



Science as a territory in dispute: an analysis of power and paradigms in the conceptualization of agroecology

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Accepted: 19 February 2025 / Published online: 14 March 2025
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Abstract

Agroecology is often portrayed as a new paradigm challenging industrial agriculture. What a paradigm or a so-called paradigm shift consists of, is not always clear, however. This paper does not aim to introduce a novel definition of agroecology, but rather to critically interact with the concept of paradigm shift, both through a focus on power relationships within academia and between academia and alternate epistemologies. Our arguments stem from comprehensive ethnographic field work done in Argentina between 2019 and 2024 and are based on the notion that (a) academic spaces are inherently contested spaces and knowledge production does not occur in a vacuum, but in a context shaped by strong economic interests and power dynamics; (b) agroecology is a paradigm in consolidation; and (c) the role of non-Western epistemologies in the production of knowledge on agroecology is often ignored and the relationship between academia and actors involved in these epistemologies is often an unequal one. Through the interrogation of the characterization of agroecology as a “paradigm shift”—often used as a buzzword in academia—we contend that in order for agroecology to be truly emancipatory and not just another frontier of capital accumulation, a transdisciplinary shift is fundamental.

Keywords Agroecology · Paradigm · Argentina · Transdisciplinarity · Co-optation

Abbreviations

INTA	Instituto Nacional de Tecnología Agropecuaria
MNCI	Movimiento Nacional Campesino Indígena
MOCASE	Movimiento Campesino de Santiago del Estero
FANA	Frente Amplia para una Nueva Agronomía
UNICAM-SURI	Universidad Campesina-Sistemas Rurales Indocampesinos

Introduction

Agroecology, science and power

In a recent surge of analyses around so-called “political agroecology”, agroecology is not just framed as a form of agriculture that includes social, cultural and political values, but as a proposal for a new society that calls into question current power structures and engages in critical opposition to the current “food regime” and its relation to capitalist relations of production (Akram-Lodhi 2021; Bellamy and Ioris 2017; Giraldo 2019; Giraldo and Rosset 2018; Gonzalez de Molina 2013; Hammelman et al. 2022; Sevilla Guzmán 2011; Sevilla Guzmán and Woodgate 2013). Political agroecology thus “*requires to be grounded in a rigorous socioecological framework that adequately spells out the roles of institutions and the necessary means to establish or change them, anchored in the indissoluble nexus established between human beings and their biophysical environment*” (de Molina et al. 2020, p. 3), to avoid it becoming “*just another instrumental discipline in the continuing saga of capitalism’s struggle to overcome its own internal contradictions*” (Sevilla Guzmán and Woodgate 2013, p. 43). This

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distinction in conceptual approaches was also identified by Giraldo and Rosset (2022) in their formulation of their seven principles of transformative agroecology, and by Giraldo in his work on “agroecological multitudes” (Giraldo 2022).

In their paper, Giraldo and Rosset (2022) propose a categorization of agroecology into three groups: neoliberal, reformist, and emancipatory agroecology. This categorization is deemed necessary due to the divergent understandings of the term and the diverse actors involved in its definition. Giraldo and Rosset consider emancipatory agroecology to be “based on radically different, non-institutional processes”, as “their collective construction and expansion obey different logics—ones very different from how the Green Revolution spread around the world” (Giraldo and Rosset 2022, p. 4). Within the realm of emancipatory agroecology, scholars often invoke the idea of a “paradigm shift” in science, representing a profound transformation in how knowledge is generated and by whom (Borsatto et al. 2022; Gliessman 2012, 2020; Sarandón 2021).

To grasp the emergence of agroecology as a paradigm shift is to inherently understand it as transformative through the radical proposition of new approaches and solutions to the plethora of issues generated by the current food regime. These solutions entail a thorough reimagining of both the process of knowledge production and the process of education as an integral practice of producing knowledge. Both “paradigm shift” and “popular education” then become conceptual cornerstones for the analysis of agroecology as transformative and emancipatory.

Paradigms and scientific revolutions

The concept of a “paradigm shift” is used by many scholars (Baiardi and Pedroso 2020; Gaba and Bretagnolle 2020; Gliessman 2012; Sarandón 2021; Sarandón and Marasas 2017) to both highlight the bankruptcy of the current agro-industrial model to address the myriad of societal problems that arise from its applications, and demonstrate the superiority of agroecology to formulate solutions to them. This concept was popularized by Thomas Kuhn in his work “The Structure of Scientific Revolutions”, where he defined paradigms as “universally recognized scientific achievements that for a time provide model problems and solutions to a community of practitioners” (Kuhn 1996, p. 10). Kuhn describes the dominant scientific model as “normal science”, which enters into a crisis when it is not able to give adequate insight into the phenomena it attempts to explain. He refers to these phenomena as “puzzles” and to the lack of answers as “anomalies”. Once too many unsolved puzzles arise, a crisis occurs, which is then resolved through what Kuhn calls a “scientific revolution”, as a new paradigm that provides a better model through which to interpret reality

replaces the dominant one. Paradigms are distinguishable from each other because of their “incommensurability”, which emerges from the notion that the boundaries of these different models are clearly defined, share a distinct lack of overlap with each other, and lead to completely different perspectives, meaning that these models cannot be embraced at the same time. Kuhn wrote that “the proponents of competing paradigms practice their trades in different worlds” (Kuhn 1996, p. 150).

Although the theory concerning paradigm shifts has been reinterpreted through a radical lens (Pinch 1997), it is important not to read too much relativism and political activism in Kuhn’s work. Kuhn is infamous for not clearly describing what he means with “paradigm” and has been described as a “reluctant revolutionary” in his view of scientists as deeply conservative puzzle-solvers and science as being guided entirely by internal dynamics, thus neglecting the impact of the larger social environment and the role of science in shaping it (Fuller 2007). Kuhn was also famously unenthusiastic about the adoption of his theory on scientific revolutions in the social sciences, stating that he is “much fonder of [his] critics than [his] fans”, referring to the initially tepid reception of his book in the “hard” sciences (Horgan 1991). This has led scholars to formulate approaches to epistemology that diverge from the Kuhnian school, where they emphasize the need to conceptualize science as a socially embedded process (Knorr-Cetina 2013) or even as a social movement (Fuller 2000, 2007).

