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International Journal of Phenomenology, Hermeneutics and Metaphysics

Gadamerian philosophical hermeneutics and the laudanian perspective of research traditions in agronomy

A hermenêutica filosófica gadameriana e a perspectiva laudaniana das tradições de pesquisa em agronomia

Leandro P. Albrecht[1]
Universidade Federal do Paraná - UFPR

Alfredo Junior Paiola Albrecht[2]
Universidade Federal do Paraná - UFPR

ABSTRACT

Agronomic science or technoscience has an important role in contemporary times and is the focus of necessary philosophical investigations. The present study aimed to relate Gadamerian philosophical hermeneutics with the Laudanian concept of philosophy of science, also applied to the philosophy of technology within the agronomic context. The central question to be answered is: can Gadamerian philosophical hermeneutics apply to the understanding of agronomy? Given this, central references and commentators were selected, dividing the dialogue between the authors and the argumentation into the following points: sciences, technologies, and Gadamerian philosophical hermeneutics; agronomic traditions and their Laudanian progress; reaching the final possibility of intersections between Gadamer and Laudan, when reflecting on agronomy, especially on the theme of traditions.

KEYWORDS

Agronomic science; agrotechnologies; Gadamer; Laudan

RESUMO

A ciência ou tecnociência agronômica possui relevante papel na contemporaneidade, sendo, portanto, foco de necessárias investigações filosóficas. O presente trabalho tem por objetivo relacionar a hermenêutica filosófica gadameriana com a concepção laudaniana de filosofia da ciência, aplicada

[1] E-mail: lpalbrecht@yahoo.com.br
[2] E-mail: ajpalbrecht@yahoo.com.br

também a filosofia da tecnologia, dentro do contexto agronômico. Em que a questão central a ser respondida é: a hermenêutica filosófica gadameriana pode ser aplicável ao entendimento da agronomia? Face a essa problemática, foram selecionadas bibliografias centrais e comentadores, dividindo o diálogo entre os autores e a argumentação nos seguintes pontos: ciências, tecnologias e hermenêutica filosófica gadameriana; tradições agronômicas e seu progresso laudaniano; chegando à possibilidade final de interseções entre Gadamer e Laudan, no refletir sobre a agronomia, em especial, na temática de tradições.

PALAVRAS-CHAVE
Ciência agronômica; agrotecnologias; Gadamer; Laudan

INTRODUCTION

Agronomy, as a science, technology, and/or technoscience, is a field that is still arid, inhospitable, and yet to be explored and cultivated by philosophy. Agronomy deserves special philosophical attention, whether due to epistemological, bioethical, or social aspects. Considering the role of agronomy in the contemporary scenario, with a view to food security and sustainability, in itself, would be a field for fruitful reflections and in-depth analyses.

The search for good practices in agriculture and livestock farming on the emerging needs for environmental preservation provides considerable pressure for adjusting or creating new concepts, theories, and technologies. This occurs in progress mediated by problem-solving, considering a set of anomalies, which can be a driver of instability within current paradigms or traditions. This in a larger panorama regarding the influence of internal and external, cognitive and non-cognitive aspects, on the development of science. And, all this without ignoring an adaptive and historical evolutionary scenario, which includes historicist interpretation and understanding. A historicist understanding that brings to light authors such as Dilthey and Gadamer, but also Kuhn and Laudan, among others, whether in human sciences or natural sciences (respectively), whether in pure science or applied science, whether in science or technology.

The vision of agronomy timidly covered in studies on the subject tends to be Kuhnian; however, we adopt here a posture of understanding based on Laudan's philosophy. With the aim of better understanding possible developments in Laudan's concept of traditions, a dialogue is promoted between Laudan and Gadamer's philosophical hermeneutics. With this purpose, the argument focuses on two works by the aforementioned authors: "Truth and Method" by Han-Georg Gadamer and "Progress and its Problems: Towards a Theory of Scientific Growth" by Larry Laudan. In a related and accessory way, other authors/commentators are consulted, subdividing the philosophical argument into three topics that follow.

