conducted at public meetings, technical workshops, social demonstrations, olive farms, and scientific forums where the *X. fastidiosa* crisis was debated. These included events organized by local municipalities, the regional government, farmer associations, and activist groups. Attending such gatherings allowed the first author to trace how "saving the olive trees" was invoked, what meanings it carried in different settings, and how diverse enactments of disease and trees were articulated in interaction. Fieldnotes captured both the spoken arguments and the material-symbolic settings in which they were made.

Documentary analysis: The empirical base includes a wide range of documents: scientific reports, European Commission decisions, parliamentary debates, court rulings, technical guidelines, farmers' association statements, and media coverage at local, national, and international scales. Collectively, these documents provide insight into how the crisis was framed, how authority was claimed and contested, and how different enactments of disease and olive trees were stabilized through law, regulation, and discourse. Particular attention was given to controversies around eradication orders, heritage designations, and the diagnostic methods used to detect infection.

Analytical strategy: The material was analyzed using a qualitative, interpretive approach. The aim was not to adjudicate the "true" nature of *X. fastidiosa* or OQDS, but to trace how different versions of disease and of the olive tree were enacted in practice and how some gained precedence over others. Coding focused on identifying recurring enactments of the olive tree and the disease, the practices and devices through which they were stabilized (diagnostics, compensation tables, heritage registries, maps), and the political effects of their authorization. Analysis moved iteratively between field material and theoretical concepts, refining

categories such as "relational being," "productive asset," and "landscape element" for trees, and "pathogenic invasion," "socio-ecological syndrome," and "political construct" for disease.

Reflexivity: As with all interpretive research, our positionality shapes the inquiry. Trained in philosophy of science, political ecology, and science and technology studies, we approached the controversy with sensitivity to both epistemic and ontological dimensions. At the same time, extended periods of fieldwork by the first author in Apulia—visiting farms, sitting with families, walking through affected groves—highlighted the affective and material weight of the crisis, beyond what documents or debates alone could convey. For the first author, this engagement was further shaped by personal ties: being from the region and coming from a family that owns a small olive orchard, he has spent time caring for olive trees since childhood. The prospect of saving his father's trees became, in fact, one of the motivations that drew him into the topic.

These attachments deepened our understanding of the stakes at play and helped expand the interview base, while also requiring reflexive distancing to ensure that analysis was guided by systematic evidence rather than personal involvement. Especially given the highly emotional context in which the case unfolded (Gatti, 2022), we treated personal engagement, emotions and affects—those of the stakeholders involved, but also those of one of the authors—not as sources of bias to be eliminated, but as analytically valuable contributions to a deeper understanding of what was at stake. This approach embraces longstanding critiques of the "view from nowhere" in favor of situated knowledge, most notably articulated within feminist philosophy of science (Haraway, 1988; Harding, 1989). Moreover, the affective dimensions of environmental conflicts constitute key analytical elements both within the broader "affective turn" in the social sciences (Lemmings & Brooks, 2014) and in recent work in emotional political ecology (Sultana, 2015; González-Hidalgo & Zografos, 2019). Accordingly, this work is informed by these analytical and methodological perspectives.

4.5 Ontologies of the olive tree: relational being, productive crop, or landscape element?

"We have always considered olive trees as eternal. Now, this small being is destroying not only olive trees, but also our conception of olive trees. X. fastidiosa is not only harmful for olive trees, it is also harmful

for the people: the olive tree as a reference point has disappeared. You lose production, but you also lose a point of reference: this is what centuries-old olive trees were for Apulian farmers." (a researcher from the National Research Council in Bari, from an interview)

Olive trees have long stood as symbols of Mediterranean identity, a material anchor for rural livelihoods, and a landscape emblem invested with cultural heritage (Loumou & Giorga, 2003; Grego, 2022; Schicchi et al., 2021; Avramidou et al., 2024). Despite ongoing debates on the origins and domestication of olive trees (Breton et al., 2009; Diez et al., 2014; Besnard et al., 2018), they have to be acknowledged as a longstanding companion species for Apulian peoples (Fabbri, 2023). As we anticipated in Section 4.3, this cultural attachment is inseparable from its economic role: Italy has long ranked among the world's leading producers of olive oil, and the entire economy of Southern Italy has been shaped by the historical production of *olio lampante* (Ipsen, 2020). The arrival of bacterium *X. fastidiosa* in Apulia has exposed these different layers, amplifying tensions between them and making coexistence problematic. The controversy over how to govern the bacterium and the disease is therefore inseparable from how we answer the question: what is an olive tree? The following section will examine three different "ontologies of the olive tree": as relational beings, as productive assets, and as landscape elements.

4.5.1 Olive trees as relational beings

"Centuries-old olive trees are like elders. They need company. This is why sometimes I go to the field, I put myself a little under that tree, a little under the other, and we talk" (a farmer, from interviews)

Salvatore, a smallholder from the countryside of Salve, is one among those who have a very embodied relationship with his olive trees. The opening quote vividly captures this: Salvatore speaks of his trees as more-than-human companions, beings with whom he spends time and, at times, even converses. Owning 4 hectares that he partially inherited from his father and partially bought during a phase of economic expansion in olive oil markets, he began to notice the first signs of desiccation in 2015. At that point, he tried to do everything he could think of to save his trees from death. When recounting his experience with the disease, he often referred to his olive trees as *"part of the family"* and shared the frustration caused by the desiccation as *"seeing someone who is falling into a ravine and asking for help, but you cannot do anything"*. His memories are interwoven with family anecdotes: the proudness he

experienced when he bought his first tractor, the fact that *"I was the only one, among my brothers, to be interested in agriculture"* or recalling how his father once *"paid agricultural workers at the end of the day with one liter of olive oil,"* a story that reminds how much more economically valuable olive oil was then compared to now.

Salvatore is one of those individuals in the region who relate to olive trees as relational beings. For these individuals, olive trees are not merely an agricultural crop that sustains livelihoods; they are also anchors of intergenerational ties that bind family and cultural identity. Tending the groves is thus inseparable from maintaining a sense of belonging and inter-generational continuity. In Apulia, olive trees are often planted at key life events (Gatti, 2022), and therefore carry the memory of these milestones. To abandon or uproot them is akin to erasing the family's history inscribed in the landscape (see Fig. 4.2 for an example of a millenarian olive tree). In this sense, olive trees mediate time: binding past and present while orienting hopes for the future. They also used to weave families into broader communities, as the exchange of oil, labor, and stories around harvest season turns olive groves into nodes of social life. To frame olive trees merely as resources, therefore, overlooks their social role as anchors of memory, kinship, and cultural reproduction.

These relational olive tree ontologies resonate with debates on "Indigenous ontologies," where rivers, mountains, or other non-human entities are acknowledged as persons and lived with as part of longer genealogies of human–nonhuman relationality (Kramm, 2020; De la Cadena, 2015; Ressiore et al., 2024). The relational ontology that emerges is not metaphorical but practical: olive trees are not "like" kin, they are kin, embedded in dense affective and material ties that structure everyday life, and that are valued for their relational rather than instrumental value: *"For a person from Salento* (the southern part of the Apulian region,) *the death of a centuries old olive tree is like the death of a father or a grandfather"*, a farmer told us explaining how he feels contemplating the ghostly landscape. This is the reason why the epidemic is experienced by many as grief (Gatti, 2022). While we do not endorse simplistic representations of Indigenous ontologies as necessarily "holistic" (Ludwig & El-Hani, 2025), this comparison is useful to nuance metadualist framings that oppose Western and Indigenous worlds as if they were bulk, homogeneous objects to be analyzed only in terms of radical alterity and incommensurability (Risjord, 2021). This does not erase significant differences—a careful comparison between Apulian farmers and Indigenous peoples would require a far more extensive discussion than the scope of this paper allows—but it shows how relational worlds are enacted well beyond canonical sites of indigeneity. In Southern Europe too, trees

demand recognition as beings whose value cannot be reduced to economic productivism or heritage symbolism.

Yet kinship and companionship do not exhaust their significance. Olive groves remain sites of labor, sources of income, and producers of a commodity—olive oil—that circulates in local and global markets. Much of their symbolic value, in fact, rests on a not-so-distant past when owning an olive orchard signified wealth, status, and prosperity. To focus only on affective ties would risk obscuring the extent to which olive trees are also productive crops—valued for their yield, oil quality, and role in sustaining rural livelihoods.



Figure 4.2. A millenarian olive tree in the countryside of Oria (Brindisi province). Photo: first author.

4.5.2 Olive trees as productive assets

"As long as this romantic vision of the olive grove persists, olive farming in Puglia is destined to die." This is how Salvatore Camposeo, professor of agronomic sciences at the University of Bari, intervened during an interdisciplinary symposium organized on February 1st, 2024, by the Italian Geographical Society titled "The olive trees decline and the *Xylella* crisis in Puglia a decade after the emergency

measures". His stance exemplifies the productivist vision of olive trees, considered as engines of economic growth and sustainers of rural livelihoods. Camposeo and his group advocate, teach, and conduct research on a wide range of innovations aimed at making olive farming more competitive on the global market. For people like him, this requires not only technological improvement—mechanisation, intensified production, and higher yields—but also a change in mentality: *"to make a new olive oil, we need a new olive farmer."* The tacit implication is that, for olive farming to be able to survive, it must be approached primarily as an economic activity—one that demands attention to matters of productivity and accounting rather than to emotions and affective ties.

The history of olive production in Apulia is deeply entangled with the global political economy and histories of domination. From the late eighteenth century, the region's olive groves were drawn into colonial relations of supply and demand, supplying low-quality oil for industrial uses in Northern Europe and beyond (Pindinelli, 1998). These relations established a monocultural, productivist model in which quantity mattered more than quality, favouring tall, woody olive trees that maximized yields but that produced cheap, bulk oil. With the restructuring of European agriculture under the Common Agricultural Policy (CAP) (Garzon, 2006) and the rising demand for extra-virgin olive oil, emphasis shifted to quality differentiation. In this new context, the monumental groves that once underpinned Apulia's comparative advantage came to be seen—by agricultural experts and policy makers—less as assets than as liabilities. For those who embrace this modernist productivist view, the problem is structural: traditional olive groves lock Apulian farmers into outdated practices and impede a transition to a mechanised, market-responsive olive industry. Clinging to the "romantic vision" of centuries-old trees, he argues, amounts to an economic dead end.

Intensification and mechanisation are, in this view, the only way to reduce costs and keep pace with global competitors—a perspective, to be fair, shared by many olive farmers who expressed frustration with the absence of a clear plan to "modernise the sector" and compete with producers with lower production costs. This vision, however, entails the reshaping of the olive trees themselves. Centuries-old trees, often 10-15 meters tall, reflect older harvesting methods geared to low-quality oil—mostly waiting for the olives to fall spontaneously on the ground—thus making big trees advantageous (the larger the tree, the greater the harvest). The size, stiffness, and irregular forms of the centenarian Apulian olive trees, however, make mechanisation difficult, raising labor costs and undermining competitiveness vis-à-

vis Spain (which typically operates under higher density systems) and extra-European producers (who commonly face lower labor costs). In both cases, Apulian farmers are increasingly forced to cut production costs to be able to remain in the market, and in many cases, they have abandoned the orchards altogether. High-density plantations, on the other side, rely on much smaller trees, planted at short distances from each other, in a configuration that resembles more that of a vineyard than a traditional olive grove (see Fig. 4.3 for a visual representation of the contrast between traditional olive orchards and super intensive plantations). To make economically productive olive oil, therefore, you need not only a new olive farmer, but also *a new olive tree*.



Figure 4.3. A high density olive plantation planted in the midst of a traditional centuries-old olive grove in the countryside of Fasano (Brindisi province). Photo: first author.

4.5.3 Olive trees as landscape elements

In recent years, a new ontology of the olive tree has begun to gain traction: one that enacts them as landscape elements. This framing combines multiple features: an *aesthetic* component that sees trees as symbols of beauty and that mobilizes sentiments of "love" and affection; an *economic* component tied to their aesthetic for

property values and tourism markets rather than to oil production; and a *biocultural* component that treats them as cultural heritage. Compared to the ontology of relational beings, however, these attachments are more detached, visual, and *disembodied* (cf. Macnaghten and Urry, 1998; Urry, 2002). For example, the actors who enact them rarely engage with actual olive farming practices themselves. More often than not, they delegate the agricultural labor to hired workers, who would take care of the trees and farm the land on their behalf.

This ontology is especially visible among wealthy investors—Italian and foreign—who purchase rural properties not to farm them but to secure homes in what is increasingly branded as an idyllic region for tourism. In 2020, an Italian newspaper published an open letter to the regional governor entitled *"The duty to save the monumental olive trees from Xylella."* Written by a landowner who had recently bought a plot in the middle of the Plain of Monumental Olive Trees, the letter expressed disappointment that their investment was "bound to fail" and urged authorities to extend support for grafting resistant cultivars onto centuries-old trunks. A similar concern surfaced in 2022, when the first author received an email from a Dutch family interested in buying land in the Ostuni countryside. They admired the beauty of the property but expressed anxiety about *X. fastidiosa*: Could the plot be tested before purchase? How much would it cost? And what would happen if the trees became infected? The potential buyer ended his message with a mix of hope and unease: *"I really love Puglia and I would like to buy this plot for a residence, but I am trying to find information [...] that makes me sleep better at night."* A few months later, during a WhatsApp exchange on possible treatments to prevent dieback after they had purchased the plot, he added: *"I just want to do everything to save the trees."*

Associations like *Save the Olives* and A.M.O. (literally: "I love") - Alberi Monumentali Ostuni reinforce and expand this ontology. Save the Olives mobilizes scientists, celebrities, and private donors around the goal of preserving monumental olive trees as cultural icons. In 2023, they featured during the summer fashion show of Dolce and Gabbana, an internationally famous fashion brand led by Italian stylists. Its most visible public face is the English Oscar-winning actress Helen Mirren, who bought a piece of land in Apulia twenty years ago and has been restless in lending her voice to campaigns and promotional material. Their activity focuses not only on funding scientific research but also on public awareness, heritage protection laws, and high-profile sponsorships that frame the olive tree as a patrimony of humanity. Recently, Save the Olives acquired a 5-hectare field in the Gallipoli countryside to

facilitate research on resistant olive varieties, in collaboration with researchers from the National Research Council (CNR) in Bari and a prominent local olive oil producer.

The main fight for these actors is for the conservation of monumental olive trees (*ulivi monumentali*). The countryside around Ostuni, Fasano, Carovigno, Cisternino, and Monopoli contains the highest density of centuries-old trees. Although already protected under regional legislation since 2007 (Regione Puglia, 2007), associations like A.M.O. are now working to have them recognised on the UNESCO World Heritage list, and to create the first "Monumental Olive Trees Park". In collaboration with CNR researchers and local farmers, they mainly advocate for "early grafting," a technique that involves inserting branches from *X. fastidiosa*-tolerant varieties into the trunks of ancient trees (Fig. 4.4). This practice is contested by activists and other farmers in the region who claim—correctly—that this is a highly delicate intervention that can kill the whole tree if not performed carefully. Moreover, the cost of such interventions—currently about €300 per tree—is prohibitive for most olive farmers, who, as mentioned above, are already struggling with falling market prices and the need to reduce management expenses.



Figure 4.4. A landscape with centenarian olive trees that underwent early grafting intervention. Municipality of Carovigno (photo: first author)

Taken together, these accounts portray olive trees not as relational beings or productive crops, but as landscape elements whose value lies in their aesthetic appeal, their capacity to increase land and property values, and their role as markers of biocultural heritage. Unlike the ontology of relational beings, which foregrounds intimate and embodied ties between farmers and trees, this landscape ontology is shaped by more distant attachments and global circuits of value. International investors, tourist imaginaries, fashion houses, and heritage organizations situate Apulian olive trees within a global arena where they become symbols of beauty, identity, and patrimony. In this sense, olive trees are enacted less as companions in daily life than as visual monuments in a carefully constructed, romanticized landscape—scenery to be admired, protected, and capitalized upon.

4.6 Ontologies of plant disease: OQDS, CoDiRO, and the "Xylella affair"

Having examined different ontologies of the olive tree, we now turn to the ontologies of disease: the diverse ways in which the desiccation of olive trees has been understood, interpreted, and "made real." In Apulia, the olive disease has never been a single, uncontested entity. Instead, it has been variously enacted as an incurable pathogenic invasion, as a complex socio-ecological syndrome, or as a politically constructed emergency. Each of these enactments speaks to the three ontologies described earlier, yet this relationship is not one of simple correspondence. Those who value olive trees as kin are not automatically inclined to see the disease as a conspiracy, nor do advocates of a productivist vision necessarily embrace a strictly pathogenic ontology. Instead, ontologies overlap, combine, and sometimes contradict one another in complex, non-linear ways. What emerges is not a neat mapping of tree ontologies onto disease ontologies, but a shifting and sometimes unstable spectrum of positions through which the epidemic is made sense of and governed.

4.6.1 Disease as a pathogenic invasion

The dominant disease ontology—the one that became hegemonic through media, institutional, and scientific channels—is that of an incurable pathogenic invasion. The story goes as follows: *X. fastidiosa* reached Europe via the ornamental plant trade, most likely via a coffee plant imported from Central America (Giampetruzzi et al., 2017; Sicard et al., 2021). Once established, a "perfect storm" took place: olive trees, the invasive bacterium, and the insect vector that allows transmission

(*Philaenus spumarius*, or *Sputacchina*) proved highly compatible. First detected near the town of Gallipoli, as we have seen, the disease spread rapidly northwards, aided by both the high density of the insect vector and the widespread abandonment of orchards. Traditional olive varieties, *Ogliarola Salentina* and *Cellina di Nardò*, were especially susceptible, while only a few cultivars—*Leccino*, *Frantoio*, and more recently *Lecciana* and *Leccio del Corno*—show tolerance: they can host the bacterium without developing symptoms of the disease.

Central to this ontology is the claim that there is no known cure. Once a tree is infected, desiccation is only a matter of time. Researchers and officials reiterated this message, amplified by media coverage that frames the epidemic as an existential threat rather than as a manageable agronomic problem. As mentioned in the background section, early research considered multiple pathogens, hence the initial name *CoDiRO - Complesso del Disseccamento Rapido dell'Olivo* (Olive Quick Decline *Complex* would be its English translation). However, once Koch's postulates were demonstrated in the lab (Saponari et al., 2017), attention narrowed to *X. fastidiosa*. The name of the disease shifted to Olive Quick Decline *Syndrome* (OQDS) in academic literature, while it became only "Xylella" or "Xylella disease" in the public debate in Italian. As has been elaborated upon at length elsewhere (Colella et al., 2019; Gatti, 2019), this shift from a *complex of causes* to a *complex of symptoms of a single cause* represents the core of the epistemic conflict over the disease in Apulia.

According to this ontology, the implication is clear: the eradication of infected trees remains the only possible strategy. Although some actors have warned that complete eradication in Apulia is unrealistic—given both the scale of infection and the cultural significance of olive trees (Almeida, 2016)—the European Commission nonetheless mandated the uprooting of symptomatic trees and those within designated containment zones. The eradication policy has been justified with reference to its incurability: if there is no treatment, removal is a necessity. Moreover, within this framing, olive trees have been treated less as living beings *in themselves* and more as potential "inoculum reservoirs," their value tied to the productive sector they threatened. Modeling and risk assessment studies calculated that potential impacts from the introduction of *X. fastidiosa* in mainland Europe could be very significant (Schneider et al., 2020). The challenge was thus recast from saving individual trees to safeguarding Mediterranean agriculture through strict biosecurity measures and preventing the pathogen's spread across Europe.