This conception that science and education are subject to changes in the larger social environment and as tools for emancipation can be found in Paulo Freire’s influential work, *Pedagogy of the Oppressed* (Freire 2012). Freire makes a distinction between the concept of “banking” education and “problem-posing” education. The former treats students as objects in which to deposit information and knowledge, or as Freire puts it, in this method the role of the educator is to “regulate the way the world ‘enters into’ the students” (2012, p. 76). In this context, the social environment is separated from scientific inquiry and education, as the method fails to acknowledge men and women as historical beings. The latter method starts from a different assumption and attempts to resolve the teacher-student contradiction. The teacher no longer holds the monopoly on knowledge, neither are students passive objects. Dialogue becomes central in the course of recognizing that men and women are beings in the process of *becoming*—that is, unfinished beings in an unfinished reality. Here, education can be seen as a liberating praxis that aims to transform reality and an indispensable means by which people subjected to domination can fight for their emancipation (Freire 2012). Such a view

questions the idea of a pure and objective educational process, as Richard Shaull writes in the foreword of Freire's work:

“There is no such thing as a neutral educational process. Education either functions as an instrument that is used to facilitate the integration of the younger generation into the logic of the present system and bring about conformity to it, or it becomes “the practice of freedom,” the means by which men and women deal critically and creatively with reality and discover how to participate in the transformation of their world.” (Shaull 2012, p. 34).

Our objectives in this paper are grounded in an understanding of science and education as processes linked to the transformation of social, political, and economic structures. We intervene in the growing body of literature on paradigm change and agroecology to both understand contexts of power relations with regards to agroecology and what a paradigm shift in these contexts would look like. In this paper we thus investigate the issue of knowledge production about agroecology through the lens of paradigm shifts. We argue its potential for emancipatory change is dependent on its capacity to incorporate transdisciplinarity in its approaches. We base our argument on the fact that (1) academic spaces are inherently contested spaces and knowledge production does not occur in a vacuum, but in a context shaped by strong economic interests and power dynamics; and (2) agroecology is a paradigm in consolidation and faces two main challenges at this point: the domination of technical approaches in its justification and the question of which methodologies to employ. We also discuss the role of non-Western epistemologies in the production of knowledge on agroecology and the relationship between academia and actors involved in these epistemologies.

After the “[Methodology](#)” section, we first elaborate on the case of Argentina. The “[Results](#)” section focuses on power relations within academic spaces and how these contexts shape the horizons of paradigm change. Here, most of the empirical material stems from research done in the Pampa-region. In the “[Discussion](#)” section, we link the empirical evidence with broader theories of power and focus on the role of transdisciplinarity in the consolidation of agroecology as a paradigm. We also look at how spaces of alternative epistemologies might contribute to knowledge production on agroecology in Argentina. Part of the discussion section was inspired by fieldwork in Santiago del Estero.

Methodology

This paper draws on ethnographic fieldwork carried out during two periods (February–November 2022 and July 2023–March 2024) in the Argentinian provinces of Buenos Aires and Santa Fe—which form part of the economic heartland of Argentina, the Pampa-region—and Santiago del Estero, which forms part of the Dry Chaco region.

We carried out participant observation with the National Institute for Agrarian Technology (INTA) and organizations pertaining to the National Indigenous Peasant Movement (MNCI), more specifically the Peasant Movement of Santiago del Estero (MOCASE) and the Broad Front for a New Agronomy (FANA). Activities integrating participant observation with MNCI-affiliated organizations included extended stays in peasant territories under MOCASE in Santiago del Estero, participation in immersion trips organized by the movement, attendance at the School of Agroecology in Quimilí, volunteering at the Peasant University in Ojo de Agua, and involvement in various events such as youth encampments and football tournaments held across the province. MOCASE also arranged visits to their projects in Buenos Aires and Santa Fe, most notably to the “galaxies” (see “[Results](#)” section).

We also carried out two periods of semi-structured interviews, with the first period consisting of fifteen interviews with three farmers, three representatives from academia (the University of Buenos Aires, the University of Rosario and the University of Bahia Blanca), four representatives from social movements, three representatives from governmental institutions (INTA), one representative from a cooperative (Federación Agraria Argentina) and one journalist in Buenos Aires, and the second period consisting of 35 interviews with representatives from MOCASE. We incorporated nine semi-structured interviews done between January and March 2019 with stakeholders in the Pampa-region, consisting of three farmers, one representative from academia (University of La Plata), three representatives from social movements and two representatives from governmental institutions (INTA). We also conducted two focus groups, one with farmers in Santa Fe (in 2019) and one with farmers in Santiago del Estero (in 2022).

The data we gathered in these interviews and focus groups was anonymized in order to protect the identities of the respondents. We recorded verbal consent in each interview and received ethical advice from the Faculty of Social and Political Sciences of Ghent University.

Two distinct triangulation methodologies enhance the robustness of the data gathered: method triangulation and theory triangulation (Carter et al. 2014). Method triangulation was implemented by integrating semi-structured interviews, participant observation, and focus groups.

Employing these diverse data collection methods, we captured various dimensions of the actions undertaken by proponents of agroecology across different contexts. Theory triangulation is obtained by utilizing multiple theoretical frameworks to contextualize the discussion and position it within the broader scholarly discourse.

Argentina was here chosen as a case study because of the impact of industrial agriculture on rural areas, the way it shapes governmental decision-making and power relations in academia and because of the activity of social movements engaged in contesting these impacts. We chose Buenos Aires and Santa Fe because of the presence of academic and research institutions in these areas. Santiago del Estero was chosen due to the presence of MOCASE, one of the biggest agroecological movements in the country, made up mostly of peasant and indigenous communities.