SCIENCES, TECHNOLOGIES, AND GADAMERIAN PHILOSOPHICAL HERMENEUTICS

Philosophical hermeneutics, with its exponent in Gadamer, is notoriously related to discussing and understanding human sciences; however, several authors seek to make the connection between hermeneutics (especially Gadamerian) with the study of sciences as a whole (including natural sciences). In this sense, some authors/commentators are cited such as Galindo (2005), Silva (2013), Videira (2013), Babich (2016). However, attention is paid here to "Truth and Method" by Han-Georg Gadamer and his commentators, as it is the fundamental pillar of the discussion.

The first step to follow in this work is to understand the concept of hermeneutics in Gadamer. In Gadamer's own words, the "traditional self-understanding of hermeneutics rested on its character of being a technical discipline (p. 354)", with an obvious connection between hermeneutics and social sciences in Dilthey (BABICH, 2016), being an understandable tendency of hermeneutic tradition (SILVA, 2013, p. 63). Regarding the concept of hermeneutics,

> [...] It is necessary to understand the whole from the individual and the individual from the whole. It is a rule coming from ancient rhetoric and that modern hermeneutics has transported from the art of rhetoric to the art of understanding. Both here and there, a circular relationship underlies. The anticipation of meaning that aims at the whole reaches an explicit understanding through the fact that the parts that are determined from the whole determine, in turn, that whole. [...] then, it means that the expectation changes tune, and the text is collected in the unity of an intention under a different expectation of meaning. Thus, the movement of understanding goes constantly from the whole to the part and from this to the whole. The task is to expand the unity of meaning understood in concentric circles. The corresponding criterion for the correctness of understanding is always the agreement of each particularity with the whole. If there is no such agreement, it means that understanding has failed. (GADAMER, 2021, p. 386).

However, hermeneutics in Gadamer gains new airs because, despite the "habit of linking hermeneutics to literature and classical philology, as well as to theology and law [...], hermeneutic approaches to the philosophy of science provide the basis for a philosophical reflection on the natural, as in fact the social sciences, including rather than excluding the history of science [...]" (BABICH, 2016, p. 497). Noting that Gadamer, like Heidegger, "highlights the academic tendency to connect the arts and sciences" (BABICH, 2016, p. 498), as well as more easily connecting the arts and technology, in a context of plurality, present in Gadamer, but also the conception of philosophers of science such as Larry Laudan (GALINDO, 2005) and Paul Feyerabend (SILVA, 2013, p. 67), among others.

However, despite affirming the universality of hermeneutics, Gadamer was held hostage by the inductivist conception of natural sciences in "Truth and Method,"

characterizing his lack of interest in this turn (SILVA, 2013, p. 63). What can be seen in Gadamer's words when referring to the role of traditions, for which "scientific investigation as such does not receive the laws of its progress from these circumstances but solely from the law of the thing that opens itself to its methodological efforts" (p. 376). Still, for Gadamer, it is "useless to dispute that moments of tradition may also be operative in natural sciences, for example, in the form of certain occasions where certain research orientations are preferred" (p. 376). However, Gadamer himself, in a note, admits that "this issue seems much more complicated since Kuhn" (p. 376).

This possibility of revising Gadamer is evident in the post-positivism of Popper, Kuhn, and other defenders of the thesis of "theoretical impregnation of observation" and their objections against traditional inductivism "according to which science is based on observations and only slowly and gradually ascends to theories" (SILVA, 2013, p. 64). In the meantime, historicist elements are added, which Gadamerian philosophical hermeneutics can contribute because, in the case of hermeneutics, "this historical sensitivity is expressed in an appreciation of the practical context and the horizon of meaning in which the sciences are rooted" (SILVA, 2013, p. 64). In this historicist sense, philosophers of science come closer, after Kuhn, to Gadamer, in agreement with Galindo (2005) and that, in the face of "dominant epistemological methodology, we need to ask whether the emergence of historical consciousness managed to truly and completely separate our scientific behavior from that natural behavior about the past" (GADAMER, 2021, p. 374).