4.6.2 Disease as a socio-ecological syndrome

A second ontology of disease enacts olive tree decline not as the invasion of an alien pathogen, but as the manifestation of a complex socio-environmental syndrome. Here, the disease is enacted as the cumulative outcome of multiple interacting factors: biotic agents such as fungi and insects, long-term depletion of underground water resources, and the abandonment of "good agricultural practices" including regular pruning, fertilization, and soil care. Rather than a singular causal chain, this account foregrounds complexity, interaction, and context. Proponents of this ontological enactment of disease have never abandoned the use of CoDiRO as the acronym for the disease and have contested the reductionism they see as at the base of the previous ontology of disease as a pathogenic invasion.

This ontology of disease has been articulated both by some farmers and by dissenting voices within the scientific community. Plant pathologist Marco Scortichini, for example, argues that desiccation cannot be explained solely through *X. fastidiosa* but must be understood as a "complex disease" involving different pathogens and environmental stressors. From the beginning, the removal of infected trees did not make any sense to him: *"Eradication measures make sense when you are talking of a limited extension of the outbreak. In the case of trees, the area could range from 1-2 hectares to 10 -50 hectares. But not when you have 8000, 10000 hectares infected, moreover of a pathogen that does not affect olive trees alone. So the approach has been, since the beginning, extremely impractical" (from interviews)*. Farmers like Salvatore (Section 4.5.1) also endorse the "complex disease" framing, often describing olive decline in terms of imbalance: when water scarcity, pesticide residues, decrease in soil quality, and carelessness accumulate, trees become vulnerable to multiple forms of pathogenic attack.

The ontology of complexity thus challenges the reductionism of the incurable-pathogen narrative. By attributing desiccation to intertwined social and ecological processes, it recasts the problem as one of co-existence rather than eradication. The emphasis falls on restoring sustainable practices: pruning to reduce tree stress, fertilizing to replenish depleted soils, and ensuring sufficient irrigation in a region increasingly subject to drought. Rather than heavy machinery uprooting trees, this ontology calls for the slow and labor-intensive work of care. At the same time, the CoDiRO framing has political consequences. If decline is understood as socio-environmental, then responsibility extends beyond the biology of *X. fastidiosa* to encompass decades of agrarian policy, patterns of land abandonment, uneven development trajectories, and the effects of climate change, highlighting how

agricultural modernization and the abandoning of the "good agricultural practices" have rendered olive groves more vulnerable. The disease, in this sense, becomes a symptom of broader socio-ecological transformations, from rural depopulation to water resource depletion, that exceed the remit of plant pathology alone.

This ontology has circulated unevenly. It was never as dominant in media or policy as the incurable-pathogen narrative, but it resonated with many farmers who recognized in it the complexity of working within agroecosystems. It also attracted skepticism from institutions and scientists committed to the eradication paradigm, who regarded appeals to complexity as a distraction or even as a form of denial. However, by foregrounding systemic interactions and long-term vulnerabilities, this socio-environmental framing advanced an alternative imaginary of what disease is and how it should be addressed. In contrast to the inevitability and sacrifice implied by the incurable-pathogen ontology, the complex-syndrome account remains open to—and actually advocates for—the possibility of coexistence and resilience. It displaces the question from "How do we eliminate *X. fastidiosa*?" to "How do we sustain olive landscapes under conditions of environmental stress?" This shift emphasizes cultivation, adaptation, and care as strategies for living with disease.

4.6.3 Disease as a political construct

A final, and perhaps most controversial, disease ontology frames the "Xylella affair" as a constructed political emergency. According to this account, the epidemic is less a biological fact than a political fabrication: a crisis invented, exaggerated, or strategically mobilized to justify exceptional interventions. In its most radical form, it denies the very existence of *X. fastidiosa*; more nuanced versions accept the bacterium's presence but dispute its central causal role in the decline. What unites these positions is the suspicion that the epidemic narrative served other agendas, enabling powerful actors to reshape landscapes and agricultural practices under the guise of phytosanitary necessity (see Fig. 4.5).

Grassroots associations such as Ulivivo have been central in articulating this position. Their members circulated counter-expertise, contested monitoring protocols, and organized protests against eradication. In the spring and summer of 2025, they widely disseminated records from a judicial police investigation in Bari, which suggested that management decisions reflected biased alliances between scientific and political-economic actors. As stated in the report: *"the discovery and management of the bacterial disease caused by the quarantine pathogen X. fastidiosa are considered not to be exclusively linked to scientific studies, but rather*

[…] the result of biased decisions, mediated by deviant factions within the scientific community and among political-economic decision-makers." (Procura della Repubblica di Bari, investigation file, 2020).

The case is not yet closed, and a hearing scheduled on the 28th of October is set to decide whether to dismiss it or proceed to trial (Gentilini, 2025). Regardless of its outcome, however, the investigation has fueled and amplified widespread distrust toward scientific institutions, seen as complicit in sustaining an ill-defined framing of the problem. For the proponents of this ontology, the link between *X. fastidiosa* and desiccation was at best unproven, at worst deliberately overstated. Thus, eradication was not a neutral, technical obligation but a political act—paving the way for land-use change, infrastructural projects, or replacement of traditional groves with intensive plantations or solar energy collectors (for a recent agrivoltaic proposal to regenerate rural areas in Apulia in the aftermath of the epidemic, see Gatto et al., 2025). Images of police-escorted machinery uprooting centuries-old trees came to symbolise dispossession, feeding narratives of collusion between state, local mafia, CNR scientists, and EU authorities.



Figure 4.5. Writing on the wall of the University of Bari stating "Xylella is a mafia". During the early stages of the epidemic, it was not uncommon to find such graffiti on walls, overbridges, and other public spaces. Photo: first author. (May 2020)

This ontology has been labeled "science denialist" or "conspirationalist" in both academic and generalist accounts (Rielli, 2023; Tipaldo et al., 2022; De Fortuna et al., 2025). According to the authors, such labels provide insufficient explanatory power for two reasons. First, they do not take into account that formally trained scientists are also involved in making and disseminating these claims (see, for example, Ciervo, 2020), thus making the Science vs anti-Science dichotomy questionable. Second, although these labels acknowledge that the controversy challenged scientific authority, they risk—wrongly—sidelining the social and political concerns that these accounts point to. While claims that the bacterium does not exist are becoming increasingly rare as the epidemic spreads north, there is some evidence that the crisis is accelerating land concentration, speculative acquisitions, and the influence of agribusinesses. Although some proponents go so far as to attribute purposeful intentionality and direct responsibility to specific scientific and institutional actors—an interpretation we do not share until otherwise proved—it is clear that some groups have profited and taken advantage of the emergency, in ways reminiscent of Naomi Klein's "shock economy" (2007). Even exaggerated claims can thus be read as a critique—an attempt to highlight how emergency governance, framed as a response to incurable disease, has enabled new enclosures and exclusions.

The resonance of this ontology lies less in the number of adherents than in its ability to reconfigure public debate, generating deep mistrust toward scientists and institutions. By questioning not only the response but the existence of the pathogen itself—or at least its causal centrality—it undermined the epistemic foundations of eradication policies and shifted attention to questions of power concentration, corruption, and dispossession. Seen alongside the other disease ontologies, the "political construct" framing underscores how radically different enactments of *X. fastidiosa* could be, and how these enactments were inseparable from struggles over land, livelihoods, and autonomy in a territory characterized by decades of geographical marginalization, polluting industrialization, and socio-environmental injustices. As Martella (2022, pp. 60-61, *our translation*) puts it:

> *"The Xylella case in Salento and the mass hysteria it provoked cannot be understood without delving into the deepest wounds of this land, without knowing the demons that have penetrated the minds and bodies of its people. From an environmental perspective, the territory is saturated. Health crises have taken root within families. Stretches*

of uncontaminated land have been colonized and radically transformed by major industrial giants, who, after years of activity, are now leaving the bill behind: relocation, unemployment, pollution. The wounds of the landscape, the cancers, the neonatal malformations—among the highest rates in Europe—have produced fear, skepticism, and a constant perception of environmental unhealthiness."

If the pathogenic ontology translated into eradication and the socio-ecological one into coexistence, the political-construct ontology found fertile ground in the wounds of this land and insisted that the real disease lay in the governance of the crisis in itself.

4.7 Discussion

This paper argues that the conflict over the management of the *X. fastidiosa* epidemic in Apulia rests on fundamental ontological differences. Commonly portrayed as a clash between science and science denialists, we suggest that it is better understood as an *ontological conflict*: a conflict over what entities are at stake (Flemmer et al., 2024). Disagreements about how to respond to the phytosanitary crisis, in other words, stem from more profound divergences over what counts as an olive tree and what counts as disease. In Apulia, olive trees emerge simultaneously as relational beings embedded in kinship and socio-ecological ties, as productive crops sustaining agrarian livelihoods, and as landscape elements bound up with cultural heritage and property value. The disease, in turn, is variously enacted as an incurable pathogenic invasion (OQDS), as a complex socio-ecological syndrome (CoDiRO), and as a political construct framed as artificially fabricated and/or serving other interests. This multiplicity of enactments illustrates what Mol (1999) calls ontological politics—the situated practices through which realities are performed, related, and held together in governance. Farmers, scientists, and policymakers in Apulia each enact the olive tree and disease differently, yet their practices continually intersect, requiring coordination across these versions. At the same time, the controversy also reveals a dynamic in which power determines which of these realities is authorized as "the" reality. In this sense, the question is not simply how to save the olive trees, but rather which reality of the olive trees—and the disease—gets to be real.

Multiple ontologies intersect and interact in non-linear ways, sometimes reinforcing one another and sometimes pulling in different directions. Olive trees can inhabit several ontological registers at once: they can be kin and crop and heritage all at the same time, depending on the practices through which they are engaged. Disease, however, presents a more complicated case. Here, the enactments appear mutually exclusive: either *X. fastidiosa* is the singular cause of decline (OQDS), or decline results from a complex of interacting factors (CoDiRO), or *X. fastidiosa* does not exist, and it is a staged emergency to serve some hidden powers' interests. Unlike with the olive trees, switching between these accounts has consequences, as they prescribe different interventions and governance regimes.

This complex picture of partially co-existing and partially conflicting ontologies highlights the need for a more elaborate analysis that reflects the complementary but distinct nuances of "ontological politics" and "political ontology" as introduced in the theoretical framework. Following Mol's (1999) conceptualization of ontological politics, multiplicity is central to answering the ontological questions of what olive trees and plant diseases are. This multiplicity cannot be resolved through a unified ontological analysis because different situated practices—for example, of smallholder farming and agronomic research—enact different ontologies. While ontological politics highlights multiplicity, however, political ontology sharpens the focus on tensions between ontologies beyond harmonious co-existence, including outright incompatibility—for example, *X. fastidiosa* as the main causal agent of olive decline and as a political fabrication—of certain ontologies.

This emphasis on both multiplicity and conflict leads to a complex picture of the relation between ontological and political practice. On the one hand, the ontological politics of multiplicity resonates with wider appeals to a "pluriverse" (Escobar, 2017) that cultivates multiplicity by striving for "a world in which many worlds fit" (EZLN, 1996). In Apulia, an inclusive approach to the management of *X. fastidiosa* requires acknowledging ontological multiplicity rather than imposing an ontological monoculture in which olive trees are treated exclusively as productive assets. For many of the actors involved, olive trees can be both relational beings and productive assets that sustain local livelihoods and beloved landscape elements. What matters is the specific practices that enact each of those ontologies, and the extent to which they overlap, intersect, and partially intertwine. On the other hand, the political ontology of our case also highlights that embracing multiplicity is often not sufficient and can obscure tensions and outright incompatibilities between ontologies. Pluralist appeals to "a world in which many worlds fit" are not enough if they do not

acknowledge that some worlds are not compatible and that some stand in relation of domination and subjugation to others (Kramm, 2024).

By highlighting these multi-layered dynamics between ontological politics of multiplicity and political ontology of conflicts,, we aim to intervene in debates on socio-environmental governance in three ways. First, we bring ontological considerations to a European plant-health controversy, showing that even within a Western, Euro-modern setting, ontology is not one but many. Much of the political ontology literature has explored conflicts in Indigenous or extractivist contexts, often framing political ontology as challenging an "all-encompassing modernity" (Blaser, 2013, p. 547) and aiming to "destabilize Western modernity's philosophical and anthropological foundations" (Fúnez-Flores, 2022, p. 21). While resistance against colonial imposition of Western modernity highlights the political stakes of ontological difference, political ontology also needs to avoid a caricature of the West as internally homogeneous, a block that speaks with one ontological voice (Ludwig & El-Hani, 2025, pp. 43-47). This is what the controversy around the governance of *X. fastidiosa* shows. Farmers, scientists, policymakers, and activists in Apulia all mobilized different understandings of olive trees and olive disease, producing competing yet partially overlapping realities. This internal heterogeneity did not arise at the margins of modernity but at its very heart, in the EU's agricultural core and under the authority of its most powerful institutions. Recognizing ontological conflict here provincializes "the West" (Chakrabarty, 2000), refusing to treat it as unified and showing that the pluriverse is not confined to non-modern or non-Western contexts: it unfolds within Europe too, in landscapes often imagined as paradigmatically modern.

Second, we show that ontological multiplicity runs not only between science and society but through scientific practice itself. Political ontology has often focused on clashes between Indigenous and scientific-naturalist frameworks (Blaser, 2013; Escobar, 2018), yet science itself enacts multiple ontologies. Indeed, one of the main messages of contemporary philosophy of science is that science is not unified but rather "a complex epistemic and social practice that is organized in a large number of disciplines, employs a dazzling variety of methods, relies on heterogeneous conceptual and ontological resources, and pursues diverse goals of equally diverse research communities" (Ludwig & Ruphy, 2021). Rather than talking about Science in capital letters, political ontology is therefore challenged to make sense of ontological multiplicity within scientific practices as well (Lohse, 2017; Longino, 2020a; Mitchell, 2002). In Apulia, plant pathologists disagree on several key points:

whether olive decline was primarily caused by *X. fastidiosa* or a complex of interacting stressors, whether the condition should be labeled OQDS or CoDiRO, and whether eradication or coexistence offers the more appropriate path forward. These disagreements are not merely epistemic variations or disciplinary rivalries, but enactments of different diseases, each stabilized through diverse methods, diagnostic procedures, and research protocols. Science thus appears not as a unified arbiter of reality but as a site of ontological struggle, where alternative "scientific" realities are produced, negotiated, and sometimes marginalized. This recognition complicates the usual boundary-drawing between "scientific ontology" and "indigenous ontology" by showing that multiplicity is present inside the very institutions that are supposed to produce authoritative knowledge.

Third, the Apulian case points toward a non-relativist account of ontological pluralism. Recognizing multiplicity does not mean accepting that all enactments are equally valid or interchangeable. While ontologies are enacted and therefore political, they are also anchored in material practices that generate evidence, coherence, and recalcitrance (Barad, 2007). Thus, while acknowledging that the construction of scientific facts is always shaped by social and political factors, and scientific ontologies are not value-free (a point long established in philosophy of science, see Douglas, 2009; Kincaid, Dupré, & Wylie, 2007; Longino, 1990), we contend that the nature of disease cannot be settled exclusively through politics. It also requires robust empirical research and evidence from—and to be constructed, through transdisciplinary collaborations, with—bacteriology, ecology, virology, and different strands of plant science. *Sensu* Mol, we treat disease as "more than one but less than many" (Mol, 2002, p. 55). The challenge is to hold on to multiplicity while still distinguishing among enactments by their robustness: their consistency across sites, their ability to withstand intervention, and their capacity to generate workable futures. In Apulia, this means rejecting both scientism—the idea that ontological plurality ends where science begins—and an "anything goes" relativism that would treat all claims as equally valid. By advancing such a stance, the paper aligns political ontology with a pragmatic pluralism (Cooke, 2020): one that recognizes ontologies as situated and political, but also evaluates them in relation to the evidence and practices that sustain them.

A pragmatic pluralism does not resolve this tension by declaring all ontologies equally valid, nor by collapsing them into a single authoritative reality. Instead, it emphasizes the work of coordination across partially overlapping enactments, while also recognizing that some conflicts remain irreducible. Following Mol (2002, p.

70), "coordination into singularity does not depend on the possibility to refer to a preexisting object. It is a task [...] that the various realities [...] are balanced, added up, subtracted. That, in one way or another, they are fused into a composite whole". Multiplicity, in other words, does not imply infinite compatibility; instead, it highlights how different practices produce different realities that must be actively related to one another. In the case of disease, this means acknowledging that laboratory protocols, field observations, and ecological models generate divergent but partially connectable enactments of decline. Rather than choosing once and for all between "Xylella-only" and "complex syndrome" framings, governance could engage both: treating *X. fastidiosa* as a proven pathogenic agent that requires monitoring and control, while also recognising the wider socio-ecological elements that exacerbate vulnerability. At the same time, a pragmatic pluralism can attend to the political-construct ontology without reducing it to misinformation, by situating it as a critique of how emergencies are framed and whose interests they serve. Engaging with this dimension means acknowledging that disease governance is also a site where authority, evidence, and legitimacy are negotiated. This does not erase incompatibility, but it makes it politically and institutionally negotiable, opening space for hybrid responses that combine containment measures with long-term investments in soil care, water management, and landscape maintenance.

4.8 Conclusion: can Apulian olive trees be saved?

In 2016, a famous plant pathologist published a commentary in *Science* titled *"Can Apulian Olive Trees Be Saved?"*, anticipating the difficulties that phytosanitary authorities would face in trying to eradicate a pathogen from a territory where olive trees are so culturally significant and symbolically rooted (Almeida, 2016). This paper suggests that before asking *whether* they can be saved, we should be asking: *"Which is the olive tree that we want to save in Apulia?"* The point is to clarify what exactly is at stake: is it the olive tree as a relational being embedded in family history and trans-generational ties? As a productive crop sustaining rural livelihoods? Or as a landscape element that fuels the tourism industry? Current phytosanitary regimes in Europe institutionalize a singular ontology—treating olive trees merely as productive assets and *X. fastidiosa* as an invasive pathogen to be eradicated—thereby excluding alternative enactments of both tree and disease. A more reflexive plant-health governance would acknowledge ontological plurality and create participatory arenas where different understandings can be voiced and

negotiated rather than dismissed as misinformation. Recognizing Apulian olive groves as biocultural landscapes—at once economic, ecological, cultural, and emotional—also calls for policy instruments such as heritage protections or agri-environmental schemes that sustain, rather than suppress, multiplicity.

The answer to the question *"how do we save them?"* also depends on how the nature of the disease is understood and enacted. Different ontologies of the disease foreground distinct, often overlapping but sometimes conflicting, possibilities for action. When *X. fastidiosa* is approached primarily as a pathogenic agent, responses tend to focus on techno-scientific solutions—developing resistant varieties, subsidizing grafting, or improving early detection and monitoring. When the disease is conceived as a complex socio-ecological syndrome, interventions expand toward understanding how ecological degradation, agronomic practices, and broader dynamics of agrarian change interact. And when it is enacted as a politically constructed emergency, attention turns to how crisis narratives authorize exceptional measures and redistribute power and resources. This, however, does not result in a one-to-one correspondence between ontological framing and political response. Rather than mapping neatly onto specific policies, ontological assumptions shape and are shaped by the very practices through which the epidemic is governed.