Agroecology as a paradigm shift in Argentina

Agroecology gained traction in Argentina as a reaction to the increasingly apparent nefarious effects of the industrial agricultural model. Based on the productivist philosophy of the Green Revolution, this model has resulted in environmental degradation and social exclusion in both rural and urban areas in the Pampas—the economic heartland of Argentina—and in neighboring provinces that this agricultural model is extending into (Paz et al. 2019; Sarandón and Marasas 2017; Sosa Varrotti 2021; Teubal 2013). In a 2011 report, the Argentinian Ministry of Agriculture (Sili and Soumoulou, 2011, p. 87) stated that “*the specialization system with high productivity [referring to cereal monocultures] has negatively affected the soil and environment due to their use of contaminating inputs—fertilizers, pesticides, fossil fuels, etc.—and an increasing propensity to erosion in a lot of marginalised areas has manifested itself*” (translation from Spanish), while Cáceres (2015, p. 131) points out that “*in the course of expansion, agribusiness is not only getting hold of lands that belonged to campesinos, but is also changing the local rules that govern land use and the access to key resources*”. The consequence of this is that peasants are either forced to leave their lands or are pushed into less productive areas where realizing their livelihood strategies is more difficult (Souza Casadinho 2013).

As a reaction to these adverse effects, academics in Latin America started incorporating agroecology into their analysis of agrifood systems in the 1980s as they realized that to envision a solution to these problems, they needed to take into account cultural and ecological heterogeneity of the regions where these social and environmental consequences took place (Altieri 1999). Through congresses and workshops organized by Miguel Altieri, Andrés Jurjevic and Eduardo Sevilla-Guzmán, agroecology spread

throughout Latin America and was propagated in Argentina afterwards by scholars like Santiago Sarandón and Walter Pengue (Sarandón and Marasas 2017). Efforts were made in established institutions to incorporate agroecological programmes. The *Instituto Nacional de Tecnología Agropecuaria* (INTA) set up ProHuerta, a national programme to alleviate poverty and malnutrition through a network of farms and (peri-)urban orchards, reaching over 300.000 people throughout the country (Giobellina and Quinteros 2015). The National University of La Plata installed a Chair of Agroecology in the Faculty of Agronomy, the first in the country to do so (Sarandón 2021). A National Directorate of Agroecology, belonging to the Ministry of Agriculture, Livestock, and Fishery was also created (MAGyP 2020).

These advances are often framed by Argentinian scholars in agroecology as forming part of a “paradigm shift”, which they describe as a new approach to agriculture, addressing the crisis of the industrial model of agriculture, a model that they argue is not capable of resolving its own negative repercussions. Agroecology then

“emerges as a new, broader approach that replaces the purely technical conception with one that incorporates the relationship between agriculture and the global environment and the social, economic, political and cultural dimensions. It presents, therefore, substantial differences with the productivist approach of conventional agriculture in terms of approaches, objectives and techniques.” (Sarandón 2002, p. 43).

This paradigm signifies a shift from the industrial paradigm in at least three ways: (a) it focuses on long-term sustainability; (b) it starts from complexity as a guiding principle; and (c) it recognizes that this complexity leads us to question the idea that science can and should give certainties (Sarandón 2016). This paradigm shift has gone accompanied by a broader reflection on knowledge production, with scholars like Leff (2006) calling for an “environmental epistemology” and de Santos (2011) vouching for what he calls “epistemologies of the South” in an attempt to formulate alternative forms of knowledge production that are critical of Eurocentric academia.

Non-Western epistemologies have shaped agroecology thoroughly and are often found in peasant and indigenous communities as well as social movements and organizations embedded in territories where they face ongoing struggles with actors from industrial agriculture. The province of Santiago del Estero is a great example of this, where peasant and indigenous communities have resisted expansions of colonial and capitalist frontiers for hundreds of years (Paz et al. 2019). The latest cycle of the expansion is characterized by soy cultivation, as the introduction of genetically modified

organisms made possible the rapid expansion of this crop. Peasant and indigenous communities in this province are organized in the Peasant Movement of Santiago del Estero (MOCASE), primarily to stop the evictions of communities by private investors. They are a pronounced agroecological movement and conceptualize agroecology by transcending its agronomic perception and framing it within broader discussions of land, education, health and production.

Results

Argentina has long been regarded as an important case study for the analysis of biotechnology. Genetically modified soy was approved in 1996 in a record 81 days and by 1999, 75% of all cultivated soy in Argentina was genetically modified, taking the form of a true “soybean rush” (Aranda and Holland 2011; Lapegna and Perelmutter 2020; Newell 2009). Newell (2009) describes the power landscape in Argentina as a “bio-hegemony”, portraying the way in which agri-food corporations exert material, institutional and discursive power in maintaining their position in the Argentinian agricultural political economy.

This hegemony is indeed also organized in research institutions and government agencies. In an interview with a respondent in La Plata in 2019, he stated that “*with agroecology we’ve passed through different stages. When they first heard us, they ignored us. When they couldn’t ignore us anymore, they fought us. Now that they realize they are losing the fight, they have started to co-opt us. That is the process that we are going through*”. These three “stages” or “registers” refer to different categories of tensions that exist in research institutions between proponents of agroecology and of industrial agriculture, all of which are handled in different ways by both sides. We call these the three registers of *contempt, conflictivity and co-optation*.

Contempt

The first stage of contempt is characterized by attempts to minimize agroecology’s capacity to generate tangible change and by unwillingness to take agroecology seriously. Related to this stage is a *covert* nature of interaction between proponents of agroecology and those of the dominant agricultural paradigm. Tensions exist, but are often not openly communicated and horizontal dialogue is not always possible. Both in academia and government agencies, actors face disregard in different ways. Funding is here often used as a gatekeeping tool, restricting access to institutional resources for those actors engaged in agroecological projects or research related to it and often explicitly or implicitly censoring certain words. Several respondents mentioned

that the word agroecology had been systematically removed from their institutional database, except from their network which explicitly focused on agroecology:

But later on, what happened wasn’t just a downgrade in importance, but they also applied a very basic methodology. If you took [...] the documents, PDFs, and searched for the word ‘agroecology,’ it only appeared in [our] network. In all the other projects, the word didn’t exist. So, they were eliminating the word from all the projects. Even in some that could be somewhat related or were using the term incorrectly because they weren’t actually doing agroecology but something similar. They removed it. It was left only in [our] network.