> A truly historical thought must include its own historicity in its thinking. Only then will it stop chasing the ghost of a historical object – the object of an investigation that is advancing – to learn to know in the object what is different from itself, thus knowing both one and the other. The true historical object is not an object but the unity of one and the other, a relationship formed both by the reality of history and the reality of historical understanding. A hermeneutics appropriate to the thing in question must show the reality of history in its own understanding (GADAMER, 2021, p. 396).

Another aspect related to natural sciences with Gadamerian philosophical hermeneutics is the similarity of the hermeneutic circle. For Gadamer, "interpretation involves projections or anticipations of meaning based on the interpreter's assumptions or prejudices," and this is similar to the "hypotheses of the hypothetico-deductive method, while the review of projections of meaning during the interpretative process resembles the testing of hypotheses through their confrontation with experience" (SILVA, 2013, p. 65).

And even this confrontation can be carried out in the context of plurality, both for Gadamer and for Laudan and Feyerabend. Feyerabend works at the conjuncture of rival theories, while Laudan focuses on the issue of effectiveness in problem-solving. This has a connection with Gadamer, who proposes the criterion of coherence, where

it is possible, without leaving the hermeneutic circle, "to detect inappropriate prejudgments or presuppositions" (SILVA, 2013, p. 67). In this sense, the confrontation with other interpretations and theories, in the Gadamerian sense, would contribute to detecting inappropriate prejudgments, which values "strongly the openness to the alterity of the other, as it is normally in the confrontation with other perspectives" that one becomes aware of prejudgments (SILVA, 2013, p. 67). This is within a historical context, in which

> [...] hermeneutic reflection here needs to sharpen the methodological self-awareness of science. Some hermeneutical requirements are indeed met by themselves and without difficulty, where a historical connection only arouses historical interest (p. 394). [...] This temporal distance gives us the conditions to resolve the true critical issue of hermeneutics, that is, to distinguish the true prejudgments, under which we understand, from the false prejudgments that produce misunderstandings. In this sense, a hermeneutically formed consciousness will also have to include historical consciousness. It will become aware of its own prejudgments that guide understanding so that the tradition stands out and gains validity as a distinct opinion (p. 395). [...] one's own prejudice only really comes into play to the extent that one is already involved in it (p. 396).

Another aspect that brings Gadamerian thinking closer to philosophers of science like Laudan is rationality (GALINDO, 2005), a rationality linked to the historical situation and traditions. For Silva (2013, p. 68), Gadamer's proposal for a "hermeneutics of integration" leads to a view in which the "hermeneutic circle starts from assumptions of rationality, which marks its specificity about scientific-natural research." In this rationalist attempt by Gadamerian thought regarding prejudgments and tradition, the

> [...] Is it true that being immersed in traditions means, first and foremost, being subjected to prejudgment and limited in its own freedom? Isn't it true that every human existence, even the freest, is limited and conditioned in many ways? And, if this is correct, then the idea of absolute reason represents no possibility for historical humanity. For us, reason only exists as real and historical; this simply means that reason is not the owner of itself, as always referred to the data in which it exerts action (GADAMER, 2021, p. 367).

Another theme is that if hermeneutics is considered the philosophical analysis of interpretation, hermeneutics can go beyond the understanding and ratification of theories, going beyond the natural sciences. This possibility produces another effect on hermeneutics, "which is to make it worry about materiality." This "expansion of hermeneutics from the text to the thing makes it possible to link the philosophy of

science with the philosophy of technology" and philosophical hermeneutics in Science Studies projections. At this core, another possible contribution of hermeneutics to the philosophy of science and technology would be to highlight its "specific cultural form, but without this implying adherence to relativism" (VIDEIRA, 2013, p. 24-25).

AGRONOMIC TRADITIONS AND THEIR LAUDANIAN PROGRESS

The historicist conception of progress in science adopted here is that of Laudan, for whom "theories are inevitably involved in solving problems" (LAUDAN, 2011, p. 99), as the exemplars are, in a way, for Kuhn (2013). However, for Laudan, it is clearer and stronger than any other author that the "central cognitive test of any theory involves evaluating its suitability as a solution to certain empirical and conceptual problems." It is also plausible to adopt these premises in Laudan about an applied science such as agronomy and its historiographical analysis and configuration of its epistemological statutes. Considering these premises as valid, from here on, we analyze the progress of agronomic science, focusing the arguments on Laudan and his concept of traditions in science.