Ultimately, the *X. fastidiosa* epidemic in Apulia raises a broader challenge for conservation studies and plant disease governance: how can policy interventions respond to crises without sidelining ontologies or reinforcing polarization? The conflicts around olive trees remind us that policies always involve choices about which realities are allowed to endure, and at what cost. Meeting this challenge requires conservation approaches that accommodate plurality while remaining attentive to evidence and care. For policymakers, this means complementing eradication protocols with participatory forums, heritage protections, and support for farmers in maintaining landscapes of low market productivity but high cultural value. The task ahead is not to eradicate ontological difference, but to learn how to live and govern with it.

5

Chapter 5



Conservation dilemmas

Xylella fastidiosa and the future(s) of olive farming

Abstract

Over the past decade, the bacterium *Xylella fastidiosa* has profoundly transformed olive-growing landscapes in the southern Italian region of Apulia. Once characterized by ancient olive trees that sustained both rural livelihoods and cultural identities, the region is now caught between two competing trajectories: on the one hand, efforts to intensify and mechanize production to remain competitive in global olive oil markets; on the other hand, attempts to preserve centuries-old trees valued as cultural heritage and landscape elements. This paper conceptualizes this tension as a conservation dilemma: the structural conflict between sustaining olive trees simultaneously as livelihood-sustaining crops and as elements of biocultural landscapes. Drawing on long-term ethnographic research and the analysis of disease management policies and practices, the paper extends debates on conservation politics into productive agroecosystems and brings the political ecology of conservation into closer dialogue with critical agrarian studies and political agroecology. By showing that competing strategies for "saving" the olive trees enact different visions of agricultural futures, each supported—or undermined—by specific subsidy schemes, market forces, and labor regimes, the paper argues that the fate of Apulian olive trees depends less on technical solutions to the disease than on the political and economic conditions that determine which practices of care can be materially sustained. The paper concludes by reflecting on convivial conservation and a conservation basic income as potential frameworks for sustaining labor-intensive landscape-care practices beyond market-based solutions.

Keywords: *Xylella fastidiosa;* Olive farming; Conservation dilemmas; Political economy; Biocultural landscapes; Convivial conservation.

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5.1 Introduction

Since 2013, olive trees in the southern Italian region of Apulia have been affected by the introduction of *Xylella fastidiosa* subsp. *pauca (X. fastidiosa* from now on*)* (Saponari et al., 2013), a plant pathogen later associated with a disease called Olive Quick Decline Syndrome (Saponari et al., 2017). In little more than a decade, the disease has transformed centuries-old olive-growing landscapes that sustain rural livelihoods, regional economies, and cultural identities, placing large parts of the olive farming sector under severe strain (Calderoni et al., 2025). Millions of trees have dried out (Beck et al., 2019) or been uprooted (Fig. 5.1). While plant removal is a common phytosanitary response to plant disease outbreaks (Gamliel & Fletcher, 2008), in Apulia the scale of infection, combined with the exceptional longevity and symbolic significance of olive trees, has made containment measures deeply contentious (Nadeau, 2015a, 2015b; DeAndreis, 2022). More than a phytopathological emergency, the epidemic has exposed a broader tension over what olive trees are or should be: competitive agricultural crops or non-productive elements of biocultural landscapes whose value exceeds agricultural productivity? This tension is a central concern of this paper.



Figure 5.1. Recently uprooted olive trees piled up in the municipality of Francavilla Fontana, September 2025. Photo by the author.

Since its onset, the epidemic has been marked by profound disagreements over how the disease should be framed and, consequently, managed (Colella et al., 2019). On the one hand, institutional responses have treated *X. fastidiosa* primarily as a

technical problem requiring rapid containment and eradication. On the other hand, a heterogeneous constellation of farmers, activists, and scientists has advanced alternative interpretations of the disease that foreground the historical, ecological, and affective value of olive trees. Over time, these divergent interpretations crystallized into competing disease-management practices, making the Apulian epidemic one of the most contested plant disease outbreaks in recent European history (Gatti et al., 2026).

Most social science research seeking to make sense of the conflict surrounding the governance of the epidemic has so far foregrounded its epistemological and ontological features. From an epistemological perspective, scholars and public commentators have interpreted the controversy either primarily through the lens of anti-science populism and conspiracy thinking (Rielli, 2023; Parmigiani, 2024; Brandmayr, 2025) or, conversely, by emphasizing knowledge pluralism, non-scientific expertise, and undone science (Colella et al., 2019; Gatti et al., 2026). From an ontological perspective, Gatti & Ludwig (2026) have argued that the controversy can be understood as an "ontological conflict," in which different enactments of olive trees and disease coexist, interact, and compete, giving rise to a situation in which "everybody wants to save the olive tree, yet what is to be saved is far from clear" (p. 1).

Yet critical social science inquiries have so far paid relatively little attention to the political-economic dimension of the conflict. To be clear, what remains insufficiently explored is not the epidemic's economic impact *per se*—an aspect examined, for example, by Schneider et al. (2020) and, more recently, by Calderoni et al. (2025). Rather, less attention has been devoted to how structural pressures, agrarian change, and rural development policies have shaped the controversy, as well as to how orchard owners have engaged—or could engage—with different responses to the epidemic. A notable exception is Dell'Abate (2025), whose work seeks to "give back the voice to the farmers" by examining their responses through the lens of economic sociology, foregrounding the productive dimension of olive farming and emphasizing its income-generating role amid the crisis. Nevertheless, studies that mobilize a more explicit political-economy sensitivity to analyze responses to the disease remain scarce.

This paper addresses this gap by examining how economic constraints (and policy instruments) shape which forms of care, conservation, and agricultural futures are possible in Apulia in the context of the Olive Quick Decline Syndrome. While recent research has begun to reconnect the epidemic to its political-economic

underpinnings, for example by showing how the history and specific materiality of olive production in Apulia created favorable conditions for the spread of the disease (Gatti, 2026), this analysis focuses on the *present* and *future* of olive farming in Apulia. Drawing on long-term ethnographic exploration of disease-management interventions and the analysis of relevant policy frameworks, this paper shows that public subsidies, technological innovations, and market constraints do not merely provide technical solutions to a phytopathological problem: they actively configure the landscape of possibilities within which olive trees are cared for, abandoned, replaced, or transformed.

On this basis, this paper conceptualizes the structural tension between sustaining olive trees as both productive crops and elements of biocultural landscapes as a conservation dilemma. The dilemma arises when centuries-old olive groves—once central to the region's economy and household livelihoods—lose economic viability in contemporary, globalized agri-food markets. Under such conditions, and in the absence of public support to counterbalance global market forces, efforts to maintain olive trees as income-generating assets tend to prioritize restructuring toward more intensive, mechanized, and economically competitive groves. Conversely, preserving them as they are, in order to sustain their role as other-than-productive biocultural features of the landscape, tends to rely on labor-intensive "practices of care" (Mol et al., 2011; Puig de la Bellacasa, 2017) that prove economically fragile and, most importantly, unevenly distributed.

I frame the issue in these terms because the question of how to "save the olive trees" has been a recurring theme in public debates surrounding the *X. fastidiosa* crisis in Apulia, mobilizing farmers, activists, scientists, institutions, and the media alike. Yet while the language of saving trees invokes fundamentally conservation-oriented concerns, conservation scholarship rarely engages with cultivated species embedded in working agricultural landscapes, focusing instead on wildlife, biodiversity protection, and protected areas (more on this in Section 5.2). Conceptualizing the crisis as a conservation dilemma, therefore, allows the Apulian case to be brought into dialogue with broader debates on conservation, while foregrounding the tensions that arise when the entities to be "saved" are simultaneously economic crops, cultural heritage, and ecological features of biocultural landscapes.

In developing the analysis, the paper aims to contribute to and expand debates in political ecology of conservation, critical agrarian studies, and political agroecology in three main ways. First, it reconceptualizes plant disease governance as a contested

terrain at the intersection of conservation politics and rural development, showing that policy responses to the epidemic and attempts to save the olive trees are inseparable from the economic conditions—and power relations—that sustain them, as well as from broader struggles over the future of agriculture and olive farming in Apulia. Second, it extends conservation debates beyond classical interpretations of conservation projects as drivers of dispossession or as forms of "green grabbing" (Fairhead et al., 2012) by examining conservation claims that arise within productive agricultural landscapes and from agrarian actors themselves, rather than in protected areas or conservation frontiers. Third, it engages with convivial conservation and one of its main policy corollaries—conservation basic income—as potential frameworks for addressing the conservation dilemma identified in the Apulian case. Specifically, these approaches offer a way to support forms of more-than-human care (Ressiore et al., 2024) that generate ecological and cultural value but are often difficult to sustain through market mechanisms alone.

The remainder of the paper is structured as follows. Section 5.2 introduces the conceptual and theoretical framework, situating the analysis at the intersection of conservation studies, political (agro)ecology, and critical agrarian studies. Section 5.3 outlines the methodology. Section 5.4 provides background and context for the case study, situating the Olive Quick Decline Syndrome within the broader political economy of olive production. Section 5.5 presents the empirical material, examining the practices and policies that enable—or undermine—the ways currently in place in Apulia for "saving" the olive trees. Section 5.6 discusses the findings, engages with the conservation dilemma, and reflects on the implications of convivial conservation for agricultural landscapes with strong biocultural value.

5.2 Conceptual and theoretical framework

Conservation studies and conservation biology have long grappled with ecological crises and biodiversity loss through competing approaches to how nature should be protected, restored, or "saved". These approaches typically oscillate between exclusionary models centered on protected areas and notions of "pristine" nature—often labeled "fortress conservation" or neo-protectionism—and market-oriented positions that align conservation goals with economic incentives, also referred to as "neoliberal conservation" (Igoe & Brockington, 2007; Büscher & Fletcher, 2020; Fletcher, 2020). In this "great conservation debate" (Büscher & Fletcher, 2020), political ecologists have shown that both approaches tend to reproduce the very problems they purport to solve, notably by displacing social costs,

exacerbating inequalities, and failing to address the structural drivers of ecological degradation (Fletcher, 2024). Conservation, in this sense, must be understood not as a neutral technical endeavor but as a deeply contested field structured by struggles over values, politics, power, and resources (Escobar, 1998; Adams & Hutton, 2007; Saberwal & Rangarajan, 2009).

Within the political ecology of conservation, however, empirical and conceptual attention has largely centered on conflicts surrounding charismatic wildlife, protected areas, and human–wildlife coexistence (Massé, 2016; Fletcher & Toncheva, 2021; Bontempi et al., 2023). While this literature has effectively shown how conservation projects are shaped by state violence, displacement, and historically situated power relations (Bocarejo & Ojeda, 2016; Weldemichel, 2020), its empirical focus has narrowed the objects through which conservation is typically theorized: conservation is most often conceptualized in relation to wild or semi-wild nature—spaces imagined as external to, or in tension with, economic production—and thus is typically targeted as a new spatial fix for capital accumulation within neoliberal conservation projects (Büscher & Fletcher, 2015). By contrast, productive agroecosystems—and the biocultural landscapes they generate and sustain—have received comparatively less attention as sites of conservation politics. Although important strands of scholarship, particularly within agroecology, have challenged the separation between production and conservation, productive agrarian landscapes remain comparatively underrepresented within the political ecology of conservation, where tensions between agriculture and conservation continue to shape much of the broader debate.

In effect, agroecology (Altieri, 2018; Gliessman et al., 2022) has perhaps done more than any other body of scholarship to challenge the assumption that agriculture and conservation are inherently opposed. Intervening within the so-called “land sparing vs land sharing” debate (Fisher et al., 2014; Kremen, 2015; Loconto et al., 2020) through the concept of Nature’s Matrix (Perfecto et al., 2019) and the analyses of multifunctional landscapes, agroecologists have shown that farming systems can simultaneously support production, biodiversity, and ecosystem functions (Liere et al., 2017). In doing so, agroecological scholarship has attempted to bring productive agricultural landscapes to the center of conservation debates, thus recasting farmers not merely as food producers but also as key stewards of socio-ecological systems whose everyday practices of care and land management contribute to conservation outcomes (Altieri et al., 1987; Badgley, 2003; Raymond et al., 2016).

At the same time, agroecology is a deeply contested political terrain. Often defined as a combination of science, practice, and social movement (Wezel et al., 2009), it emerged historically—especially in its Latin American variant—from struggles for peasant autonomy and food sovereignty (Holt-Giménez & Altieri, 2013; van der Ploeg & Schneider, 2022; Gonzalez de Molina, 2026) and has often been shaped by anti-capitalist commitments (van der Ploeg, 2021). However, it has increasingly undergone depoliticization and institutional co-optation (Giraldo & Rosset, 2018; Rivera-Ferre, 2018), giving rise to what some have called "junk agroecology" (Alonso-Fradejas et al., 2020). Proposals for a "political" or "dialectical" agroecology (Gonzalez de Molina 2013; Gonzalez de Molina et al., 2019; Vandermeer & Perfecto, 2024) seek to re-embed agroecological practice within the politics of rural transformation, foregrounding questions of class, power, and capital. Recent scholarship has also called for more systematic engagement between agroecology and agrarian political economy (McKay et al., 2025a; McKay et al., 2025b).

Critical agrarian studies (CAS) is the field that has most extensively engaged with agricultural transformations, agrarian politics, and struggles over peasant livelihoods, primarily through the lens of political economy. Rooted in the broader debate around the "agrarian question" (Byres, 1977; Akram-Lodhi, 1988; Bernstein, 2006; Akram-Lodhi & Kay, 2010c)—how capital penetrates rural areas and restructures relations of production and reproduction through wider processes such as peasants' differentiation and land grabbing (Byres, 2009; Borras & Franco, 2012; Cousins, 2022)—CAS has long been preoccupied with whether small-scale farmers can persist under the pressures of industrialization and globalized markets, or whether they are compelled to disappear (Bernstein, 2010; van der Ploeg, 2018a). Issues of labor, generational renewal, and land access remain central to this tradition (Borras, 2023). Yet CAS's engagement with conservation debates has remained limited. Within CAS, conservation rarely appears as a central analytical concern in itself, and when it does, it is often framed as a variant of the more established and central land-grabbing debate (Ojeda, 2012; Holmes, 2014). As a result, conservation is seldom analyzed as a political project emerging from, or actively advanced by, rural stakeholders. Instead, it is often interpreted as an external intervention imposed on rural communities, rather than as a terrain of agrarian contestation in its own right.

Taken together, these bodies of scholarship illuminate the theoretical terrain of this paper while also pointing to its central gap. Agroecological scholarship shows that agriculture and conservation need not be opposed, and has brought productive

landscapes into conservation debates. Yet, despite important efforts within political agroecology, questions of class, labor, agrarian differentiation, and rural political economy have often remained secondary to ecological practices and landscape functions[16]. CAS, by contrast, has foregrounded precisely those structural dimensions—class, capital, labor, social reproduction, social differentiation—but has largely left conservation as an analytical blind spot, treating it either as marginal to agrarian politics or as a form of green grabbing (Fairhead et al., 2012). In this paper, I combine these strands of scholarship to advance a *political agroecology* analysis of the Olive Quick Decline Syndrome in Apulia. By centering on a productive crop and on agricultural landscapes that are simultaneously economically vital and culturally meaningful—olive trees and olive orchards—the paper engages with a class of socio-ecological objects that remains comparatively under-theorized within conservation debates and expands the attention of conservation studies from protected areas and charismatic species to multispecies, productive agrarian landscapes.

Finally, a recurring theme in conservation debates (as well as in agroecology and CAS) is the role of capitalist markets in sustaining or undermining conservation efforts. As Büscher & Fletcher (2020) argue, conservation and capitalist development have historically gone hand in hand, despite resting on a fundamental contradiction: the capitalist economy is the main driver of ecological degradation and environmental injustice (O'Connor, 1988; Foster et al., 2010). They therefore propose "convivial conservation"—framed as "a vision, a politics and a set of governance principles grounded in a critique of capitalist political economy" (Büscher & Fletcher, 2019, p. 286)—as a way to move beyond both neo-protectionist and market-oriented conservation paradigms. As a policy corollary, proponents have advanced the idea of a "conservation basic income" (CBI): a non-market instrument designed to materially support those whose everyday practices of more-than-human care (Ressiore, 2025) and ecological maintenance contribute to biodiversity conservation, rather than relying on payments for ecosystem services, carbon markets, or the creation of protected areas (Fletcher & Büscher, 2019). While convivial conservation is not the primary analytical framework adopted here, it offers a useful normative and policy-oriented perspective for considering how

[16]It is worth stressing that Latin American agroecology, with its deeper roots in food sovereignty struggles and campesino movements (Holt-Giménez & Altieri, 2013; Rosset & Altieri, 2017), has engaged more seriously with political-economic dimensions than the technocratic and ecological design strands of agroecology dominant in the Global North.

practices of ecological care might be sustained in contexts where market mechanisms alone prove problematic. In the discussion, I return to these ideas to reflect on the uneven capacities of different actors to maintain olive trees and on the kinds of institutional arrangements that might support labor-intensive forms of landscape care beyond market imperatives.

5.3 Materials and methods

This paper draws on approximately 18 months of cumulative ethnographic research conducted in the southern Italian region of Apulia between 2019 and 2025, focusing on olive disease management practices. Data were generated through 40 semi-structured interviews with a wide range of stakeholders, including olive farmers, mill owners, agronomists, plant pathologists, agricultural officers, policymakers, and grassroots activists involved in initiatives aimed at "saving the olive trees". Interviews explored participants' understandings of the disease, their practical responses, their experiences with subsidy schemes and regulatory frameworks, and their visions for the future of olive farming.

Fieldwork also included sustained participant observation and active participation in orchard management practices—such as pruning, grafting, replanting, and soil management—along with attendance at public meetings, workshops, and consultations where farmers, researchers, and policy actors debated responses to *X. fastidiosa*. Primary data were complemented by an analysis of policy documents, including regional directives and funding schemes (*bandi regionali*) that support specific rural development trajectories, and by historical data on the political economy of the olive sector in Apulia from the early 1990s to 2025.

Methodologically, the research combines ethnography with elements of agrarian political economy analysis. A systematic analysis of rural development measures (including EU Common Agricultural Policy instruments, regional emergency funds, and replanting incentives) traced their eligibility criteria, conditionalities, and implicit assumptions about productivity, scale, and technological modernization. This documentary analysis was triangulated with farmers' accounts of how these instruments shaped their decisions—whether to uproot, replant with resistant cultivars, intensify production, diversify, or abandon groves altogether. Interview transcripts, fieldnotes, and documentary materials were then analyzed iteratively to identify recurring narratives, practices, and policy orientations concerning the future of olive cultivation, from which the three pathways discussed below emerged.

A note on positionality: I am originally from Apulia, and my family owns a small olive orchard where I have long participated in olive cultivation and harvesting and, more recently, in the commercialization of olive oil. In fact, the decision to move toward more formal market commercialization became part of the methodological orientation of this research, as it provided situated insight into the political-economic conditions that structure olive cultivation under pressure from *X. fastidiosa*, and it opened access to a heterogeneous range of farmers and producers who might otherwise have remained partially inaccessible. While facilitating trust and access, this position also required ongoing reflexive attention to how personal attachments to olive cultivation could shape both interpretation and field engagement.