Some respondents emphasized the power relationships they perceived at the institutions that employ them. They mentioned that agroecological change was particularly difficult to pitch in those places where ties exist with agribusiness. This again illustrates the importance of economic interests in institutional struggles and the way these intertwine with dynamics of power and change. One respondent stated that:

I can say that in terms of the power relationship there are certain forces, every type of project or everything that is done in [X] goes through the board of [X] and all the organizations linked to the field sit in those chairs, such as the agrarian federation, rural association, they are related to agribusiness in terms of production and use of fertilizers, so when you come up with something new they are resistant to change.

Agroecological actors also have to navigate various ideological barriers, particularly when attempting to find collaborators in research institutions. The difficulties that present themselves when trying to construct counter-alliances and create visibility are yet another characteristic of the stage of contempt. The reduction of research to “subjective” or “ideological” is a common strategy to undermine the impact of agroecological scholarship and is inherently related to power relations. This is reflected in one respondent’s experience, where he refers to having been to scientific events

where we are accused of being ideological. ‘That’s not scientific, that’s ideological.’ So, for us, well: first, it is flattering to be told that what we do is ideological, because it clearly means that we have managed to convey what we want to convey. Now, what is clear is that there is nothing more scientific than ideology, or there is nothing more ideological than science, if you want to put it that way.

Respondents have talked about more subtle forms of disregard, like the act of hiding books related to ecological economics in their faculty, discontinuing classes related to agroecology and wilfully overlooking certain individuals for promotions within institutions:

I made it to the final discussions, there were two of us left. The person who is currently in the position, of course, is the one who won... But there were two of us, and I knew a week before that they didn't want me in the position, though I didn't know why. [...] I'm not going to force myself into a position where they don't want me because they'll make my life miserable. So, that's it, this is where it ends, even though some things were not entirely clear in the selection and scoring process. But, well, if things are arranged so that I don't get the position, that's already a message.

Conflictivity

The second register of *conflictivity* can be described as a register of *overt* interactions, characterized by a recognition of agroecology as a present form of science, albeit one that conflicts drastically with the interests of proponents of the dominant paradigm. This is manifested not through minimization or dismissal of the importance of agroecology, but rather through undisguised and direct confrontation between the advocates of the dominant paradigm and proponents of the new one. It is here that more explicit forms of power relations are revealed and a new struggle presents itself: dismantling the old paradigm and finding allies in the construction of the new one. This struggle faces several obstacles, as academics engaged in agroecology deal with both personal and structural challenges in their institutional surroundings. What differs here is the form in which power relations manifest themselves; they are no longer limited to subtle and discrete forms of coercion but instead open and unveiled conflicts.

One of the characteristics of this stage is the public display of conflicts and the use of punishment towards people working there as a form of intimidation. In most cases, this is directed towards actions, publications, or statements made by actors that radically question the dominance of the existing paradigm. One respondent spoke of how

Since 2016, when the Monsanto International Tribunal was held, we had some pretty tough situations and in 2019, when the leadership of the faculty changed, a very strong, very fierce persecution process began directly against us. In fact, this was our door and after the pandemic they changed the door, they partitioned the door, they made bathrooms on the other side... We

had to enter through that accessory door... Even that happened to us, they walled up the entrance door to the Institute.

This quote is important, as it details one main aspect of this stage of conflictivity: the conflicts that do occur in these institutions do often not take place under horizontal or equal power relations, and require a great deal of strategic manoeuvring on the part of the “insurgent” group. Proponents of agroecology often do not internalize the norms reproduced by the hegemonic powers in institutions, but recognize the power difference and the need to create spaces of manoeuvring. This is reflected in the following answer of one respondent:

We understand that there are times to act more strongly and there are times to withdraw a little and strengthen ourselves. And even, as microorganisms do, there are times to sporulate, which is to be locked up watching what is happening around us and letting everything happen to move forward. Well, we understand that perhaps these are times of a little retraction and some sporulation in order to strengthen ourselves.

Not only are these actions by the authorities testament to the stage of conflictivity, sometimes the position of the agroecological proponent itself comes under threat by the actions of colleagues. One respondent spoke of how after giving an internal lecture on GMO's, “*some colleagues wanted my head and even complained to the director of the institution, demanding I be fired*”.

Still, this conflictivity manifests itself not just through open confrontation, but also through the creation of myths that actively discredit the agroecological paradigm and maintain the status quo. Based on our interviews, we identify four myths that are propagated by the proponents of the current industrial agricultural paradigm, all of which are positioned in direct opposition to agroecology and used as instruments against the agroecological paradigm: (1) agribusiness feeds the planet (and agroecology cannot); (2) the current paradigm is not responsible for noteworthy social, political, economic or ecological damage (and a switch to agroecology will not repair these damages); (3) the current paradigm can fix its own problems (and does not need agroecology to do so); and (4) current biotechnologies do not pose significant health risks (and any claim that argues so is unscientific).

Co-optation

The third and final register of *co-optation* is characterized by a silencing of insurgent voices not through their exclusion,

but through their inclusion in the hegemonic apparatus. Radical ideas and ideologies are transformed and made to fit the parameters of the existing power structures. This stage can partially be seen as a conceptual struggle, with different actors appropriating a term and allocating it a meaning that allows them to utilize it according to their own interests. This is also manifested in the way some respondents have voiced the co-optation of agroecology as their “*biggest fear*”, as they vouch not to become “*the next organic agriculture*”.