Before even going into and exemplifying, and contrasting the concept of research traditions in Laudan (with specific theories, methodologies, and axiologies – as central components), it is worth summarizing what a paradigm is, in the Kuhnian view, in parallel, since it is usually a commonly used reference, but not always well understood and applicable to all segments of science or science and technoscience. The paradigm "as the constellation of group commitments" can be replaced in Kuhn with the reference to the "disciplinary matrix", being composed of symbolic generalizations, metaphysical parts, values, and exemplars (2013, p. 288-295). In this, scientists, within mature sciences, will accept the prevailing paradigm within a normal development of science, and only in periods of crisis would viable alternatives be examined (KUHN, 2013; LAUDAN, 2011). And that the problem of scientific change, from a revolutionary perspective, would be the incommensurability between exemplars in successive competing paradigms (LAUDAN, 2011, p. 196 and KUHN, 2013, p. 309-316).

However, for Laudan (2011, p. 99-211), theories, which in Kuhn would be like exemplars (making a simplified parallel), would denote "specific sets of doctrines" in science related to hypotheses, theses, axioms, and principles. These theories can be used for "specific experimental predictions and give explanations" of natural phenomena, both in Kuhn and Laudan. But theories would also have a broader role in Laudan, designating a "set of more general doctrines or assumptions, more difficult to test" (within the context of historical reference of research traditions). Added to this, Laudan's consideration that paradigms would be, in Kuhn, something more than a tradition, something like a "means of looking at the world," thereby involving unclear "broad visions or almost metaphysical premonitions" of a certain field of knowledge. Allied to questions shared by Feyerabend (2011) about the "incorrectness" or factual lack of historical "stipulation" of the reality of a typical Kuhnian normal science (also absent in agronomy, as will be seen).

Nevertheless, the strongest question raised here about Kuhn's proposal, compared to Laudan's, is that, in Kuhn, there is a certain "inflexibility of paradigms" in addition to difficulty in achieving explicit and rigid incommensurability. For Laudan, "it is difficult to adapt the inflexibility of Kuhnian paradigms to the historical fact that many maxitheories have evolved" (2011, p. 106). Therefore, it is noted that Kuhn's paradigms "have a structural rigidity that prevents them from evolving, in response to the weaknesses and anomalies they generate." This, associated with other factors already mentioned and to be described exemplarily, makes it possible to detach, even partially, agronomy from a Kuhnian vision, bringing it closer to the Laudanian perspective. Noting that the integration of research traditions in Laudan is a legacy of Lakatos, both differing from incommensurability in Kuhn or even in Feyerabend, even given the softening of the term's implications when it appears in Hacking (2012, p. 136-145). In Laudan, the issue is to analyze the adjustments that occurred within a research tradition over time because, unlike Kuhn, who speaks of revolutions, the most typical phenomena in Laudan's concept are adjustments.

The above does not prevent Laudan from sharing aspects fully in common with Kuhn, such as the rejection of the cumulative character of science, also adopted by Feyerabend but advocated to some extent by Popper. It also highlights the importance of values in the construction of science, where Ludwik Fleck and Kuhn lay the constructionist sociological foundations of science, and Feyerabend radicalizes it in patronage, persuasion, and subterfuge. However, in Laudan, there is a more moderate or prudent version as an internalist, restricting or focusing more on internal (cognitive) values and placing secondary values on external ones. Regardless of the gradient in which values usurp the exemption of science, a consideration is present in all these authors, and even in Popper, about the extra-method (but no less epistemic) role in shaping what science is in practical expression. Noting that Laudan, to a certain extent, inherited rationality from Popper (but without demarcation purposes), the influence of programs from Lakatos, and values from Kuhn, as well as the delimitation of reason from Kuhn and the need for plurality from Feyerabend. But, regarding values, Lacey and Laudan's meta-scientific perspective proves to be potentially more effective for agronomy (because it foresees adjustments, which highlights such efficiency), as induced by observations in Bezerra (2012, p. 484), in the Laudanian reticulation focus.