5.4 Olive farming in Apulia: political economy and plant disease

5.4.1 Political economies of olive production

The olive landscapes of Apulia must be understood not simply as the outcome of climatic suitability or agronomic tradition, but also as the material sedimentations of specific political–economic conjunctures that created the incentives for olive cultivation and shaped the form of the groves as they exist today. In the seventeenth and eighteenth centuries, olive oil production in southern Italy flourished as part of a broader export economy (Pennetta, 1958). Large quantities of lamp oil (*olio lampante*) were shipped from the port of Gallipoli to Northern European ports, where it supplied soap manufacturing—most notably in Marseille—and served as an industrial lubricant during the early phases of the "industrial revolution" in England (Salvemini, 2000; Mazzotti, 2004). In this period, olive trees became long-term capital assets, and the morphology of the Apulian landscape itself—in many parts of the region, a sea of centuries-old olive trees (Fig. 5.2)—reflects the profitability of olive oil as a global commodity.



Figure 5.2. A landscape view of the monumental olive trees plain in Apulia (surroundings of Fasano municipality), March 2026. Photo by the author.

The monumental groves that today define Apulia's rural identity thus reflect a history of economic prosperity that went hand in hand with active processes of landscape care (Sereni, 1961; Mathews, 2022). Centuries-old trees were planted, maintained, and passed down through generations because they generated wealth. As historian Francesco Prudentino remarked during a meeting on the sustainable management of olive groves in Ostuni (Brindisi province), *"having an olive orchard, for a family, meant being considerably rich."* Olive oil, therefore, functioned not just as a food product but as a store of economic value: *"My father used to pay agricultural laborers one liter of oil for a day's work,"* a farmer told me during fieldwork—an indication of its purchasing power in the rural economy of a not-so-distant past.

This economic relevance, which continues to be reflected in today's olive landscapes, began to erode in the second half of the twentieth century. While olive production expanded in certain periods, especially in the early phases of the EU's Common Agricultural Policy (Dell'Abate, 2025), the relative profitability of traditional systems began to decline. Over the past fifty years, economic data show

that olive oil prices have increased only modestly, while input costs—fuel, fertilizers, labor, machinery—have risen dramatically (see Table 5.1). In light of this, profit margins began to narrow, particularly for small- and medium-scale producers who relied on manual (labor-intensive) harvesting techniques and "traditional" orchards. These groves are characterized by large and tall trees that hold considerable aesthetic and cultural value but require more time-consuming and, therefore, costly cultivation practices. At the same time, agricultural labor in Apulia—as in many other parts of the world—has become increasingly scarce due to rural outmigration and persistently low agricultural wages (Stockdale, 2004; De Brauw 2019). In the past decades, these dynamics have led many aging farmers to abandon cultivation, leaving a growing number of olive orchard plots unmanaged.

Product	Unit	Value in 1966	Value in 2008	2008/1966 value ratio
Fertilizer $(NH_4)_2SO_4$	€/ton	13	397.67	31
Tractor (Fiat 50HP)	€	1,000	20,658.27	21
Agricultural labor	€/hour	0.09	9	100
Fuel	€/ton	8	529.37	66
Extra virgin olive oil (market price)	€/ton	300	3,700	12

Table 5.1. Price variations between 1966 and 2008 for selected inputs and Apulian extra virgin olive oil (adapted from Godini 2010). Author's own elaboration.

Reforms of the EU Common Agricultural Policy (CAP), particularly the decoupling of subsidies from production in the 1990s (Giuliani & Baron, 2025), at times worsened these tendencies. As a farmer told me: *"People were taking the incentives (l'integrazione) and then building swimming pools"*. Such types of comments point to a widely acknowledged dynamic in which subsidy beneficiaries received payments without necessarily reinvesting them in the agricultural activities

the subsidies were originally intended to support. Put differently, in contexts where olive production had started to become economically marginal (Pulighe, 2023), following decoupling, landholders preferred, in some cases, to retain field-based payments rather than reinvest them in (labor-intensive) farming practices. In this way, processes of underinvestment and land abandonment were facilitated rather than prevented.

Simultaneously, the global geography of olive oil production began to shift. Spain consolidated its position as the world's leading producer, largely through mechanization and the widespread adoption of high-density and super-intensive plantations that dramatically reduced per-liter production costs (Infante-Amate et al., 2016). More recently, non-European countries such as Tunisia and Turkey have increased output and strengthened their presence in international markets (International Olive Council, 2025; UkrAgroConsult, 2025; DeAndreis, 2025). Italy, instead—once a dominant producer—gradually lost relative market share. As one olive oil expert told me during an interview: *"Italy consumes mostly Spanish olive oil. This happens for two reasons: first, domestic consumption greatly exceeds production; second, Italian olive oil is often exported because its production costs are too high for domestic markets."* Once again, this quote stresses the competitive disadvantage of Apulian producers compared with other olive-producing countries that could rely on higher levels of mechanization or lower labor costs. A dynamic also echoed by a farmer:

> *"The sector was already facing great difficulty. Prices have been falling for two decades. In Spain, they mechanized everything forty years ago. Franco subsidized income and replanting intensive monocultures. Today, they can produce a liter of extra virgin for €2–2.30. If the market price is €3, they stay within costs. If I sell at €3, I don't even cover maintenance costs."*

Beyond confirming the competitive disadvantage vis-à-vis more "modern" olive-farming sectors, this quote is relevant because it highlights a second important aspect: the central role of public intervention in enabling agrarian transformation. When farmers are already facing significant declines in the profitability of their agricultural activities, a transition toward more competitive (or any other) production systems becomes possible only if the state—or someone else—absorbs the temporary income gap associated with the restructuring phase.

This economy notably changed, quite abruptly, between 2022 and 2024, when olive oil prices rose dramatically (The Economist 2023). During these years, the wholesale price of extra-virgin olive oil in Apulia reached 9€ per liter, compared with roughly 4€ per liter just a few years earlier (International Olive Council 2025). As prices increased, the socio-ecological conditions surrounding olive cultivation began to change. Traveling across the region, one could witness renewed attention to olive farming: farmers returned to previously neglected orchards, pruning intensified, olives were harvested again, and, in some cases, groves even became targets of robbery during the harvest season (Coldiretti Puglia 2024). This is a reminder that, when economic conditions allow, olive farming can still be a profitable activity capable of attracting attention and incentivizing active management.

The main takeaway from this section is that by the late 2000s, olive farming in Apulia was already under severe structural pressure. Profit margins narrowed, global competition intensified, labor became increasingly scarce due to rural outmigration and demographic aging, and policy reforms reshaped incentives in ways that often favored disengagement over active cultivation. The landscape continued to display centuries-old groves—a morphology embodying the material traces of a once prosperous agrarian past (cf. Mathews 2022)—yet the economic forces that had sustained such long-term developments were steadily eroding. As environmental historian Stuart McCook reminds us in his account of the coffee leaf rust, a fungal disease that spread from Asia to the Americas, "the fungus did not devastate coffee farms; the combination of disease and low coffee prices did" (2019:12). Likewise, *X. fastidiosa* did not enter a thriving and expanding sector. When first detected in 2013, it landed in a farming sector already weakened by decades of declining economic returns and a broader transformation of the rural world.

5.4.2 *Xylella fastidiosa* and the Olive Quick Decline Syndrome

> *"The problem is not Xylella, this is just the cherry on the cake [...] They have decided to kill an entire sector slowly, not with Xylella. It was already dead, it was already dying. Then the coup de grace arrived. [...] In agriculture, nobody helps you, and there is no economic gain"* (a farmer, from interviews)

The epigraph opening this section—taken from the interview with a farmer who had recently sold their olive mill after the desiccation of most trees across their 40-hectare orchard—captures a widespread perception that the bacterium did not create the crisis so much as intensify an already critical situation for many. Similar frustrations were frequently voiced at the public meetings I attended during fieldwork and can be summarized as follows: *"How can we fight against Xylella if we do not have enough to make a living?"* This frustration exemplifies a central argument developed throughout this paper: while *X. fastidiosa* is a biological threat with serious consequences for plant health, its impact was even more disruptive as it affected a sector already marked by deep structural fragilities.

From a plant pathology and epidemiological perspective, *X. fastidiosa* is a xylem-limited bacterium that colonizes plant vascular tissues, forming biofilms that obstruct the transport of water and nutrients (Chatterjee et al., 2008). First detected in Apulia in 2013 (Saponari et al., 2013), it was soon associated with Olive Quick Decline Syndrome (OQDS) (Saponari et al., 2017). The pathogen likely arrived through the movement of infected plant material—most plausibly an ornamental coffee plant imported from Central America (Sicard et al., 2021). Subsequent entomological research has shown that the disease is transmitted by insect vectors, most notably the spittlebugs *Philaenus spumarius* (Hemiptera: Aphrophoridae) and, to a lesser extent, *Neophilaenus campestris* (Hemiptera: Aphrophoridae) (Cornara et al., 2017; Cornara et al., 2019), whose life cycle begins on herbaceous vegetation in early spring before moving to trees in early summer (Cornara et al., 2018). Following its detection, the European Union declared a phytosanitary emergency and introduced containment measures to eradicate the pathogen from Apulian territory (European Commission, 2015). These measures included: the removal of infected trees; the control of insect vectors through weeding or plowing to suppress nymphal stages; insecticidal treatments targeting adults; and surveillance protocols intended to prevent further spread (EFSA, 2015). As already mentioned, these containment policies quickly became controversial among farmers and local communities, opening intense debates over how the epidemic should be managed.

As more extensively argued elsewhere (Gatti & Ludwig, 2026), part of the conflict stems from a fundamental disagreement over what olive trees are—and therefore what it means to "save" them. On the one hand, olive trees are understood as productive crops, valued as economic assets and "defended" for their role in generating income. When this is the case, interventions aim to safeguard olive farming as an economic sector rather than to preserve individual trees valued for

their intrinsic or non-instrumental qualities. On the other hand, the olive tree serves as a companion species, a living entity valued for its cultural, historical, and emotional significance within regional landscapes and household identities. In this case, the tree is valued *in itself*, only partially tied to its productive function. In between, a third approach focuses on the olive tree as a landscape element that contributes to the aesthetic and symbolic character of the countryside and indirectly sustains other economic activities such as agro-tourism and rural leisure. In each of these cases, different solutions have been proposed to "save" the olive tree. In what follows, I present the practices linked to each of them, along with the policies that have supported (or not) their implementation.

5.5 How to save the olive trees? Practices and policies of disease management

5.5.1 Restructuring for competitiveness: resistant varieties and high-density plantations

The dominant institutionally supported pathway for "saving" olive farming in Apulia—rather than individual olive trees—is based on restructuring the productive system by replanting with *X. fastidiosa*-tolerant cultivars and adopting high-density plantations. Rather than attempting to preserve the existing orchard structure, this strategy treats the epidemic as an opportunity to modernize a sector widely perceived as economically fragile. This orientation is closely aligned with the position of several farmers' organizations (*organizzazioni di categoria*), whose main concern seems to be less the preservation of existing landscapes than the safeguarding of olive farming *as an economically viable activity*. Since the onset of the epidemic, regional subsidy schemes have therefore consistently targeted farmers willing to replant so-called "resistant" cultivars in place of older autochthonous varieties—incidentally, those most susceptible to the disease (EFSA, 2016).

In the last decade, plant pathology research has identified several cultivars—most notably *Leccino* and *FS-17* (also called *Favolosa*), and, more recently, *Lecciana* and *Leccio del Corno*—that show a degree of tolerance to *X. fastidiosa* (Camposeo et al., 2022; Frangipane et al., 2025). These cultivars can still host the bacterium, but due to a combination of morphological and genetic traits, they tend to maintain a lower bacterial load and display milder or no symptom expression compared to the local varieties *Ogliarola Salentina* and *Cellina di Nardò* (Surano et al., 2022; Montilon et

al., 2023), which dominate the traditional Apulian landscape and have been severely affected by the disease.

From a productivity perspective, however, these cultivars are also appealing for other reasons. Traditional Apulian varieties such as *Ogliarola Salentina* and *Cellina di Nardò* are typically found in what farmers refer to as traditional planting systems, where trees are spaced roughly 10–15 meters apart (Fig. 5.3). These groves, historically, formed part of multifunctional farms in which olive cultivation was always taking place in combination with other activities—for instance, sheep grazing between the trees, or other crops cultivation in the inter-rows. Trees in these systems also tend to be larger and more widely spaced, partly reflecting historical production practices associated with the manufacture of *olio lampante* (Ipsen, 2020). By contrast, the cultivars currently promoted for replanting are more suitable—and sometimes explicitly bred for—"modern" plantation models based on (1) higher planting densities and (2) greater degrees of mechanization (Camposeo et al., 2022). These include medium-density systems (*uliveto semi-intensivo*) and high-density systems (*intensivo* or *superintensivo*). Compared to traditional groves, these plantations are characterized by much shorter spacing between trees—around 5–6 meters in intensive systems and as little as 1.5 × 4 meters in the most dense super-intensive configurations—and a far higher number of trees per hectare, ranging from roughly 300–400 trees/ha in semi-intensive systems to over 1,500 trees/ha in super-intensive ones (Rallo et al., 2013) (see Fig. 5.4 for a recently planted super high-density plantation in Salento).



Figure 5.3. A traditional olive orchard characterized by widely spaced, centuries-old trees, in the municipality of Ostuni (March 2026). Photo by the author.



Figure 5.4. A newly established super-intensive olive plantation in the municipality of Melendugno (November 2023). Photo by the author.

These plantation models are specifically designed to maximize productivity by facilitating mechanical harvesting, speeding management operations, and reducing labor costs, thus making olive production more compatible with the competitive pressures of contemporary olive oil markets (Freixa et al., 2010). A super-intensive plantation, for instance, can yield up to 18 tons of olives per hectare, compared to roughly 3–4 tons in semi-intensive or traditional systems. Setting aside the (significant) initial investments required for planting and machinery acquisition, these systems enable much faster, cheaper management operations. As one large-scale farmer explained during an interview: *"I can prune three hectares of superintensivo in about three hours. Normally, it would take between five and seven days with a team of four workers."* Harvesting operations are similarly accelerated through the use of specialized machinery that collects olives in a manner comparable to vineyard harvesting, most notably through over-the-row harvesters (*macchine scavallatrici*) (Fig. 5.5).



Figure 5.5. Over-the-row olive harvester in a super-intensive plantation system. Source: iStock.com/liorpt (purchased under Standard License)

Higher mechanization also helps address a second problem commonly encountered when talking to farmers in Apulia: the structural shortage of agricultural labor. In rural and critical agrarian studies, this is typically explained by the

difficulties in generational renewal, commonly referred to as the "generational problem" in agriculture (White, 2012). What matters, for the purposes of this paper, is that *superintensivo* plantations are usually advocated as, among other things, a pragmatic response to these labor constraints, allowing production to continue while reducing dependence on an increasingly scarce labor force.

While intensive and super-intensive plantations solve certain economic and organizational problems, they also introduce new vulnerabilities. First among them is water: high-density systems require constant, reliable irrigation to deliver the yields they promise, which in turn would justify the initial financial investment. However, Apulia is a region characterized by limited water availability, and, coupled with increasing desertification (Ladisa et al., 2010), this makes water a scarce and highly valued resource. Yet these systems are often advertised and framed as "more efficient" in terms of water use. As a result, they frequently go hand in hand with discourses of precision agriculture, smart irrigation, and broader narratives of technological innovation, which aim to promote these systems as compatible with the region's ecological constraints.

In February 2025, for instance, I attended a gathering in Torre Santa Susanna—a small town in the province of Taranto—where representatives from a diverse range of agribusiness actors met to discuss "New perspectives for olive growing in Salento". The event aimed to promote the latest technological developments to farmers that enable "competitive and mechanized olive farming" and to update them on the incentives available for replanting intensive and super-intensive olive groves. Speakers included representatives from plant-breeding companies (among them the Spanish multinational Agromillora), machinery suppliers, smart farming solution providers, and a legal office specializing in subsidy schemes. The title of the opening presentation was clear: "*Opportunities* for olive grove regeneration in Salento" (emphasis mine). In this sense, the response to the epidemic—and the replanting programs associated with it—appears not only as a strategy for agricultural recovery, but also as a significant business opportunity for companies involved in plant breeding, agricultural machinery, and smart farming technologies aimed at promoting a "modern" transformation of the sector.

As already mentioned, these systems are often described as "more sustainable from an economic and environmental perspective", or as requiring "much lower amounts of water than traditional plantations". This is typically justified by citing the lower water requirement per tree—rather than per hectare—and the fact that these cultivars are specifically bred for high-density plantation systems. Yet

concerns about water availability keep emerging in public debate and pose a clear constraint on the spread of such plantation models, particularly in a region historically characterized by water scarcity. Giacomo Laterza, a former manager of Pieralisi, one of the world's leading manufacturers of olive oil machinery, articulated these concerns bluntly during an interview:

> *"The biggest bullshit is to say that in Apulia you have to go super-intensive. Let's talk again in ten years. How do you think you can water them? We already take drinking water from the Sele! In a super-intensive plantation, if you stop watering, everything dies within two months. I don't mean that they suffer—everything literally dries out. I've seen eight-year-old trees die just because the dripline was off by half a meter. Olive trees are not made to grow one meter apart."*

He concluded simply: *"It's madness. We don't have water."* Similar concerns are beginning to emerge in Spain, where super-intensive olive systems were adopted earlier and on a larger scale. Recent studies increasingly question the long-term environmental sustainability of plantation models that may prove highly profitable in the short term but remain heavily dependent on water, external inputs, and technological infrastructure (Barberá & Castillo, 2026).

Importantly, this "modernization" pathway has been actively supported by regional policy instruments. During the early stages of the epidemic, for instance, the regional government offered grants covering up to 50% of replanting costs to farmers willing to establish new plantations. Yet access to the remaining capital often depended on financial institutions. As one farmer explained during an interview: *"If I go to the bank and ask for a loan for the remaining 50%, they only grant it if I show that I am replanting an intensive or super-intensive system."* In practice, intensive plantation models are considered the only "economically sustainable" configurations capable of supporting the business plans required by both subsidy schemes and bank financing. The recovery of the sector is therefore closely tied to a broader process of agrarian restructuring, in which the olive tree is reconfigured less as a monumental element of the landscape than as a productive unit within highly mechanized orchards designed for competitive and globalized olive oil markets.

In sum, the paradigm underpinning the replanting of so-called resistant cultivars—bringing together agronomists, plant scientists, agribusiness actors, and

financial institutions—rests on a productivist vision that seeks to preserve olive farming as an economically viable sector in the midst of a deep agrarian crisis, rather than to conserve individual olive trees valued for their landscape or cultural heritage.

5.5.2 Reshaping for preservation: grafting and the defense of monumental olive trees

When trees are valued for their aesthetic and symbolic qualities rather than for their productive role, especially centuries-old specimens whose monumental trunks and sculptural shapes have become iconic features of the region's countryside (see again Fig. 5.3), efforts to "save" olive trees are directed less toward restoring their productive capacity than toward preserving their appearance and "landscape presence". The practice that has gained most traction in this regard, and which has received modest but non-negligible support from regional policies, is "early grafting".