There are some issues involved in using the term co-optation, however. Using the term co-optation often implies that leaders are either sell-outs or that movements are easily duped; it might miss the situated agency of leaders and constituents and it may also do a poor job in capturing the political significance of the pressing survival needs of actors in these movements (Lapegna 2014). It is thus important to conceptualize co-optation here not necessarily in terms of hegemonic actors deciding to incorporate agroecology, but rather as a process marked by struggles between agroecology and dominant institutions of authority and power, which is often defined by the actions of agroecologists themselves. This is important as academics proposing the agroecological paradigm often criticize the way agroecology is being portrayed by actors within the same paradigm. One respondent stated that “*we can say that we are seriously concerned about the problem, because we see a very strong co-optation of agroecology, by many who say that they do agroecology but they only do a part of agroecology*”. This relates to a reduction of agroecology, often cut back to technical-agronomic principles that can easily be implemented by corporations. The respondent went on to say that

that is tremendously dangerous because even though they do that part well, they are playing in the hands of corporate and state groups, [...] who are saying “I do agroecology”. Yes, but they do a little bit. [...] You had better not said that you do agroecology then, that you do a small agronomic part, but do not use the name, because [...] it can quickly be co-opted by the state or the private sector.

Paradigm change and the primacy of the technical

A popular term used to describe the transformation of perspectives in academia is that of paradigm change. This applies mostly to scientific institutions, but many respondents extend it to broader knowledge systems, often framing them as “structures” or “belief systems”:

Agroecology is an alternative paradigm, because it is another belief system, it is not [merely] a practice. It is

not a technique that you are going to apply to improve the other. Rather, it is a whole different belief system that comes into conflict with the dominant paradigm.

One respondent stated that the current agroecological paradigm currently finds itself in a process of “consolidation”. Concretely, this means that scholarly debate concerning this paradigm concerns, as they stated it, “*the development of its methodological instruments and the strengthening of its theoretical capacity*”. This process of consolidation is intrinsically linked to the development of the emancipatory capacities of agroecology and may give rise to internal contradictions when enhancing the paradigm’s transformative potential. One such contradiction emerges as a result of the aforementioned dialectic process of on one hand the engagement in the struggle of being recognized as a science, and thus following “the rules of the game”, but on the other hand dealing with the fear of being co-opted. Scholars who actively participate in the field of agroecology often find themselves embroiled in intricate discussions that aim to validate agroecology as a scientifically rigorous discipline; however, this steadfast commitment to defending its scientific merit inadvertently leads to a narrowing and oversimplification of the broader societal implications inherent to agroecology. Paradoxically, this reductionist perspective arises from a genuine desire to garner credibility and acceptance from the academic community, but it unwittingly contributes to a co-optation process that compromises the holistic essence of agroecology and reduces it to a mere technical approach which consists solely of applied practices that superficially address the issues generated by the industrial paradigm. This is what we call the “*primacy of the technical*”. If agroecology can only be validated through its technical-agronomic characteristics, it then follows that other aspects of agroecology are obscured and the paradigm is reduced to a mere band-aid for the fundamental systemic fractures caused by industrial agriculture. One respondent stated that

“I often say, you can’t criticize agroecology without having technical foundations, primarily. That’s where serious agronomists can turn the tables on you. In other words, that’s where they start scratching the surface and where one falters if not well-versed in that area.”

The primacy of the technical thus reveals a very clear divide in agroecological scholarship: on one hand, some actors conceptualize agroecology as a response to multiple crises facing humanity, extending its scope to include sociological, political, economic and cultural analyses; on the other, those actors who approach agroecology primarily as a set

of technical tools, preferring to focus on rigorous technical agronomic arguments to plead for its legitimacy in academia. This is not to suggest that all technical approaches to agroecology are necessarily co-opted or lead to deradicalization, as they are essential; but rather, that the exclusion of other viewpoints creates a divide within the field, one that could potentially be overcome through more collaboration. Many respondents have observed this divide, with one respondent mentioning that:

[...] this is where we are today. That is to say, we have, in several parts of the world, people promoting agroecology with a paradigm shift in mind, one that starts from food production but extends to a broader issue, to social transformation. And then we have people who say that agroecology is just a set of technical tools, which must have a scientific basis—which is true—but they see it as just that, and they think that's fine.

Discussion

Power

According to our research in academic and research institutions in Argentina, we found that the power struggles that actors involved in agroecology face can be divided into three categories: contempt, conflictivity and co-optation. These three categories correspond to the three dimensions of power as identified by Lukes (1974) and are not necessarily exclusionary, but might co-exist depending on cultural, institutional and socio-political contexts that shape certain spaces. The register of contempt conforms to what Lukes called the second dimension of power, or to what scholars (Dahl 1958; Gadini and Miazad 2018) have referred to as “hidden power”. In his book “Power: A Radical View”, Lukes refers to Bacharach & Baratz for his conceptualization of two-dimensional power. He makes the distinction between decision-making processes and nondecision-making processes, with *decision* being the choice between alternative modes of action, and *nondecision* being the thwarting of certain options on the horizon of the decision-maker. Bacharach and Baratz define this second dimension of power as “*a means by which demands for change in the existing allocation of benefits and privileges in the community can be suffocated before they are even voiced; or kept covert; or killed before they gain access to the relevant decision-making arena; or, failing all these things, maimed or destroyed in the decision-implementing stage of the policy process*” (1970, p. 44). Actors who propose alternative modes of action related to agroecology are excluded, censored and defunded, so as to limit the horizon of possibilities in academia and

institutions. They face boundaries that are set up by those in power and the first task for agroecological actors in this stage is thus to lay bare these hidden power relations, exposing the interests that lie behind established principles and so-called “unbiased” rhetoric and create the parameters that allow for their ideas to be recognized. Bruno Latour stated in his influential work “Science in Action”, “*depending on the trials of strength, spokespersons are turned into subjective individuals or into objective representatives. [...] A dissenter accused [...] of being subjective must now wage another struggle if he or she wishes to go on dissenting without being isolated, ridiculed and abandoned.*” (1987, p. 79). Latour would argue there is nothing more powerful in rhetoric than to make “the dissenter” feel lonely or isolated. An example of this happened at INTA, where according to a declaration made by the union APINTA, the words “agroecology”, “climate change”, “gender” and “biodiversity” were censored in their internal communications and social media activities (APINTA 2024). This is a key characteristic of the stage of contempt and might explain why actors involved in agroecology often struggle to make an impact in these institutions, as they are waging a dual struggle: on one hand, a struggle to be recognized as a valid scientific voice; on the other, a struggle to challenge the dominant scientific paradigm.

Once they do succeed in making an impact, this ushers in a stage of conflictivity. This register is also linked to the first dimension of power by Lukes, which is also often referred to as visible power. It involves “*‘direct’, i.e. actual and observable, conflict*” (Lukes 1974, p. 18) “*in which the preferences of the hypothetical ruling elite run counter to those of any other likely group that might be suggested [and] in such cases, the preferences of the elite regularly prevail*” (Dahl 1958, p. 466). This is the stage where differences in power relations become visible and hegemonic structures emerge from the shadows, as they are made visible through the unveiled exertion of their power. This is also where agroecology is acknowledged as an existing alternative, but proponents face severe repercussions for defending it. It is embrace and exclusion. Actors engaged in the promotion of agroecology are sometimes symbolically punished, often with the aim of intimidating and maiming others involved in agroecology. Bourdieu spoke of symbolic power as the often subconscious legitimation of the differentiation of groups in society and the reproduction of the norms that justify the position of the dominant groups (Bourdieu 2003). A key mechanism in this process is the creation of myths and strategic narratives (Schmitt 2018), which reinforce power structures by framing certain viewpoints as desirable and others as excessive or even nefarious. These narratives maintain the status quo by focusing the attention on select

issues and presenting the interests of the dominant group as universally beneficial and even inevitable.

The tension of embrace and exclusion that exists in the stage of conflictivity is resolved in the last stage, co-optation. This stage conforms to the third dimension of power, according to Lukes, also often referred to as *invisible power*. Lukes describes this as a *latent conflict*, “*which consists in a contradiction between the interests of those exercising power and the real interests of those they exclude*”, where “*these latter may not express or even be conscious of their interests*” (Lukes 1974, p. 28). Power is here successfully exerted not in the way that a hegemonic power manages conflict, but through the way it can avoid it. This power relation is expressed to the degree that institutions succeed in eliminating the insurgent aspects of agroecology and streamlining it to the parametric limits of the hegemonic structures. This was termed “repressive tolerance” by Marcuse, referring to the apparent relinquishing of control by the capitalist system of challenging or insurgent ideologies, with this surrender of control in reality being more illusory than real, as it relies on the disarmament and neutralization of these alternatives (Ul-Haq et al. 2022). Marcuse wrote that “*within a repressive society, even progressive movements threaten to turn into their opposite to the degree to which they accept the rules of the game*” (Marcuse 1965, p. 83). In agroecology, this neutralization happens through the reduction of the paradigm to its mere technical principles. As agroecology is streamlined in academia, its reach dwindles and its socio-economic and political-cultural principles vanish, performing a mere complementary function to the agronomic core of the discipline (Sevilla Guzmán 2011; Sevilla Guzmán and Woodgate 2013).

The use of language and discourse cannot be underestimated in this stage. A key aspect of the success of co-optation is the degree to which hegemonic powers in institutions are able to determine the indicators through which paradigms are analyzed. Many authors refer to this as “*performative intent*” (Engelen 2002; Fournier and Grey 2000; Ul-Haq et al. 2022), the pre-commitment to efficiency and optimization as the determining factors that condition the validity of an argument. This category is portrayed within these institutions as existing outside of the economic reality, as objective indicators, obscuring the fact that they constitute this reality and shape it through the assumptions that are made at the point of departure of and throughout the analysis (Callon 2008; Mackenzie 2006). By determining agronomic and technical principles—such as output, efficiency and cost minimization—as the primary scientific criteria for the validity of agroecology as a paradigm, institutions lay the foundations for its neutralization. This is not to suggest that these conditions are unimportant, but rather that consistently prioritising them over other criteria risks

narrowing the scope of agroecology, limiting its potential as a transformative approach by disregarding its social, political, economic and cultural dimensions.

The hegemony of agribusiness in academia is reflective of a broader international economic and political constellation, one which has had a profound impact on Argentinian politics in the last decades. Argentina was the first country to legalize genetically modified soy in 1996 (Adriaensens et al. 2025), which was followed by what observers have called a “soy fever”, reminiscent of the “gold fever” back in the 19th century (Lapegna and Perelmutter 2020). As soy could now be grown in regions where it could not beforehand, private investors from the Pampa region rapidly expanded outwards into provinces like Santiago del Estero. The neoliberal government of Menem (1989–1999) approved and introduced many of these new so-called “gene revolution” technologies, which had a profound impact on the Argentinian landscape, with disastrous consequences for peasant and indigenous communities (Lapegna 2013, 2016; Pingali and Raney 2005). In 2003, Néstor Kirchner took office and although he and later his wife Cristina Fernández de Kirchner (2007–2015) confronted agribusiness discursively, as they were the Argentinian representatives of the so-called “pink tide” governments in Latin America, they did little to alter the neoliberal foundations that they inherited after Menem left office. Instead, they represented what is now referred to as neodevelopmentalism in Argentina, where extractivism—including the activities of agribusiness—is taxed and the appropriated rents are then used to fund programmes fighting poverty and policies to promote social mobility. Still, their initiatives did not change the economic and political matrix from the neoliberal period, but instead helped maintain the hegemonic power of agribusiness in the country.