Grafting consists of inserting a branch of one variety into the trunk of another, with the aim of replacing the entire upper vegetation of the original tree with a new genetic component (Fig. 5.6). One way to visualize the process is through an analogy with an organ transplant: a functioning liver inserted into a body whose own liver is failing. In the context of the *X. fastidiosa* epidemic in Apulia, grafting operates in a similar way. The intervention transforms a centuries-old tree of a susceptible variety into a "new" tree that retains the original specimen's monumental trunk while supporting the canopy of a tolerant cultivar. However, as the notion of "early grafting" suggests, this intervention must be performed preventively—before the bacterium colonizes the new tissue. In this sense, the analogy with organ transplantation is only partial: rather than replacing a failing organ with a functioning one, the graft introduces a cultivar whose physiology allows it to resist (better, tolerate) an infection that would otherwise be much more damaging to the original variety.



Figure 5.6. Grafted olive tree showing scion insertion onto a mature trunk. Ostuni municipality (March 2025). Photo by the author.

Nevertheless, grafting in Apulia often seems to be carried out in imprecise, approximate ways, particularly when commissioned by owners who have little awareness of the delicacy these interventions entail. Lorenzo Longo, a grafter from Monopoli who has become widely sought after for this kind of work, in light of his experience with grafting "since he was eight years old", made this clear during a grafting course organized in March and April 2025 by the association *Save the Olives*, a philanthropic organization committed to the safeguard of monumental olive trees and sponsored by a variety of actors and wealthy individuals with an outspoken passion for centuries old olive trees of Apulia:

> *"There are some areas where you should not graft anymore. The area from which I receive the highest number of requests is San Vito dei Normanni, Carovigno, and Serranova, but there it is already too late—grafting must be carried out before the epidemic arrives."*

Lorenzo is more similar to a surgeon than to a nurse. The way he speaks of the physiology of the olive tree, and he warns about all the little details grafting entails, is fascinating: he transmits self-confidence and competency that at times exceeds that of "professional agronomists". He confirms that *"grafting is a preventive act, not a cure"*, and stresses that *"grafting is, in every respect, a surgical operation"* that requires *"patience, precision, and care for the details"*. To illustrate the precision involved, he contrasted grafting with pruning—a far more common agricultural practice:

> *"Grafting is not pruning. You have to do it once, and you have to do it right. If you get pruning wrong, two years later, you might not even notice. If grafting doesn't work, the tree might even die."*

As he explained during the course, demand for grafting interventions has increased dramatically in recent years, yet the number of skilled grafters remains extremely limited. *"Demand consistently exceeds supply"*, he remarked, noting that it is increasingly difficult to find younger workers willing to learn the craft and accompany him in the field as apprentices. Simultaneously, Longo nuanced the more optimistic narratives surrounding grafting as a universal solution to the crisis. While he acknowledged the effectiveness of the technique when applied correctly, he emphasized the practical limits of scaling it across a territory containing millions of olive trees:

> *"Grafting works. It must be done carefully and before the plant gets infected. But I can assure you that out of 100 plants that I will graft, in at least 99 of them, the graft successfully takes. This is, however, in principle. In reality, it is practically impossible to graft all the monumental olive trees in the territory. Because it's costly and because there are not enough people who are able to do so".*

Grafting is also, as this quote hints at, a costly intervention. The operation costs €250 per tree in the year it is performed, plus an additional €100–150 per year for follow-up care in subsequent seasons. As with every major surgical procedure, grafting requires careful post-operative management to ensure the intervention is successful. Newly emerging shoots are particularly fragile and vulnerable to insect attacks or adverse weather conditions. Moreover, because grafting involves removing most, if not all, of the secondary branches of the tree, the plant reacts to this physiological shock by producing numerous new shoots over the following two or three years. These shoots must be regularly removed so that nutrients are channeled toward the grafted branches that will eventually restore the tree's productive canopy. What is often presented as a one-off intervention, thus, becomes a multi-year commitment to intensive care.

In addition to being both costly and technically delicate, grafting causes trees to undergo a prolonged non-productive phase. After the intervention, olive trees typically require four to five years before they resume significant production. During this period, they generate no income, making grafting difficult to reconcile with the immediate livelihood needs of most farmers. As one olive grower explained to me during an educational grafting session in the field:

"This is a way to preserve the monumental olive trees, yes—but it's a palliative. It's something that could make sense to preserve the most ancient trees, but after such an intervention, I have to wait four or five years before the tree becomes productive again. And in the meantime, how do I make a living?"

The constraints illustrated so far raise an important question: who is actually carrying out grafting interventions? Lorenzo himself offered a clear answer immediately after cautioning against overly optimistic expectations about the technique:

"Who is saving the trees today? Those who have an interest in preserving their ornamental value—those who own a masseria (a traditional Apulian fortified farm complex), or who run a tourism or hospitality business."

Early grafting, in fact, has been most actively promoted and implemented by a relatively small group of landowners, associations, and philanthropic actors committed to landscape preservation rather than farming as a livelihood. Chief among them is the above-mentioned association *Save the Olives*, which has played a central role in financing and coordinating grafting interventions on monumental trees. Through private donations and targeted fundraising campaigns, the association has supported grafting projects that would otherwise be economically unfeasible for most individual farmers. In this sense, grafting depends less on rural economies than on external resources mobilized in the name of heritage conservation.

Grafting received some support from the regional government, although to a lesser extent than replanting programs. In 2025, farmers were eligible for a subsidy of approximately €140 per grafted tree (Regione Puglia, 2021). Yet because early grafting relies on the same tolerant cultivars used in replanting, its proponents have often aligned themselves with supporters of the broader "tolerant varieties" transition. The association *Save the Olives* itself has actively invested in research on resistant cultivars in collaboration with scientists from the National Research Council (CNR) in Bari and has consistently defended the importance of scientific research in addressing the epidemic (Gatti & Ludwig, 2026).

This reliance on philanthropy highlights a key limitation of grafting as a broader response to olive decline. While public subsidies exist, they typically cover only part of the initial costs and do not compensate for lost income during the recovery period. As a result, grafting remains accessible primarily to actors who can absorb economic losses, who are motivated by non-productive valuations, and who can rely on non-agricultural incomes. The technique thus reinforces a distinction between trees preserved as landscape elements and trees maintained as productive assets, effectively separating conservation from livelihood-making.

Overall, grafting represents a compromise between full agricultural recovery and the preservation of biocultural landscapes. It allows the monumental bodies of centuries-old trees to remain standing while gradually altering their biology in order to cope with the disease. Yet this pathway remains constrained by high costs, technical complexity, and reliance on actors motivated more by biocultural heritage valuation than by agricultural livelihoods. As a result, grafting cannot easily scale to the millions of olive trees affected across Apulia. Alongside replanting and grafting, however, a third set of responses has also emerged that neither seeks to replace trees through new plantations nor to transform them through early grafting. Instead, these approaches focus on sustaining existing trees through intensified care and

management practices aimed at living-with the pathogen rather than fully eradicating it.

5.5.3 Re-caring for conservation: coexistence protocols and practices of living-with

A third, and final, ideal-type pathway for "saving the olive trees" in Apulia rejects both large-scale restructuring through cultivar substitution and plantation restructuring, and the selective preservation (of one specific type of olive tree) embodied in grafting. Instead, it seeks to live with the pathogen through intensified care and management.

Over the past decade, in fact, a proliferation of "coexistence protocols" has emerged, ranging from the application of specific micronutrient-based products to the revival of what are often described as the "good agronomic practices" (*le buone pratiche agronomiche*)—namely traditional practices of attentive pruning, ploughing, and soil management—abandoned after decades of rural outmigration, mechanization, and heavy reliance on herbicides and pesticides. Rather than eradicating infected trees or replacing them with tolerant cultivars, these approaches attempt to improve tree health to sustain the natural response to disease and reduce symptom expression, with limited, though not negligible, attention to actual levels of olive productivity within existing orchards.

Coexistence protocols encompass a wide range of treatments to support tree vitality. Among the most widely discussed is *Dentamet*, one of the first products claimed to be effective against the bacterium (Scortichini et al., 2018). *Dentamet* is essentially a foliar fertilizer composed of copper, zinc, and citric acid, applied through spraying, and is commercially available. Other products circulating in these networks include *Nuovolivo*, a soap-based extract once criticized for lacking scientific grounding but later receiving limited experimental support (Bruno et al., 2021), and *NutrixGold*, a proprietary formulation typically applied via foliar spraying, along with granular zeolite in the soil and micronized zeolite on leaves. Some farmers have also tried microbial complexes, especially mycorrhizal fungi, though without noticeable effects. Although scientific validation of these treatments remains limited or wholly absent, many practitioners report partial improvements, particularly in the form of higher resprouting rates compared with the development of new symptoms.

In April 2024, I visited one such orchard with Emanuela Sardella, an agronomist at the company NutrixGold. The farmer using the product reported being satisfied with the results, and his trees did indeed appear noticeably greener than those in neighboring plots. Yet olive cultivation was not his primary source of income: he worked as a truck driver and maintained the orchard alongside other activities. According to company representatives, many clients are relatively affluent foreign residents who own olive groves in the region. More broadly, these actors belong to a category of landowners who do not depend on farming for their livelihoods but nonetheless cultivate olive trees out of personal interest, lifestyle preferences, or the desire to produce olive oil for household consumption.

Even if most coexistence protocols do show a certain degree of efficacy in keeping infections under check, they still require a non-negligible investment. This has represented a main limitation in their consistent and sustained application. As Dell'Abate (2025) observes, in Salento, *"taking care* (la cura) *of old, diseased trees was the characteristic response during the early phase of the epidemic, but was progressively abandoned as the costs associated with this option became unsustainable—particularly in the absence of concrete results. Those who have persisted in treating the trees generally rely on income sources outside olive cultivation [...] and have done so because they do not find the development model advanced by institutional actors compelling"* (p. 102, *my translation*).

Beyond the cost of purchasing the product, a second bottleneck is the need for someone to apply it regularly. Proponents often argue that these treatments *"are not so expensive,"* especially when compared with grafting, with combined product and labor costs commonly estimated at around €9–12 per tree per year. Yet this tends to understate the difficulty of ensuring application every two months (or less). Moreover, these costs must also be read against the broader crisis of olive farming, where profit margins have been declining for decades. Traditionally, many Apulian groves were managed with limited external inputs, relying mainly on pruning, weed management, and manual harvesting. Compared with these relatively low-cost operations, regular commercial treatments create a new dependency on purchased inputs and raise production costs.

Another initiative that briefly attracted attention in the region—and that, in some ways, combined elements of both landscape preservation and coexistence paradigms—was that of INVAIO. The company appeared in Apulia around 2021, promoting what was presented as a more effective method for applying the already-mentioned product Dentamet. Rather than using foliar spraying, INVAIO proposed

delivering the treatment via endotherapy, a technique that involves inserting a small needle into the tree's bark to inject the substance directly into the vascular system, thereby distributing it more efficiently throughout the plant (Fig. 5.7).



Figure 5.7. INVAIO endotherapy system installed on an olive tree, used for targeted treatment of X. fastidiosa (November, 2022). Photo by the author.

What made the system attractive to some orchard owners was its apparent practicality. The company would handle installing the injection devices and managing the periodic replacement of the treatment containers. Compared with foliar spraying—which requires a tractor, specialized equipment, and an operator—this intervention promised to be faster, easier to administer, and less costly than grafting. Despite these initial expectations and its apparent potential for scaling up, however, the system ultimately failed to deliver the results that had been promised. Within a relatively short time, confidence in the method declined, and the company withdrew from the local market.

Taken together, these examples illustrate how coexistence protocols seek to sustain olive trees not through agronomic restructuring or tree modification, but through practices of care that maintain the trees even in the presence of the pathogen. Yet their diffusion of such practices remains strongly constrained by economic

considerations. Unlike replanting with tolerant cultivars or grafting monumental trees, coexistence approaches have received little to no institutional support from regional policies and therefore depend largely on the willingness—and financial capacity—of individual landowners to absorb the additional costs of treatments and labor. As a result, these practices are primarily adopted by actors whose livelihoods do not depend directly on olive production, such as hobby farmers, part-time landowners, or residents motivated by environmental or landscape values. This uneven distribution highlights a broader tension running through the responses to the epidemic: while coexistence protocols foreground more-than-human relations of care, the conditions required to sustain such practices remain unevenly distributed.

5.6 Discussion and conclusion

"The problem with olive farming is only one: there is no profit"
(a farmer, from interviews)

The crisis triggered by the bacterium *X. fastidiosa* in Apulia is not only a dispute over how to manage a plant pathogen, but also a struggle over which olive futures could (or rather should) be materially sustained. The three pathways analyzed above—replanting with tolerant cultivars in intensive systems, grafting monumental trees, and maintaining orchards through coexistence protocols—go hand-in-hand with different ways of valuing what an olive tree is, but also, importantly, different ways of organizing labor, capital, and socio-ecological relations around them, as well as imagining the future of agricultural landscapes in Apulia. Read in this way, the responses to the Olive Quick Decline Syndrome in Apulia are not just technical interventions to a phytosanitary threat, but also a terrain of agrarian politics in its own right.

At the heart of these dynamics lies a tension between saving olive farming and saving olive trees. While the former depends on sustaining an economic sector that, to some extent, relies on exploiting olive trees for profit, the latter involves valuing trees as biocultural heritage whose significance extends beyond their economic role. I conceptualize this tension as a conservation dilemma: the difficulty of sustaining, at the same time and with the same instruments, both economically viable olive production and the preservation of olive trees as biocultural landscape elements. Policies that prioritize the former tend to favor the restructuring of olive cultivation into intensive, mechanized systems, thereby transforming or replacing existing landscapes. Approaches centered on the latter, by contrast, rely on labor-intensive

care practices that are economically fragile, unevenly distributed, and often dependent on external income support or non-market forms of valuation. The dilemma, then, is not simply one of competing values, but of materially divergent socio-ecological futures.

If global markets remain the primary mechanism through which olive farming must sustain itself, the empirical sections above suggest that they provide limited support for maintaining traditional olive landscapes. Centuries-old olive trees require time-consuming—and therefore costly—management practices that increasingly clash with declining profit margins in olive production. Under these conditions, the only economically viable strategy indeed appears to be the modernization of olive farming through mechanization and the restructuring of orchards into intensive or super-intensive plantation systems. Mechanization reduces labor costs, increases productivity, and improves harvesting efficiency, but it also requires reshaping both the plantation and the individual tree in ways that are fundamentally incompatible with the morphology of traditional groves. If market dynamics remain the dominant organizing principle of the sector, centuries-old olive trees seem destined to survive only as remnants of a declining agrarian past rather than as living components of productive agricultural presents. At the same time, many discourses defending monumental olive trees tend to overlook the fact that these landscapes were themselves historically generated through a productive tension—one that has now largely disappeared.

Market forces may still indirectly sustain olive trees that no longer serve a primarily productive role. When monumental trees function as aesthetic and symbolic assets within tourism-oriented landscapes, landowners may draw on income generated outside agriculture to finance costly interventions such as early grafting. In practice, however, this means that such preservation strategies are largely accessible only to a relatively small group of affluent landowners whose livelihoods do not depend directly on olive farming. Despite critical tourism studies (Bianchi, 2009; Gibson, 2021) showing that, in the countryside, tourism can act as either a constructive force—for example by generating additional income or supporting diversification and multifunctionality of farms (Gascón & Cañada, 2025)—or a destructive one—for instance through processes of rural gentrification (Gascón & Cañada, 2016), de-peasantization (Gascón & Milano, 2018) or increased pressure on already scarce resources, such as water—further research is needed to assess how these counteracting dynamics are playing out in contemporary olive landscapes transformations in Apulia.

A third possibility involves imagining institutional arrangements that support practices of care beyond capitalist market logics. Rather than relying solely on the profitability of olive production, such approaches would recognize both farmers' role in maintaining biocultural landscapes and sustaining relations between human and non-human life (thus moving beyond nature-culture dualisms), while also problematizing capitalist markets as drivers of conservation in biocultural agricultural landscapes. As critical agrarian studies scholars have long argued, in fact, (capitalist) markets tend to favor those forms of food production that reduce labor costs, simplify landscapes, and reinforce rural differentiation, often via technological squeezes (van der Ploeg, 2018b). A redistributive mechanism capable of partially freeing farmers from these pressures seems, therefore, a central element, if less productivist and more care-centered rural futures are to remain materially possible.

It is here that the convivial conservation framework becomes useful. Rather than imagining olive groves primarily as heritage sites or proposing protected landscape parks—options currently debated in Apulia—a convivial conservation framework would recognize the multispecies human–nonhuman collaborations that have historically shaped Apulian landscapes and support farmers through redistributive mechanisms such as a conservation basic income. In other words, public intervention should support farmers not only as agricultural producers, but also as landscape stewards. By providing a stable income less dependent on market dynamics, a conservation basic income could enable labor-intensive "practices of care" to continue without being subordinated to volatile olive prices, competition in global markets, or rural tourism initiatives. Crucially, this would also reduce the risk that such practices become the exclusive domain of affluent landowners, thereby counteracting what we might call a "class differentiation of care". By this I mean the process by which labor-intensive practices of ecological stewardship become concentrated among those with the material capacity to absorb their costs – affluent landowners, hobby farmers, or actors with extra-agricultural income – while becoming inaccessible to those who depend directly on olive production for their livelihoods.

The Apulian case helps bring political ecology of conservation into closer dialogue with critical agrarian studies and political agroecology. As already mentioned, conservation scholarship has often focused on protected areas, charismatic species, and the exclusionary or market-based mechanisms through which nature is governed. Yet the case of olive tree decline in Apulia shows that

entities deemed worthy of protection—or around which saviorist discourses are mobilized (Almeida, 2016)—may also be productive species deeply embedded in anthropogenic landscapes, whose present form is inseparable from centuries of human–nonhuman co-evolution (Gatti, 2026). Within such biocultural landscapes, analyzing how to "save the olive trees" cannot be separated from paying attention to and sustaining those who make their continued existence possible in the first place: olive farmers. If some strands of new conservation argue that conservation must engage more seriously with questions of livelihood and human development (Kareiva & Marvier, 2007), the Apulian case pushes this point further: in productive agrarian landscapes, farmers should be seen not as simply beneficiaries of protection from the side effects of conservation, but as constitutive participants in the socio-ecological relations through which that same nature is continuously reproduced.

At the same time, the case also raises an important challenge for agroecological scholarship. In Apulia, proponents of coexistence protocols often invoke "agroecology" or "regenerative agriculture" as guiding principles for environmentally friendly olive management. Yet in the absence of strong public support, these practices remain largely confined to niche spaces occupied by relatively affluent actors, landowners with extra-agrarian income, or farmers motivated primarily by ethical, aesthetic, or affective commitments rather than by the need to make a living from olive production. This suggests that agroecology cannot be approached simply as a set of better farming practices or ecological design principles. It must also engage more directly with political economy, class differentiation, and the institutional conditions that determine who can actually afford to practice care-intensive agriculture. Without such attention, agroecological alternatives risk remaining socially selective, rather than constituting viable pathways for wider agrarian transformation.