Paradigms and transformation

Agroecology is frequently described by its proponents as encompassing a major transformative shift, often referred to as a paradigm shift; this term is intermittently applied within scholarly discourse when discussing the influence of agroecology. However, in numerous instances, it is not supplemented with a comprehensive explanation that articulates the meaning of a paradigm, how agroecology aligns with such a concept, and the characteristics of a purported paradigm shift. The idea of a “paradigm shift”, within the framework of agroecology, has been employed to characterize transformations in areas ranging from crop protection and productive practices to public policies, communication, and social networks (Borsatto et al. 2022; Duff et al. 2021; Otieno et al. 2023; Soto et al. 2022). The confines of this paper do not allow for the creation of a novel interpretation

of what a paradigm (shift) entails, instead, our focus lies on drawing from the principles set forth by Thomas Kuhn (among other scholars) as a basis for a succinct analysis of its implications for agroecology. Presuming the principle of incommensurability as fundamental to defining a paradigm, it then follows that the agroecological paradigm can only be considered as such if it radically reimagines not only agronomic practices, but also the social, cultural, economic and political ramifications of agriculture and the ways in which science approaches them. To talk about transformative agroecology is to imagine a new paradigm that is inherently incompatible with the current one, where actors involved in knowledge production on agroecology practice their trades in different worlds than those engaged in the paradigm of industrial agriculture. For this paradigm shift to materialize, we must view agroecology as inherently transformative, developing its own methodologies and approaches.

The conceptualization of agroecology as a transformative paradigm can only be substantiated through its envisioning as a holistic approach relying on transdisciplinarity. For one, this means shifting away from the primacy of the technical through a transdisciplinary approach that moves beyond the agronomic gaze of agroecology and integrates perspectives from other disciplines, incorporating political, technical, economic, organizational, methodological, pedagogical, and philosophical principles in the process (Giraldo and Rosset 2022). Achieving such integration requires contributions from diverse scientific disciplines and it cannot be undertaken without a radical questioning of the prevailing hegemonic structures within academia. Secondly, this necessitates reevaluating the existing methodologies that are used in the production of knowledge and transcending the institutional boundaries to move towards nuclei of co-creation of knowledge. For agroecology to fully generate a paradigm shift, it is imperative to decolonize the process of knowledge production and extraction from the territories; this involves recognizing epistemic justice (Peddi et al. 2023) and valuing diverse epistemologies that extend beyond the confines of institutions influenced solely by Western academia. It is to engage in a discourse that acknowledges the agroecological multitudes that exist and the reach it has beyond the discipline of agronomy or the university walls; it entails creating alliances to contest hegemonic structures that agroecological actors face, both in research institutions and outside of them.

Still, some caution is warranted when addressing transdisciplinarity in agroecology. Transdisciplinarity is often described as an approach that engages in socially responsible science (Bernstein 2015; Lembi 2022). Going “beyond the disciplines”, it values extra-institutional cooperation in its aim to create a systemic and enduring science (Mittelstrass 2011). This has led some to call this a science of

sustainability (Brandt et al. 2013). However, there have been some doubts about the use of the word, as its widespread usage have let some to interpret it as a buzzword which is often employed to secure funding (Maasen et al. 2006; Schmidt and Pröpper 2017; Toomey et al. 2015). Here, we interpret transdisciplinary science as a science that is inherently focused not only on engaging and valuing the production of knowledge outside of academia, but also on generating a societal impact through this knowledge. This relates to what Paulo Freire refers to as “conscientização”, the awakening of a critical consciousness with oppressed and excluded groups in society, or as Torre (2014) describes it, “*a process wherein people develop critical consciousness through collective inquiry, reflection, and action on the economic, political, and social contradictions they are embedded in*”. Also important to note is that although transdisciplinary methodologies by themselves do not guarantee transformative change—they are already present in many institutions—they are an important prerequisite for such change (Giraldo and Rosset 2022; Méndez et al. 2013).

Alternative epistemologies and popular education

Agroecology and its relationship to the development of science in Argentina cannot be analysed without considering how knowledge is produced there and who benefits. The repeated epistemic injustice (Peddi et al. 2023) that is exerted towards peasants and indigenous communities in the form of exclusion, dispossession and disparagement leads to a constructed superiority and scholarly elitism of Western modes of knowledge production, a position which is then hurled upon and internalized by these communities (Connell 2014; Rivera Pichardo et al. 2022; Viniestra-Velázquez 2020). The construction of knowledge in Western academia often takes place through processes of what is commonly referred to as “extractive” inquiry, with a lack of feedback mechanisms between the researchers and the communities involved, and limited recognition of the voices of the stakeholders involved in shaping this knowledge (Koskinen and Rolin 2019; Latulippe and Klenk 2020; Sands et al. 2023). Agronomists are often framed as “*those who know*” and peasants and indigenous communities as “*those who need to learn*”, leading to an approach to knowledge production that minimizes the agency of these communities and establishes a vertical and exclusionary relationship between the “experts” and the “non-experts. As agroecology consolidates as a paradigm, it must then consider the power differences that shape the relationship between Western academia and non-Western epistemologies. Methodologies like popular education, participatory action research and participant observation can (and often already do) bridge the divide that exists between Western academic knowledge and alternative

forms of knowledge and contribute to a transformative agroecology (Meek et al. 2024; Tarlau 2019).

In many spaces of popular education, education is not merely about learning how to read, but also how to “*read reality*”, as the oppressed are empowered when they understand their position and are engaged in organized struggle for their own humanization and liberation (Freire 2012). This is also the case in Santiago del Estero, where MOCASE has been organizing spaces of popular education since 1990 throughout the province. One of the main objectives of popular education in the projects of MOCASE is to contest and deconstruct concepts of superiority and valorise the knowledge that arises out of experiences from peasant and indigenous communities in their own territories. This approach forms the basis of MOCASE’s work in Santiago del Estero and has a profound impact on the self-belief of peasants.