Ultimately, the Apulian olive crisis reveals that saving olive trees is not only about "just" the trees. It is about the co-constituted agrarian worlds within which trees are embedded, the kinds of labor that are recognized or ignored, and the political choices through which some socio-ecological relations are made durable, while others are allowed to disappear. The fate of olive trees in Apulia will therefore depend less on identifying a single correct technical response to *X. fastidiosa* than on deciding which agricultural futures, and which infrastructures of care, are worth collectively sustaining.

6

Chapter 6



General Discussion and Conclusions

This dissertation developed a multidimensional account to analyze the controversy surrounding the management of the Olive Quick Decline Syndrome (OQDS) in Apulia and to explain why the conflict in the region occurred with such intensity following the detection of *X. fastidiosa* in 2013. Each empirical chapter foregrounds a distinct dimension of the conflict, with the aim of complicating dominant accounts of the epidemic and advancing a more accurate (and therefore useful) understanding of the politics of plant disease in Apulia. This final chapter brings those elements back together. I begin by summarizing and discussing the main findings presented through Chapters 2 to 5. I then move to a broader theoretical synthesis that goes beyond the specific case study and develops an integrated framework for the study of socio-environmental conflicts (section 6.2). As is often the case with ethnographically and historically situated research, the moment when results are written down and presented typically distances itself—sometimes a bit, sometimes a lot—from the moment when things *happen* on the ground. This thesis is no exception. From the moment I sat down to give coherent and meaningful shape to my empirical material, particularly from the early months of 2025 onward, new developments have continued to unfold in Apulia. For this reason, Section 6.3 provides a brief update on "where we are" (cf. Saponari, 2019) regarding the spread of *X. fastidiosa* and the current "socio-ecological" manifestation of the disease in the region. Section 6.4 then reflects on some practical implications of the thesis, especially for plant health governance, science policy and practice, and environmental decision-making. Section 6.5 discusses the study's limitations, and Section 6.6 outlines possible directions for future research. Finally, Section 6.7 offers concluding remarks and proposes three interrelated moves for thinking about how Apulian olive trees might still be saved in light of the findings presented throughout this dissertation.

6.1 Summary of the research findings

The contribution of this thesis can be read at two different, complementary levels. On the one hand, it presents a case-specific analysis of the conflict surrounding OQDS in Apulia, and contributes to the growing body of social science research on *X. fastidiosa* in southern Italy and beyond. On the other hand, it uses this case as a point of departure to develop a broader analytical framework for understanding socio-environmental conflicts as "multidimensional" political problems. In this

section, I focus primarily on the first level: the thesis's contribution to the framing and understanding of the Apulian phytosanitary emergency and the related conflict in their own right. The more general theoretical ambition is addressed in Section 6.2.

About the specific case, this thesis complicates dominant accounts of the *X. fastidiosa* epidemic in Apulia in four main ways.

First, the disease has often been framed as an essentially technical problem where an invasive species—the bacterium *X. fastidiosa* subsp. *pauca*—entered the Apulian territory and caused the decline of olive trees as a result of its biological characteristics and extremely high pathogenicity. This dissertation adopts instead a topological understanding of disease (Hinchcliffe et al., 2016), in which pathogenicity is not an intrinsic property of an organism but emerges from the relations it establishes with its environment, including the other beings with which it interacts. Chapter 2 therefore shows that while biological and phytopathological explanations are certainly part of the story, they are insufficient in their own to fully account for the epidemic. Other factors played a decisive role. Drawing on the concept of "Anthropocene detonators" (Tsing et al., 2021), I adapt this notion to the context of plant disease and propose the concept of "plant disease detonators": specific historical-material conjunctures that progressively "built momentum" toward the outbreak, until socio-ecological conditions reached what ecologists would call a "tipping point" (Lenton, 2013; Dakos et al., 2019). In this sense, the epidemic did not begin with the bacterium's intrusion into Apulia; rather, its onset must be located earlier, alongside processes of agrarian change and rural abandonment that caused monocultural plantations—already weak ecological systems—to collapse under biological pressure.

Second, the controversy is often presented as a clash between scientists and policymakers proposing evidence-based solutions, and opponents driven by conspiracy thinking and anti-scientific attitudes. Chapter 3 demonstrates that this binary is analytically inadequate. Rather than a confrontation between "science" and "anti-science," the conflict involves multiple, interacting layers of knowledge politics that cut across heterogeneous social groups. As shown in that chapter, what has been contested in Apulia is not Science "with capital letter"—an abstract ideal rooted in the (positivist) values of objectivity and neutrality—but a specific configuration of scientific practices that came to dominate the research landscape. The controversy, thus, cannot be reduced to a divide between scientists and science antagonists; it also encompasses disagreements among scientists and among farmers. Recognizing these internal tensions allows one to move beyond representations of

science as a homogeneous, bulk object and instead foreground its inherent plurality. If a "community" is understood as a social group sharing common questions and concerns, then the Apulian case reveals not one scientific community but a multiplicity of communities engaged in ongoing struggles for epistemic authority across disciplinary and institutional domains. This interpretation resonates with longstanding insights in the sociology and philosophy of science. From *The Structure of Scientific Revolutions* by Thomas Kuhn (1962) to the broader field of Science and Technology Studies (for an overview, see Jasanoff et al., 2001; Sismondo, 2011), social studies of science have long emphasized that scientific development proceeds through competition, negotiation, and contestation. Feminist science studies have further shown that knowledge is always situated, shaped by the standpoint from which it is produced (Haraway, 2013; Harding, 2013). In line with these perspectives, the thesis advances an understanding of phytopathological research on OQDS in Apulia as a deeply social enterprise shaped by institutional dynamics, disciplinary boundaries, and contingent processes of knowledge production (see also Longino, 2020b).

Third, debates over disease management have largely assumed that the object of contention is a singular and unambiguous entity. Embodied ethnographic engagement, on the contrary, reveals that in Apulia what is "to be saved" is, in fact, multiple and only partially overlapping. As shown in Chapter 4, stakeholders often speak about different "things"—not only in terms of preferred interventions, but in what they understand the disease, the tree, or even farming to be. This ontological slippage complicates the establishment of shared grounds for communication, thereby intensifying polarizations. To be fair, this observation echoes a well-known critique of political ontology (see, for example, Nadasdy, 2021): if reality is multiple and these "multiple worlds" do not speak to one another, how is politics even possible? Chapter 4 addresses this tension by using Annemarie Mol's notion of ontological politics, which conceptualizes reality as "more than one but less than many" (Mol, 2002). This formulation allows for multiplicity without collapsing into incommensurability: different enactments of reality coexist, overlap, and sometimes conflict, yet remain sufficiently connected to sustain meaningful interaction and negotiations, a process that Mol herself calls "coordination". Along these same lines, the thesis does not endorse a fully relativist position in which "anything goes." Taking "refused knowledge" seriously (see Chapter 3) or embracing ontological pluralism (Chapter 4) does not mean treating all claims as equally valid; rather, it involves a methodological commitment to engage seriously with forms of

knowledge that may initially appear implausible, while maintaining "epistemic humility" (Mathews, 2006; Kidd, 2016; see also Parviainen et al., 2021) regarding the partial, provisional and situated character of all knowledge claims.

Fourth, discussions centered around "living with the pathogen", multispecies assemblages, more-than-human entanglements, relational ontologies, and so on, often sideline the economic and structural conditions that shape what forms of care, not to mention which ontologies, are feasible, under which circumstances, and for whom. Chapter 5 (and, to some extent, Chapter 2) therefore reintroduces political economy as a necessary—though not alone sufficient—analytical lens for understanding multispecies agrarian worlds. The chapter shows how different strategies for "saving the olive trees" are embedded in specific configurations of capital, policies, and uneven access to (economic) resources. It names the structural tension between saving olive farming as a productive economic sector and conserving individual, often monumental, trees as biocultural heritage as a conservation dilemma. It demonstrates that the capacity to hold tight to non-productive or loosely productive orchards is unevenly distributed and often concentrated among affluent landowners who are not dependent on farming for their livelihoods. This gives rise to what I term a "class differentiation of care," whereby the burden of adaptation falls disproportionately on farmers, exacerbating existing inequalities and contributing to further concentration of power within the agrarian system. Drawing on cognate debates in the political ecology of conservation (Büscher & Fletcher, 2020), in that chapter I propose a conservation basic income (CBI) as a policy mechanism to sustain an economically declining sector in virtue of its broader ecological and cultural value. This also extends conservation debates beyond "wild" nature to anthropogenic landscapes and productive agroecosystems.

At a more conceptual level, the empirical chapters also problematize the seemingly self-evident categories of "scientist" and "farmer." As already mentioned, the thesis treats science as a heterogeneous, internally diverse field rather than a homogeneous, abstract ideal. Scientific practice is a "human, all too human" (Nietzsche, 1979) activity, a situated and often messy process shaped by institutional dynamics, disciplinary boundaries, and struggles for authority within the scientific arena. As such, it is characterized by internal differentiation. A parallel argument applies to the category of the "farmer." Drawing on critical agrarian studies (Akram-Lodhi et al., 2021; Borras, 2023), the thesis rejects the notion that farmers constitute a unified social group or a "class in itself" (to use a famous expression of Marx). Instead, it highlights a spectrum of actors ranging from landless workers and

smallholders to large-scale producers, multinational agribusiness corporations, and real estate actors who treat land as a financial asset. This internal differentiation—a key concept in agrarian studies (see Van der Ploeg, 2018; Cousins, 2022)—implies divergent and often incompatible interests, values, and visions of farming.

Importantly, these categories should not be understood as fixed or mutually exclusive. In practice, the boundaries between "scientists" and "farmers," or between "farmers" and "non-farming landowners," are often porous. Many scientists I have met in Apulia during my fieldwork, for instance, also own olive groves inherited through family lineages, which they cultivate directly—much like my father did alongside his work as a schoolteacher (see the Introduction)—or lease out. Conversely, many smallholders engage in pluriactivity, combining farming with other forms of employment in higher-revenue sectors. Acknowledging this hybridity is essential to understanding the social fabric in which the *X. fastidiosa* controversy—and, more broadly, olive farming in Apulia—unfolds.

6.2 An overarching analytical framework: articulating the 4Ps

At a more general level, this thesis offers an entry point into a broader theoretical question: how should socio-environmental conflicts be approached when nonhuman entities are not merely material resources, knowledge is a key asset for exerting power, and ecological processes are not simply "political" but also grounded in the biological and material relations that sustain interactions between human and nonhuman worlds? The *X. fastidiosa* emergency in Apulia shows that such conflicts rarely coalesce around a single dimension. Rather, they emerge from overlapping tensions that entangle livelihoods, ecological and historical-material conditions, struggles over knowledge, authority, and expertise, and ontological claims about what entities, or beings, are at stake.

To account for this multidimensionality, this thesis proposes an overarching theoretical framework—hereafter termed the "4Ps"—that brings into focus the relations among political economy, political ecology, political epistemology, and political ontology. These four dimensions must be treated as analytically distinct yet empirically inseparable. They are not intended as a universal theory of socio-environmental conflict, nor as a rigid model to be applied mechanically across cases. Rather, they should serve as a heuristic device: a way of holding together different dimensions of politics that are often addressed in isolation or, alternatively, analyzed

with a clear order of priority. The 4Ps framework, therefore, calls for sustained attention to how relations of production and reproduction, ecological dynamics, knowledge practices, and ontological claims co-constitute the politics of environmental justice and shape the possibilities for its governance.

Political economy is and remains a foundational dimension of socio-environmental conflicts. It is indispensable for understanding not only "who wins and who loses" in environmental struggles but also the structural conditions that generate vulnerability in the first place. The Apulian case can certainly be illuminated by attention to ontological difference and more-than-human relationalities. Yet it cannot be explained by these alone. Olive trees—like mountains, rivers, forests, and other elements of the "natural environment"—may be kin, nonhuman companions, and elements of affective landscapes that exceed purely instrumental or economic logic. Yet they are also economic pillars of agrarian livelihoods. The morphology of the Apulian landscape, for example, is the result of historical economic processes linked to the production of export commodities; the shape of monumental olive trees emerged through a long mutualistic relationship between humans and plants oriented toward production; and the abandonment of the countryside that facilitated the spread of the epidemic is inseparable from market globalization and a structural crisis that pushed many olive farmers out of agriculture altogether (Chapter 2). Today, the push for modernization, competitiveness in global markets, productivity, and the replacement of increasingly scarce labor remains strongly influenced by the global political economy of olive production (Chapter 5). These dynamics are often overlooked in many accounts of "more-than-human care" (Ressiore et al., 2024) or "living with the pathogen" (Vacirca & Milazzo, 2021). At the same time, political economy does not "explain everything," nor does it exhaust its explanatory potential.

Political ecology forms a second, distinct yet closely related dimension. In the specific context of articulating the 4Ps, however, I want to stress that I do not use "political ecology" as a mere extension of Marxist political economy—or any other strand of social theory, from post-structuralism to constructivism to post-constructivism—to questions of natural resource exploitation or the governance of biological processes (or life itself) (Peet et al., 2010). Rather, I use it as the *politically attuned analysis of ecological processes* themselves (processes that are independent of politics): the complex, partially autonomous interaction of human and nonhuman biologies in the making of material worlds. In this sense, I align with critiques of political ecology that sometimes describe it as "politics without ecology" (Walker,

2005). If ecology without politics is (certainly) gardening, as the popular quote attributed to Brazilian environmental activist Chico Mendes suggests, politics without ecology risks reducing biological processes to passive backdrops for human struggles, rather than recognizing them as active, and at times uncontrollable, forces that condition the very terrain on which those struggles unfold.

From this thesis's perspective, the political ecology dimension of the 4Ps therefore concerns the ecological dynamics that shape ecosystems and landscapes, while also being constrained, enabled, and redirected by political choices and political-economic arrangements. In the case of *X. fastidiosa* in Apulia, it is valid to claim that the crisis is being instrumentalized by actors pursuing interests that extend beyond the preservation of olive landscapes, a reminder of what Naomi Klein has conceptualized as "shock economy" (2007). Yet the disease itself cannot be reduced to a purely political construct. It emerges from the relational interplay among a bacterium, olive trees, insect vectors, agronomic practices, environmental conditions, institutional interventions, and longer economic trajectories, which together produce a pathological situation. (More-than-)Human politics is thus constitutive of the disease, but not exhaustive of it. This is why, in Chapter 2, I call for closer collaboration between social and natural scientists—alongside the situated knowledges of farmers and other practitioners. While such calls are certainly not new, they remain essential for adequately understanding the (political) ecology of the Olive Quick Decline Syndrome.

Political epistemology, as the third dimension of the 4Ps, brings to the fore the role of knowledge in structuring environmental conflicts. Knowledge and power are always intertwined (Foucault, 1977; 1981): what counts as valid knowledge, who is recognized as an expert, and which forms of evidence are mobilized in decision-making processes are all deeply political questions. Decolonial and post-development scholarship, for example, has long argued that colonial and imperialist projects have historically relied on the marginalization or erasure of alternative ways of knowing—a process some authors have described as "epistemicide" (de Sousa Santos, 2015; Grosfoguel, 2015). From this perspective, socio-environmental conflicts are also struggles over the production, validation, and mobilization of knowledge, and over whose ways of knowing reality come to guide action. In the *X. fastidiosa* case, scientific expertise was mobilized to discredit both experiential knowledge produced outside the laboratory and forms of scientific knowledge developed outside the dominant technocratic framing of the disease (Chapter 3). The boundaries of legitimate expertise were actively policed: certain questions were

rendered inadmissible, certain actors were excluded from consultation, and certain forms of evidence were systematically marginalized. Political epistemology makes these dynamics analytically visible. It encourages one to ask not only who produces knowledge but also who has the authority to make it count—and with what consequences for governance.

Political ontology, finally, draws attention to the ways in which environmental conflicts are not only disputes over the distribution of resources but also, in some cases, disputes over the nature of the entities at stake (Blaser, 2013; Flemmer et al., 2024). As scholarship associated with the ontological turn has shown, different actors do not always inhabit the same world, even when they appear to speak about the same objects. A river, for example, may be simultaneously a legal property, an ancestor, an economic asset, and a hydrological system—and these enactments are not merely representational differences but ontological ones, with real consequences for governance and politics (Rickard & Ludwig, 2025). An attentive account of socio-environmental conflicts must therefore explicitly address this ontological dimension. Yet, as with political economy, ontology does not exhaust the explanatory terrain, nor is it sufficient on its own. An exclusive focus on ontological—or, for that matter, epistemological—differences or "partial overlaps" (Ludwig, 2016) risks, if taken in isolation, to downplay the material constraints, institutional arrangements, and structural features that shape those very same ontological claims (for some reflection on the relationship between social and epistemic justice, see Ludwig, 2025). Ontological conflicts are therefore also political-economic conflicts, embedded in broader configurations of capital, power, and unequal material relations. For this reason, this thesis engages with political ontology not as a standalone explanatory framework but as one dimension within a broader analytical constellation.

Once these four dimensions are clarified, the question remains how they relate to one another. Their interaction is inherently complex, and this thesis does not claim to provide a definitive or generalizable account of it. Nor is such an account likely to be possible. Rather than offering a fixed model of interaction, the 4Ps framework calls for explicit attention to how these dimensions are articulated in specific empirical contexts. It does not aspire to a "grand theory" capable of explaining socio-environmental conflicts in their entirety. Instead, it advances a more "situated" theoretical orientation: one that privileges empirical specificity over universal abstraction and remains attentive to the partial, evolving, and open-ended character of theoretical work. The contribution of this thesis, thus, lies not in resolving once

and for all how these dimensions interact, but in delineating a conceptual space within which their relations can be empirically traced and analytically explored.

Finally, it is worth elaborating on how the 4Ps framework relates to the broader theoretical lens invoked in this thesis's title: the more-than-human Anthropocene. In my reading, the more-than-human Anthropocene already gestures—albeit often implicitly—toward the entanglement of political economy, ecology, epistemology, and ontology. It calls for "an attention to diverse modes of knowing as well as modes of living" (Tsing et al., 2019, p. S192), and brings humans and nonhumans into the same analytical frame, without abandoning a sustained attention to structural dynamics. This, in my view, creates space to think about these dimensions together, and it is, in fact, what initially drew my attention to it. At the same time—and this resonates with my earlier discussion of political ecology as "political economy applied to questions of the environment"—such a framework does not present capitalism as an all-encompassing explanatory force capable of subsuming all other dimensions (including the ecological processes that both shape its developments and, as in the case of the "feral ecologies", at times exceed or escape its control). This is well captured, for example, in the following passage from Tsing et al. (2024), where the authors engage with the work of Jason Moore and his Capitalocene argument:

> *"Sociologist Jason Moore has written an insightful book about the ecological dynamics of capitalism, a "world ecology" he calls the Capitalocene. The book usefully argues that "cheap nature" has been as important a product as "cheap labor"; capitalism has remade landscapes for its best use. The book refreshes discussions of ecology and capitalism. However, Moore's imperative to get beyond the false dichotomy of Nature and Society drives him to posit an all-encompassing capitalist system for which there are no outsides. For Moore, nonhuman (and human) lives are always an expression of capitalist logics. Here nonhumans, once again, become mechanical puppets of human elites". (p. 143)*

Yet the broader body of scholarship associated with the "more-than-human ontological turn" (Tsing, 2018) tends to privilege multispecies and ontological sensitivities over structural and political-economic analyses. For this reason, it has become the target of fierce critique from scholars working within more structuralist- or materialist-oriented traditions (see, for example, Büscher, 2024, for a critique of

the concept of "friction", most notably associated with the work of Anna Tsing, 2005, versus a more conflict-oriented, and therefore "Marxianly acceptable", "tension"; but also Knudsen, 2023 for an argument against "flat ontologies"). In this thesis, I adopt the more-than-human Anthropocene framework for two main reasons. First, it offers a theoretically precise conceptual home for a disease caused by a more-than-human entity that escaped human control as a consequence of human-led projects of agricultural modernization—in short, it names the kind of problem this thesis is about. Second, it allows me to retain the ontological and multispecies sensitivity of more-than-human approaches while still foregrounding capitalism, colonialism, and imperialism as key drivers of the Anthropocene (the original detonators I took inspiration from in Chapter 2).