MOCASE engages in popular education in three direct ways: through their School of Agroecology, their Peasant University, and their “*Galaxies*”. The School of Agroecology was founded in 2007 in Quimilí (Santiago del Estero) and provides primary and secondary education to students from different provinces in Argentina. It was founded with the aim of fostering political formation and collective memory within the movement, while also reproducing and “multiplying”, as they call it, different knowledges and experiences and creating spaces of exchange to facilitate dialogue between people from different territories and/or movements. Much of the youth from rural communities in Santiago del Estero lacks concrete education opportunities due to the distance and costs involved in attending primary and secondary schools. This is why MOCASE based its education structure of the Agroecological School around an alternation system, with students attending classes one week a month and spending the rest at home. The school firmly views its students as subjects who are participants in the process of knowledge production, not as vessels for the storage of knowledge. This reflects a dignification of the agency of peasant and indigenous communities that resonates at the very heart of the whole movement.

The Peasant University UNICAM-SURI (acronym) was founded in 2011 in Ojo de Agua (Santiago del Estero), after a thorough reflection on how the education of peasant and indigenous communities in the region should look. It develops courses concerning theory and praxis that the movement identifies as crucial for its own development but also for the development of local communities. It does not start from an individual logic, but from a logic of “*belonging*”, as they consider education to be an integral part of “*weaving a new social fabric*”, as one respondent put it. On one hand, the University aims to integrate vulnerable young people into rural communities and on the other hand aims to strengthen the organization through the exchange that happens during

the courses. It aims to be a “*university for Argentina and the whole of Latin America*” and combines traditional education with other pedagogical forms that recover local and ancestral perspectives. The political objective of this university is threefold: Firstly, to have a distinctly critical and autonomous space to develop knowledge in a decolonial manner; secondly, to exert influence on public and private universities; and thirdly, it also serves as a point of political organization of the movement.

The experience of UNICAM-SURI gave rise to the “*galaxies*”, initiatives led by MOCASE that aim to integrate vulnerable young men and women into local rural projects, addressing the pressing social challenges surrounding them. One such galaxy, situated in Mercedes (Buenos Aires), supports marginalized youth living in precarious conditions, deprived of the opportunity for a dignified life. Another galaxy, located in Maximo Paz (Santa Fe), focuses on empowering vulnerable girls residing in children’s homes. To combat child trafficking, a new project is being planned in the province of Formosa. These agroecological projects transcend the realm of agriculture, emphasizing the creation of thriving, resilient communities. Central to this endeavour is the construction of alternatives for at-risk individuals and vulnerable populations. MOCASE describes the galaxies as “*refuges of good living to those who have been denied human, economic, cultural, political and/or religious rights by the individualist, colonial, patriarchal and capitalist society.*” (MOCASE Via Campesina 2020).

The relationship between popular education and ancestral knowledges on one hand and academia on the other need however not be a distant one. What has often been described as *dialogo de saberes* focuses on the horizontal exchange of knowledge and experiences between different actors engaged in agroecology (Delgado and Rist 2016; Leff 2006; Martínez-Torres and Rosset 2014). Key here is the equal consideration of not only different actors, but also of their lived experiences and the forms of knowledge exchanged. Knowledge is exchanged in an active manner, through meaningful participation of different actors and the recognition of different forms of knowing. Agroecology can only succeed as a transformative paradigm insofar as it accomplishes to cross the borders of academic institutions and engages with other epistemologies through *diálogo de saberes* to construct a broader and inclusive paradigm that recognizes different forms of knowledge production.

To be transformative or emancipatory, agroecology thus needs to establish alternative arenas for collective learning and empowerment. These spaces should be under communal oversight, aimed at transcending the oppressive official education that instils shame in being a peasant and perpetuates the colonial patterns of the industrial agricultural system, emphasizing individualism and competition. Instead, they

should foster a spirit of humility and collaboration, where knowledge is shared in a reciprocal manner, nurturing the growth and preservation of peasant identities. Any relationship that is initiated between academia and these alternative spaces should work on decolonizing and decommo- difying the knowledge exchanged during this collaboration.

Conclusion

Agroecology as a science in Argentina encompasses more than just academia. It is marked by the power struggles that exist within academia and the alternative epistemologies that play an important role in the dissemination of agroecological knowledge outside of research institutions. The conceptualization of a paradigm shift as a transformative change then entails a radically new envisioning of addressing the crises that we are faced with today. The concept of a “paradigm” seems to be utilized by many advocates of agroecology in Argentina, but a concrete definition is often not provided in scholarly discourse. We used Kuhn’s paradigm theory to frame the objectives of this paper, in which we consider agroecology as a paradigm in consolidation. Those seeking to legitimize agroecology as a science face a strong dominance of technical approaches, while the question of which methods to employ becomes more pertinent through the recognition of alternative modes of knowledge production that can shape emancipatory futures. We proceeded to identify three categories of how power operates within academia and analysed how unequal patterns emerge in the relationship of academia and non-academic spaces. We then acknowledged the imperative of embracing a transdisciplinary approach within agroecology. This approach is essential when envisioning a paradigm shift that actively challenges not only the prevailing dominance of industrial agriculture in academia, but also the methodologies that accompany it.

Still, further research is warranted in three key areas. Firstly, the concept of co-optation has faced criticism within academic discourse, requiring a more comprehensive conceptualization that explicitly delineates the underlying conditions driving this co-optative process. Secondly, the notion of a paradigm shift has been the subject of extensive debate, yet a lack of clarity persists regarding its interpretation among scholars. Some employ it to denote incremental improvements in farming practices and public policies, while others perceive it as signifying structural transformations in our understanding of the role of agriculture in society. Consequently, greater clarity and consensus are needed to elucidate the varying understandings and implications associated with this concept. Thirdly, more attention should go to exploring how academia engages with alternative

epistemologies and the power dynamics inherent in these relationships. While recent scholarship has focused on epistemic justice and the appreciation of indigenous knowledge systems, further investigation is necessary to uncover the power dynamics that shape agroecological knowledge production, which voices are privileged and under which conditions they are heard.

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Publisher's note Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

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