The 4Ps framework builds on this foundation and aims to give these drivers a more explicit analytical form. Political economy illuminates the structural conditions of capital accumulation and penetration across both the productive and reproductive aspects of life; political ecology traces their dependence on material-ecological entanglements; political epistemology asks how they shape and are shaped by what counts as knowledge; and political ontology attends to the more-than-human worlds they produce, foreclose, or render invisible. Together, these four dimensions offer a way to analyze socio-environmental conflicts not as purely economic, ecological, epistemic, or ontological disputes, but as multidimensional political struggles in which all these elements are simultaneously at work (though their relative weights and nuances remain matters of careful, context-specific empirical inquiry).

6.3 *Xylella fastidiosa* in Apulia today: an update

Today, the Apulian socio-phytopathology, as Colella et al. (2019) have called it, appears to be undergoing three major shifts.

First, as briefly noted at the end of Chapter 3, a number of olive trees in the region's most heavily affected areas have either resisted infection (Sabella et al., 2026) or begun to resprout (Scortichini & Ragno, 2024; Gaeta, 2026), a phenomenon that could be interpreted as a form of "multispecies resurgence" (cf. Ejsing, 2023), in which new configurations of human and nonhuman relations emerge within capitalist ruins (Tsing, 2015). Although these dynamics are being explored, the response of dominant research institutions and international governance bodies has largely been cautious, if not tacitly dismissive. A research agenda centered on the biology or ecology of "resilience" has so far attracted limited institutional support and remains marginal within mainstream scientific research. This marginality is also

evident in the organization of key science and policy events. On 23rd-25th of June 2026, the 5th International Conference on *X. fastidiosa*, organized under the auspices of EFSA, will take place in Bari. At the time of writing, abstract selection is ongoing; however, preliminary indications suggest that the phenomenon of "resilience" is quietly being sidelined as a possibly relevant theme (C. Sopranzetti, personal communication). By contrast, researchers who have advocated, since the early stages of the outbreak, for exploring pathways to coexistence with the pathogen point to a gradual—if uneven—shift in discourse. As one of them remarked, *"nowadays, more and more people are starting to talk about treatment or coexistence; it would be good to remember those who were already talking about treatment or coexistence long before it became acceptable to do so"* (P. Fanizzi, University of Salento, late 2025). Positions that were previously marginal thus appear to be gaining renewed, albeit still contested, visibility.

Second, the northward advance of the epidemic front has slowed markedly compared with the rapid expansion observed in its early years, when the bacterium spread from the Gallipoli area (Boscia, 2024). Over the past eighteen months, this deceleration has been consistently reported and is now widely acknowledged within the scientific community. In areas such as the Valle d'Itria—encompassing municipalities like Cisternino, Ceglie Messapica, Martina Franca, Locorotondo, Fasano—the emergence of new symptomatic trees since approximately 2018 has proceeded at a significantly slower pace than in southern Salento between 2013 and 2018. Regional and scientific authorities have largely attributed this deceleration to the effectiveness of containment measures. While this explanation is plausible, it is unlikely to be exhaustive. A number of additional factors, so far insufficiently explored, may be contributing to this pattern and warrant further investigation. From an ecological perspective, for example, the Valle d'Itria differs substantially from southern Salento in microclimatic conditions, temperature regimes, and landscape heterogeneity. The latter is characterized by larger estates and a more homogeneous ecological matrix, whereas the Valle d'Itria presents a more fragmented mosaic of cultivated and semi-natural environments. Such differences may play a significant role in shaping pathogen dynamics.

The agrarian structure and its associated productive (and socially reproductive) features are also important to consider. In the Valle d'Itria, smaller, more fragmented landholdings are often linked to higher levels of localized investment in orchard maintenance, with many landowners—frequently urban residents—allocating resources to the upkeep of their plots. Moreover, the persistence of more diversified,

semi-subsistence farming systems reduces reliance on monocultural production models, which have been more dominant in large parts of southern Salento. Tourism further contributes to these dynamics. Whereas Salento's tourism economy is largely oriented toward coastal attractions, in the Valle d'Itria the landscape itself is a primary asset. As discussed in Chapter 5, this may create indirect incentives to maintain cultivated environments, a hypothesis that deserves further examination (see also Section 6.6). Finally, the period between 2021 and 2023 was marked by exceptionally high olive oil prices, which likely encouraged more active and attentive orchard management. Taken together, these ecological, structural, and economic factors may have contributed—alongside the containment measures—to slowing the progression of the disease front.

Third, there are emerging signs of a partial reopening of spaces for dialogue and for interdisciplinary, if not transdisciplinary, collaboration. On the one hand, explicitly denialist positions have become increasingly rare. The scale and visibility of the damage have rendered outright rejection of *X. fastidiosa* as *at least* a contributing factor progressively untenable. While in the early phases of the outbreak it was still possible to bracket or contest the material evidence of the epidemic, the extent of the affected territory now makes the disease difficult to ignore. On the other hand, there are signs of reflexivity within parts of the scientific community. Some researchers have begun to acknowledge shortcomings in the initial management of the epidemic, adopting more cautious and self-critical positions. This includes recognizing that the production of scientific knowledge and its public communication are distinct practices, requiring different competencies—competencies that were not always present (or properly mobilized) in the early stages of the emergency. Taken together, these developments point to a gradual, if uneven, reconfiguration of positions. The intense polarization that characterized earlier phases of the controversy appears to be loosening, creating what might be described as new "cracks" in the (communicative) wall through which dialogue can re-emerge. Meaningful engagement requires at least a minimal shared ground from which disagreement can be articulated, and what seems to be taking shape in Apulia today is precisely the fragile consolidation of such a ground.

Alongside growing reflexivity, another factor that might be contributing to easing tensions is the progressive stabilization of power relations within the institutional research landscape. As discussed in Chapter 3, the *X. fastidiosa* controversy in Apulia has also been a struggle for epistemic authority within Italian and European academia. Over more than a decade, certain research groups have won the "science

wars" (Ross, 1996) surrounding the disease, consolidating their positions in the epistemic arena and in access to funding. They now coordinate large-scale research consortia, attract substantial resources, and serve as key reference points for both scientific and policy communities. Paradoxically, this consolidation may create conditions for greater openness. Once leadership positions are secured, the immediate pressure to compete for recognition and resources diminishes, allowing dominant actors to engage more openly with alternative perspectives. In this sense, a more stable research landscape may reduce zero-sum dynamics and create space for articulating new research agendas. While underlying asymmetries remain, such a shift may enable a reorientation of scientific practice toward more exploratory, integrative, and collaborative forms of inquiry. With less at stake in terms of institutional positioning, there is greater scope to engage with complex questions and to foster interdisciplinary—or even transdisciplinary—collaborations that were previously constrained by competition pressures.

6.4 Implications for policy and practice

The analysis developed in this thesis suggests that plant disease governance cannot be reduced to a technical problem of pathogen control. Rather, crises such as the *X. fastidiosa* outbreak in Apulia must be approached as politically and materially complex—with three main implications for science policy, plant health governance, and environmental decision-making.

First, the findings point to the need for a more reflexive and pluralist approach to scientific governance. As discussed in Chapter 3, the management of the *X. fastidiosa* outbreak was shaped not only by the pathogen's biology but also by the "sociology of the scientific field": which research questions were prioritized and why, which forms of expertise were recognized as legitimate (and why), and which perspectives were marginalized (and why). A more pluralist science policy (Turnhout, 2024) would broaden the range of research agendas supported by public institutions, including work on ecological resilience, pathogen–host–environment interactions, the efficacy of coexistence strategies, and the social dimensions of disease management. Such pluralization, however, must be carefully calibrated. Expanding the space of legitimate inquiry does not imply that all claims are equally valid or that standards of evidence should be relaxed. Rather, it requires distinguishing between empirically grounded scientific dissent and unsupported claims, while creating institutional spaces where alternative hypotheses and approaches can be explored without being prematurely excluded. In this sense, the

challenge is not to replace scientific authority but to render it more reflexive, transparent, and open to contestation without collapsing into relativism, while acknowledging the complexity and uncertainty inherent to socio-environmental knowledge (Jasanoff, 2005; Stirling, 2010; Von Seggern et al., 2023). Narrow technocratic closure, as the Apulian case illustrates, risks reinforcing distrust and foreclosing potentially relevant lines of inquiry.

Second, and more fundamentally, the thesis highlights that plant disease management depends on the material conditions under which "care" can be enacted (Tronto, 1993; Puig de la Bellacasa, 2017). Much of the debate around *X. fastidiosa* has proceeded as if orchard management were primarily a technical issue, solvable through the right combination of phytosanitary measures, tolerant cultivars, and agronomic practices. Yet, as shown in Chapter 5, most management practices—weeding, pruning, managing soil, and so on—are labor-intensive and financially demanding. Their implementation is unevenly distributed across different categories of landholders. For many small- and medium-scale farmers operating under economic pressure, the expectation to comply with recommended management protocols is often unrealistic. A policy framework that ignores these constraints risks being not only socially unjust but also practically ineffective. If care is treated as a technical obligation without addressing its economic feasibility, non-compliance becomes structurally inevitable. This suggests that plant health governance must move beyond prescriptive approaches and engage directly with the economic and labor conditions that shape which forms of care are possible, and for whom.

This leads to a third implication: the need for a public policy intervention capable of sustaining landscape management practices that are ecologically and culturally valuable yet economically fragile. The Apulian case reveals a structural tension between maintaining olive farming's competitiveness and preserving ancient olive groves as biocultural heritage. The forms of care required to sustain monumental trees often entail reduced productivity, increased labor inputs, and limited mechanization. Under current conditions, such practices are disproportionately carried out by actors who are not economically dependent on farming, resulting in a class-based differentiation of care. To address this imbalance, the thesis proposes introducing a *conservation basic income* (Fletcher & Büscher, 2020; de Lange et al., 2023): a universal, unconditional payment granted to those who maintain olive groves containing monumental trees. The aim of such an instrument would be to decouple the maintenance of these landscapes from strict market viability, recognizing them instead as providers of ecological, cultural, and social value.

Unlike existing agri-environment schemes, which are often conditional, competitive, and administratively complex, a conservation basic income would prioritize accessibility and stability, enabling a broader range of actors—including smallholders and part-time farmers—to sustain management practices that would otherwise be economically infeasible.

This proposal raises important practical and political challenges that would require careful institutional design, including mechanisms to ensure that payments are tied to actual management practices rather than passive ownership. Yet the broader point remains: without some form of public support, the conservation of Apulia's olive landscapes is unlikely to be achieved. Technical prescriptions alone cannot resolve what is, in many respects, a political-economic problem. Taken together, these three implications suggest that effective plant disease governance requires a shift in perspective. Rather than focusing narrowly on controlling pathogens, policy must engage with the conditions that make landscapes vulnerable, the knowledge systems that guide intervention, and the material capacities of those tasked with implementing management. In this sense, managing plant disease becomes inseparable from broader questions of agrarian change, social justice, and environmental governance in the more-than-human Anthropocene.

6.5 Limitations of the present study

Like all research, this thesis has limitations. In this section, I aim to clarify and situate its scope. First, the *X. fastidiosa* crisis in Apulia is not representative of plant disease outbreaks in any generalizable or statistical sense. It unfolds in a highly specific landscape shaped by a centuries-long olive economy, the peculiar legal and cultural status of monumental olive trees, historically specific patterns of agrarian development, and a particularly contentious relationship among scientific expertise, public authority, and local forms of attachment. For this reason, the findings developed here cannot be directly generalized to all plant health emergencies or agricultural landscapes. At the same time, the value of the case lies precisely in its intensity. Apulia offers a particularly revealing site for examining how plant disease becomes a multidimensional political problem, in which ecological disturbance, economic vulnerability, epistemic disagreements, and ontological differences are tightly intertwined.

Second, the research is shaped by its situated, partly autoethnographic character. My lifelong relationship with Apulia, my family's involvement in olive cultivation, and my participation in practices such as pruning, harvesting, processing, and selling

olive oil clearly influenced both the empirical material and its interpretation. This position enabled forms of access and embodied understanding central to the analysis, particularly regarding everyday experiences of tree decline, more-than-human care, or orchard abandonment. Yet it also means the account is necessarily partial and situated rather than detached. While this has been addressed through reflexivity, triangulation, and sustained engagement with a diversity of actors, the analysis remains shaped by my positionality. Following the argument developed in the Introduction, this is nevertheless understood not as a limitation to be eliminated but as an intrinsically unavoidable condition that allows for "strong objectivity" (Harding, 1995), whereby the systematic examination of the researcher's own positionality becomes a resource for producing more rigorous and less partial forms of knowledge, and must be embraced rather than silenced.

Third, empirical access was uneven across the actors involved in the crisis. The thesis draws on interviews, participant observation, public meetings, policy documents, and scientific literature, with particular attention to farmers, agronomists, plant scientists, environmental and social activists, local administrators, and small landowners. Other actors—such as big commercial farmers, financial institutions, agribusiness companies, nurseries, EU-level policymakers, and other stakeholders in the broader olive oil production chain—appear only indirectly in the analysis. This unevenness reflects both the practical conditions of fieldwork and the study's empirical focus. As a result, processes related to credit systems, global land markets, labor relations, agribusiness strategies, and broader forms of agrarian restructuring remain only hinted at in the present work.

Finally, this thesis examines a crisis that is still unfolding. The epidemiology of *X. fastidiosa*, the scientific and practical knowledge surrounding it, the regulatory framework, and the agrarian responses to it continue to change. New cultivars are being tested, management practices are evolving, market conditions are changing, and ecological conditions (for example, droughts) continue to shape the context in which olive cultivation takes place. The analysis presented here, therefore, captures a specific historical conjuncture that is nevertheless far from settled. In this sense, the thesis should be read as a situated account of an evolving crisis whose dynamics require continued empirical and analytical attention, a snapshot in a temporal evolution that is still ongoing. This evolving temporality also has some spatial repercussions. In effect, moving across different parts of the region sometimes feels like "traveling in time": debates that convulsed Salento a decade ago are now resurfacing in areas where the epidemic is only beginning to become visible. This is

sometimes even shocking, as it shows how poorly information and hard-won lessons have traveled across the region.

6.6 Possibilities and directions for further research

This thesis also opens several avenues for further research. While the previous section addressed the empirical and methodological limits of the present study, this section outlines additional conceptual and theoretical developments that could build on it. These directions for further research should not be understood as unresolved gaps, but rather as possible extensions toward a broader research agenda.

A first direction is comparative. While this thesis has focused on Apulia, *X. fastidiosa* has been reported in other Mediterranean regions, including Spain, Portugal, and France (Landa et al., 2020). Comparative research could examine how cultivation histories, agrarian structures, institutional capacities, infrastructure, and cultural attachments shape divergent responses to the same pathogen. The Spanish case is particularly instructive. In Mallorca, where *X. fastidiosa* primarily affects almonds—another crop of deep cultural and economic significance to the island—as well as vineyards (Olmo et al., 2021), contestation has remained relatively limited compared to Apulia, possibly due to island geography and the reduced risk of spread, which might have facilitated an earlier shift from eradication to coexistence strategies. In Alicante, where olives are affected by a different strain and where the affected area is located on the mainland, the dynamics differ again. A systematic comparison across such cases would help identify which features of the Apulian controversy are context-specific and which reflect broader structural tensions in European plant health governance. More fundamentally, such comparisons would contribute to a relational and topological understanding of plant disease outbreaks and to showing how "disease situations" emerge through historically and geographically specific configurations of economy, ecology, epistemology, and ontology.

A second direction concerns the theoretical reach of the Plantationocene concept in the Global North. While the concept has been primarily applied to colonial and postcolonial contexts in the Global South (Chao et al., 2024), the Apulian case suggests the need to interrogate its relevance in European agrarian settings. Southern Italy, for instance, has been described as a "sacrifice zone" in relation to industrial pollution (Ippolito et al., 2025), and highly exploitative labor—such as that

unfolding around the so-called *caporalato* in the tomato sector—persists in contemporary agricultural systems (Perrotta & Raeymaekers, 2023). At the same time, the trajectory of olive cultivation, particularly in its more capital-intensive and mechanized forms, complicates standard associations between plantation systems and (human) labor exploitation. Future research could therefore examine whether and how Southern and Northern European plantations—from Mediterranean olive groves to tomato plantations in Southern Italy to greenhouse horticulture in countries such as the Netherlands—extend, transform, or challenge dominant understandings of the Plantationocene, while remaining attentive to historical and geographical specificities.

A third direction concerns tourism's role in reshaping rurality. As with conservation, inquiries that take tourism as central force in shaping agrarian change remain relatively limited within critical agrarian studies (Gatti, 2023). Yet in regions such as Apulia, it plays an increasingly significant role in structuring rural economies and landscapes. Tourism may contribute to the erosion of agriculture by drawing labor toward more remunerative sectors, but it may also sustain farming through diversification, price premiums, and renewed cultural valuation. In Apulia, this ambivalence is particularly visible: the same landscapes that attract visitors—ancient olive groves, dry-stone walls, and *masserie*—are those most threatened by the crisis, while tourism revenues may constitute one of the few incentives for their maintenance outside strictly productive logics. Whether tourism ultimately supports the reproduction of agrarian worlds or accelerates their transformation into commodified landscapes for consumption remains an open and empirically urgent question.

6.7 Conclusion: can Apulian olive trees be saved? Toward a political agroecology of the Olive Quick Decline Syndrome in Apulia

The question of whether Apulian olive trees could be saved has haunted the *X. fastidiosa* crisis since its beginning (see Almeida, 2016) and, to some extent, still does. It has animated public controversies, scientific debates, farmers' decisions, policy interventions, activist mobilizations, and everyday practices of care in affected landscapes. Yet, as this thesis has shown, the answer to this question is not as straightforward as it may appear. To ask whether olive trees can be saved is also to ask what kind of olive trees are to be saved, for whom, through which forms of labor, with what kinds of knowledge, and under which political-economic

conditions. The answer depends not only on plant pathology or agronomic solutions but also on the social, economic, ecological, epistemic, and ontological conditions through which saving becomes possible. This calls for a "political agroecology" of plant disease: an approach capable of taking seriously the biological reality of the pathogen, the ecological relations through which disease emerges and spreads, the agrarian conditions that shape farmers' capacities to respond, the politics of knowledge through which expertise is produced and contested, and the different ways in which olive trees are valued, enacted, and cared for. Such an approach does not reject scientific research or technical innovation. Instead, it asks how science, technology, policy, and agrarian practice can be embedded within more democratic, ecologically attentive, and socially just forms of landscape governance.

A political agroecology of the Olive Quick Decline Syndrome, as I imagine it, focuses on three interrelated conditions. The first is economic. Traditional and semi-traditional olive cultivation cannot be sustained by attachment, heritage discourse, or emergency rhetoric alone. The crisis has unfolded on top of decades of structural challenges—declining profitability, rising input costs, labor shortages, and market globalization—that have contributed to rural out-migration and widespread abandonment, further exacerbating the epidemic's spread. Coexistence with the pathogen is possible, as many farmers have demonstrated; but the increased management intensity it requires clashes with labor shortages and insufficient agricultural incomes. Making traditional olive cultivation economically viable therefore requires recognizing that biocultural landscapes are sustained by work and that such work requires material support: redistributive policies, cooperative infrastructures, fairer value chains, and payments for landscape care. The conservation of olive trees is inseparable from questions of income, labor, land, and the uneven distribution of vulnerability and capacity.

The second condition concerns the need to bring ecological and environmental considerations at center stage. While extensive research has examined interactions among the pathogen, its insect vectors, and host trees, studies on the ecology of Olive Quick Decline Syndrome—particularly those examining landscape-level factors—are entirely lacking. I argue that agroecology (as a science), with its sensitivity to complex ecological relationships and its recognition of the value of farmers' knowledge, provides a crucial yet underutilized perspective. Moreover, it can serve as the necessary bridge between scientific research and biocultural conservation concerns. As this thesis has shown throughout, the misalignment between research agendas primarily oriented toward producers' immediate economic concerns and

calls for "another way of doing science" centered on ecological complexity has generated persistent tensions. This crisis presents an opportunity to rethink olive cultivation in Apulia not merely in terms of productivity but as part of a broader agroecological transition.

The third condition is both epistemological and methodological. The *X. fastidiosa* crisis in Apulia has exposed the risks of fragmented, reductionist expertise. Plant pathology and entomology remain essential, but they must engage meaningfully with ecology, social science, and local agricultural knowledge to produce strategies that are not only technically sound but socially legible, economically feasible, and institutionally trusted. Yet such collaborations need to be actively sustained and fertilized (to keep the farming analogy) by those in a position to bridge the gap between different types of expertise. This is where, I believe, social scientists engaging with plants and agrarian worlds have a distinctive role to play: not as external commentators on scientific practice, but as interlocutors capable of translating across epistemological boundaries and holding open the space for more inclusive forms of knowledge production. A political agroecology of plant disease calls for these collaborations to be not merely interdisciplinary in name but genuinely transdisciplinary in practice—creating spaces where scientists, farmers, policymakers, and civil society actors jointly define problems and evaluate responses, making conflict productive rather than paralyzing.

I ultimately contend that the focus of the debate should shift from whether Apulian olive trees can be saved—my answer to this is a resounding yes—to the more political questions of how and by whom. The conservation dilemma at the heart of this thesis is still far from resolved. What is clear is that the *X. fastidiosa* crisis is not only a regional plant disease emergency. It is a crucial site for rethinking how societies respond to ecological disruption in the more-than-human Anthropocene: not only by controlling pathogens, but by transforming the political, ecological, and economic conditions through which landscapes become vulnerable, valuable, and worth saving.

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English Summary

This dissertation examines the conflict over the management of the Olive Quick Decline Syndrome (OQDS) in Apulia, southern Italy—a phytosanitary crisis that began after the detection of the bacterium *Xylella fastidiosa* subsp. *pauca* in the region in 2013. In little more than a decade, the epidemic has transformed one of the Mediterranean's most iconic agricultural landscapes, affecting an estimated 21 million olive trees and placing centuries-old groves, rural livelihoods, and cultural identities under severe strain.

The central question guiding the thesis is: how is the conflict over *X. fastidiosa* management in Apulia constituted as a multidimensional political problem, and how do its economic, ecological, epistemological, and ontological dimensions interact to shape its emergence and evolution? This question is unpacked through four interrelated sub-questions, each addressed in one of the empirical chapters: What are the historical and socio-ecological causes of OQDS? How has knowledge of the disease been constructed, and who has been granted authority to inform policy? To what extent can the conflict be understood as an ontological conflict? And to what extent do economic conditions and rural development policies shape the range of possible responses?

Rather than adding another single-dimensional analysis to the growing social science literature on *X. fastidiosa* in Apulia, this thesis advances a different proposition: that political economy, political ecology, political epistemology, and political ontology are four analytically distinct yet empirically inseparable dimensions of the politics of plant disease in the more-than-human Anthropocene. Its overarching ambition is to show that the analytical force of each dimension is greatest when all four are brought together, rather than when they are treated as competing theoretical lenses.

Theoretically, the thesis situates itself within the framework of the more-than-human Anthropocene. This framework draws attention to organisms, ecological processes, and material entities that escape human control and proliferate in unexpected ways, yet remain deeply shaped by human infrastructures and forms of landscape reordering. *Xylella fastidiosa* is understood in these terms as a feral proliferation: introduced into Europe through the global ornamental plant trade, it encountered in Apulia a landscape that centuries of monocultural olive production had rendered highly vulnerable to its spread.

Methodologically, the research draws on more than five years of multispecies autoethnography in Apulia, combining over 40 semi-structured and informal interviews with farmers, plant scientists, agronomists, policymakers, and activists; extensive participant observation in olive groves, during harvests, at public meetings, and in scientific forums; and analysis of policy documents, court records, scientific publications, and media materials. Moreover, the author's biographical entanglement with Apulian olive landscapes—including direct involvement in farming on the family smallholding—informs the methodological orientation, serving as an analytically productive resource that enables forms of situated knowledge unavailable from more detached positions.

Chapter 2 develops a historical-material account of the causes of the OQDS epidemic. In contrast to framings that treat the disease as an exogenous biological event, the chapter argues that the epidemic must be understood as an emergent outcome of historically produced socio-ecological conditions. It develops the notion of "plant disease detonators": specific historical-material conjunctures that built momentum toward a phytopathological tipping point. Four detonators are identified—the plantation system, the lamp oil economy, globalization, and rural abandonment—which together show that the epidemic did not begin with the bacterium's arrival but with the long agrarian history that produced the landscape conditions in which *X. fastidiosa* could proliferate so rapidly and with such consequences.

Chapter 3 examines how knowledge of OQDS has been produced, validated, and contested. Against the dominant representation of the controversy as a clash between science and science denialism, the chapter demonstrates that what unfolded in Apulia is better understood as a conflict involving multiple, interacting layers of knowledge politics cutting across heterogeneous social groups. It maps five distinct epistemic domains of contestation—conflict over causality, naming, and framing; boundary work between scientific and lay knowledge holders; intra-scientific disagreement; differentiation among farmers; and the institutional politics of scientific knowledge production—and argues that the case reveals not a homogeneous "science" confronting a homogeneous public, but a multiplicity of epistemic communities engaged in ongoing struggles for authority across disciplinary and institutional domains.

Chapter 4 argues that the conflict is not only a dispute over facts or interests but also an ontological one—a struggle over what the entities at stake fundamentally are. Drawing on Annemarie Mol's concept of ontological politics and debates in political

ontology, the chapter identifies three ontologies of the olive tree (relational being, productive asset, and landscape element) and three ontologies of disease (pathogenic invasion, socio-ecological syndrome, and political construct). It advances a non-relativist account of ontological pluralism, arguing that governance that recognizes only a single ontology—treating olive trees solely as productive assets and the disease solely as a pathogenic invasion—forecloses important dimensions of what is at stake and deepens rather than resolves the conflict.

Chapter 5 examines the political economy of the crisis, showing how structural economic conditions determine which epidemic responses are materially possible and for whom. The chapter introduces the concept of a "conservation dilemma" to capture the structural tension between preserving olive farming as an economically viable sector and conserving olive trees as elements of biocultural landscapes. It analyzes three response pathways—restructuring for competitiveness, reshaping for preservation, and re-caring for coexistence—and shows that each is unevenly accessible, producing what the thesis terms a "class differentiation of care": the concentration of landscape stewardship capacity among affluent actors, away from smallholders dependent on olive farming for their livelihoods.

The general discussion synthesizes the four empirical chapters into an overarching analytical framework—the "4Ps"—that articulates political economy, political ecology, political epistemology, and political ontology as co-present and mutually constitutive dimensions of socio-environmental conflict. The thesis concludes by proposing an outline for a political agroecology of plant disease: an approach that takes the pathogen's biological reality seriously while acknowledging the ecological relations through which disease emerges, the agrarian conditions that shape farmers' capacities to respond, the politics of knowledge through which expertise is produced and contested, and the different ways olive trees are valued and cared for. Whether Apulian olive trees can be saved is ultimately less a technical question than a political one—about which agricultural futures and which infrastructures of care societies are willing to collectively sustain.

About the author



Fabio Gatti is a social scientist specializing in human-environment relations, with an interdisciplinary background spanning geography, anthropology, sociology, and the philosophy of science. Originally trained in engineering, he holds an MSc in Materials Engineering and Nanotechnology from the University of Salento (Lecce) and the Istituto Superiore Universitario per gli Studi Interdisciplinari (ISUFI), and an MA in Development Studies from the International Institute of Social Studies (ISS) at Erasmus University Rotterdam (The Hague), with a major in Agrarian, Food and Environmental Studies (AFES).

Before starting his PhD, he was an activist in Barcelona, involved in a variety of social movements, from anti-food-waste collectives to movements for the right to housing. He was also affiliated with the association Research & Degrowth and served as a visiting scholar at the Institute for Environmental Science and Technology of the Universitat Autònoma de Barcelona (ICTA-UAB).

During his PhD, he held visiting positions at the Department of Geography at the University of the Balearic Islands (UIB); the "Masificación de la Agroecología" group in the Department of Agriculture, Society, and the Environment at El Colegio de la Frontera Sur (ECOSUR) in San Cristóbal de las Casas; the Department of Anthropology at the University of California, Santa Cruz; and the Department of Sociology and Anthropology at the University of Mons, Belgium.

His research interests span political ecology, science and technology studies, critical agrarian studies, the environmental humanities, and decolonial studies, with a particular focus on the politics of plant disease, political agroecology, and the social and political dimensions of digitalization in agriculture. More recently, his work has turned to the Mediterranean as a space for developing decolonial thought from within Europe's margins, building on the tradition of Southern Thought developed by Italian sociologist Franco Cassano. He is currently developing a political ecology of the Mediterranean at the intersection of water, tourism, and agriculture.

He is also a part-time olive farmer, an agrarian justice and food activist, and a self-trained agroecologist.

List of publications

Peer-reviewed journal articles

Gatti, F. (forthcoming). Conservation dilemmas: Xylella fastidiosa and the future(s) of olive farming. *Agriculture and Human Values*.

Gatti, F. (2026). Plant disease detonators: Lamp oil, agrarian change, and the historical-material making of the Xylella fastidiosa outbreak in southern Italy. *Journal of Political Ecology* 33(1):8341.

Gatti, F., Ludwig, D., and P. Macnaghten (2026). Epistemic diversity and the politics of knowledge in plant disease management: insights from the Xylella fastidiosa epidemic in Southern Italy. *Plants, People, Planet* 8(5), 1872-1889.

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Ludwig, D., Gatti, F., & Milberg Muñiz, E. (2024). Reclaiming epistemic diversity: Between community struggles and corporate capture. *Science for the People Magazine*, 26(2).

Book chapters

Gatti, F. (2023). El turismo y los estudios agrarios críticos: un eslabón perdido. In Cañada, E., Murray, I., & Marie dit Chirot, C. (Eds.) *El malestar en la turistificación: Pensamiento crítico para una transformación del turismo* (pp. 236-254). Icaria Editorial: Barcelona.

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Approved WASS education certificate

Fabio Gatti
Wageningen School of Social Sciences (WASS)
Completed Training and Supervision Plan

Name of the learning activity	Department/Institute	Year	ECTS *
A) Project related competences			
A1 Managing a research project			
WASS PhD Introduction	WASS	2021	1
Writing PhD proposal	KTI/WASS	2021	4
Convenor: Global Pathogens, Local Pathologies: How agricultural epidemics are shaping global and local agrarian and environmental change *Presenter*: *"What is the worth of an olive tree? Political ontology and epistemic conflicts in the case of Xylella fastidiosa epidemic in Apulia, Southern Italy"*	European Organization for Rural History conference, Uppsala (Sweden)	2021	1
"Contested knowledges, ontological conflicts and olive trees in the Plantationocene: multispecies entanglements in the Olive Quick Decline Syndrome in Apulia, Southern Italy"	WASS PhD day (won the Best presentation award)	2022	0.5
"Contested Knowledges, Ontological Conflicts and Olive Trees in the Plantationocene: More-than-human Politics in the Xylella Fastidiosa Epidemic in Apulia, Southern Italy"	4S – Society for the Social Studies of Science conference – Cholula (Mexico)	2022	0.5
Visiting research stay WASS Junior Grant	UC Santa Cruz	2024	6
Convenor and chair: "Political Epistemologies and Ontologies" (with David Ludwig)	Political Ecology Network (POLLEN), Lund University (Sweden)	2024	1

"Plant pathogens in emotional landscapes: olive stakeholders and the Xylella fastidiosa outbreak in Apulia, Southern Italy" *"Olive trees in the more-than-human Anthropocene: a multispecies ethnography of the Olive Quick Decline Syndrome in Apulia, Southern Italy"*	International Society of Ethnobiology Congress, Marrakech (Morocco)	2024	1
Chair: Studies of the More-Than-Human *Presenter:* "Can a Bacterium Change Everything? A More-Than-Human Political Ecology of Plant Disease in Southern Italy"	XXVI Society for Human Ecology conference, University of Mons	2025	0.5
Convenor and chair: Political Ecologies of the Mediterranean: Decolonial Approaches, Southern Thought, and Pluriversal Futures *Presenter:* "A Plantationocene in the Global North: feral pathogens, olive plantations, and the reconfiguration of agrarian landscapes in Southern Italy"	Political Ecology Network (POLLEN), Barcelona (Spain)	2026	1
Paper reviews	Journals: Journal of Ethnobiology; Phytopathology; Geoforum; Journal of Peasant Studies	2022-2026	2
A2 Integrating research in the corresponding discipline			
Journal Club: Global Epistemologies and Ontologies	KTI	2021-2024	1
Summer School Politics, Ontologies, Ecologies	University of Pisa, Scuola Normale Superiore	2022	3
Spring School Political Ecology	CSPS/WASS	2023	3
Summer school Critical Tourism Studies	CSPS/WASS	2023	3
B) General research related competences			
B1 Placing research in a broader scientific context			
Co-organizer KTI seminars	KTI	2022-2024	1
Social Ontology	CERES	2022	4
Co-organizer GEOS Spring workshop - 16 May 2022	KTI	2022	0.5
Co-organizer GEOS-Mexico workshop - 1-7 August 2022	KTI	2022	1

Decolonising Science	IHE Delft	2023	1.5
B2 Placing research in a societal context			
Studium Generale Talk	Studium Generale	2022	0.5
Organization of WASS seminars and events	KTI/WASS	2022-2025	1
C) Career related competences/personal development			
C1 Employing transferable skills in different domains/careers			
Start to Teach	WUR	2024	0.9
Supervising BSc & MSc thesis students	WUR	2024	3
Teaching and supervision	KTI	2022-2024	2
KTI PhD representative	KTI	2022-2024	1
Total			**44.9**

*One credit according to ECTS is on average equivalent to 28 hours of study load

Authorship statement

PhD candidate's name: Fabio Gatti

First promotor: Dr. David Ludwig

Title of PhD thesis: Olive trees in the more-than-human Anthropocene: The multidimensional politics of plant disease in southern Italy

Date of public defence: 7th October 2026

Chapter 1. *Introduction*

The research questions for this chapter were developed by me in dialogue with my supervisors, Phil Macnaghten and David Ludwig. I was responsible for the conceptualization, structure, and writing of the chapter. Draft versions were discussed in two supervision meetings, and I revised the manuscript in response to my supervisors' feedback. Additional comments from colleagues Matthias Kramm and Adriana Ressiore were incorporated in a subsequent round of revisions.

Chapter 2. *Plant disease detonators: lamp oil, agrarian change, and the historical material making of the Xylella fastidiosa epidemic in southern Italy*

I was responsible for the study's conceptualization, fieldwork, data collection and analysis, theoretical and conceptual framing, and manuscript writing. Material support for this chapter, as well as for the other empirical chapters present in this thesis, was provided through the ERC-funded project *Local Ecologies of Knowledge: Towards a Philosophy of Ethnobiology* led by David Ludwig. Phil Macnaghten and David Ludwig provided feedback on manuscript drafts and support during the research process. The manuscript was subsequently revised in response to comments from Rodrigo Almeida, Sayan Banerjee, Bram Büscher, Robert Fletcher, and Edward Huijbens. Following submission, it was accepted with minor revisions and underwent a further round of revisions in response to feedback from three anonymous reviewers during peer review.

Chapter 3. *Epistemic Diversity and the Politics of Knowledge in Plant Disease Management: Insights from the Xylella fastidiosa epidemic in southern Italy*

This chapter was co-authored with my supervisors, Phil Macnaghten and David Ludwig. I was responsible for the conceptualization of the study, data collection and analysis, and preparation of the original manuscript draft. The overall structure of the paper was discussed during a supervision meeting, after which the manuscript underwent several rounds of revision to incorporate feedback from my co-authors. The discussion section was developed in close collaboration with David Ludwig, who contributed to part of the writing. Following submission, the manuscript underwent a further round of major revisions in response to comments from three anonymous reviewers before being accepted for publication.

Chapter 4. *Saving the olive trees? Ontological Politics and Plant Disease Governance in Apulia, Southern Italy*

This chapter was developed in collaboration with David Ludwig. His contributions focused primarily on the discussion section, aspects of the theoretical framework, and manuscript review and editing. I was responsible for the conceptualization of the study, data collection and analysis, visual materials, development of the theoretical framework, preparation of the original manuscript draft, and subsequent review and editing. Both David Ludwig and Phil Macnaghten provided feedback on successive versions of the manuscript, which was incorporated into the text. Prior to submission, the manuscript benefited from minor comments and suggestions provided by Carlota Houart, Matthias Kramm, Adriana Ressiore, Mihnea Tănăsescu, and Michiel van der Pavert. Following peer review, the manuscript was accepted with minor revisions and underwent a further round of revisions in response to comments from two anonymous reviewers.

Chapter 5. *Conservation Dilemmas: Xylella fastidiosa and the future(s) of olive farming*.

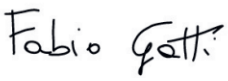
I was responsible for the study's conceptualization, data collection and analysis, theoretical and conceptual framing, preparation of visual materials, and writing of the manuscript. The structure and content of the chapter were discussed with David Ludwig and Phil Macnaghten during two supervision meetings. Their feedback was incorporated through successive rounds of revision. The manuscript also benefited from comments and suggestions provided by Robert Fletcher, Bram Büscher, Marc Vicol, Julie Guthman, and Ivette Perfecto prior to submission for publication.

Chapter 6. *General Discussion and Conclusions*

I was responsible for the conceptualization, structure, and writing of this chapter. Phil Macnaghten and David Ludwig provided feedback on the manuscript, which I incorporated during one round of revisions. Additional comments from colleagues Matthias Kramm and Adriana Ressiore were integrated during a final round of revisions.

Date: 11 June 2026

Signature PhD candidate



Signature promotor for agreement



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