Leading arguments about the theoretical-practical macromodels of so-called conventional agriculture (based on mechanization, use of agrochemicals, breeding, etc.) versus (or supposedly "versus") agriculture now called agroecological (like organic agriculture). The same, departing from a Kuhnian vision, where they would be called conventional paradigm and agroecological paradigm, we assume here, in an appropriate way (as we will see), conventional tradition and agroecological tradition (but both modern and with a current presence).

When assuming the Kuhnian stance, one tends to observe the supposed paradigms as opponents or in succession in the history of agronomy; however, they are more like competitors in the Laudanian vision. Because there is no necessary antagonism or clear incommensurability, at least that is not what is observed in a

scrupulous historiography. Because the two supposed paradigms, correctly or better-called traditions, have existed in history for a long time. Regarding only the last three decades, we can observe a growing adoption of conceptual and empirical concepts typical of agroecology, mainly due to environmental and social questions arising from technological problems of applying conventional agriculture. Nevertheless, conventional agriculture also grew, not serving exclusive economic or scientific market niches but broadly adopting good ecological practices in agriculture, introducing biotechnological tools and digital innovations.

Critics of these positions, close to Laudan and distancing themselves from Kuhn, could state that these advances or progress in agronomic science in the consolidation of conventional agriculture would be a reflection of the adoption of ad hoc concepts or a dialectical effort of synthesis or even the emergence of a new paradigm. But this does not refute the argument that it is still a tradition sharing common elements, which does not prevent intersection with other traditions, such as agroecology, and does not impose incommensurable theories with a supposed competing tradition or paradigm in exclusive crisis. This could give rise to Kuhnian revolutionary science, to be seen as a revolutionary proposal, agroecology.

However, both agroecology and the so-called conventional one (which would be the paradigm of normal science in crisis for Kuhn or hegemonic tradition in Laudan) contemporaneously adopt laws or theoretical achievements in other areas (such as mathematics, physics, chemistry, biology, etc). Both involve the use of concepts and practices that are integrated or integrative with the environment, have related ontological bases such as trophobiosis and homeostasis, assume good practices in the holistic view of the production system, and accept and use experimental statistical methodological principles, and therefore, empirical, in common, either based on statistics premises or univariate, multivariate, or Bayesian inference, or even open to new probabilistic discoveries that allow the testing and predictability of theories. The traditions in question walk in parallel as competitors but embrace common aspects, not "speaking different languages," and, therefore, are commensurable despite competing.

For Laudan, "every good research tradition contains significant guidelines on how its theories can be modified and transformed to increase its ability to solve problems (2011, p. 130). Nonetheless, many of the assumptions made by theories in a research tradition can serve as exclusion marks, "influencing the recognition and consideration of the empirical and conceptual problems of their component theories, and can offer heuristic guidelines for generating or modifying specific theories" (LAUDAN, 2011, p. 132). A dynamic and flexible process can be observed within the tradition, as it is in the agronomic experience. These processes, which progress from solving problems, can lead to the emergence of a new tradition, distinct from the revolutionary mode in Kuhn.

To make the argument more clear, it is important to detail what these models would be, now called traditions. The macro agroecological tradition rescues the importance of traditional knowledge and effective ecological practices of ancient

agriculture, such as those practiced since the Sumerians, Egyptians, Hebrews, etc. (and even transcribed in sacred books, such as the concepts of crop rotation, fallow, environmental balance, etc.). Or even it may be associated with or invoking principles of the first agricultural revolution of modern times or even the birth of new agriculture, with the rescue of Greek and Latin traditions. Which, according to Mazoyer, Roudart (2010), was associated with the functioning of agrarian and productive systems without fallow in temperate regions, a type of ancient agronomic tradition but which allowed the renewal of fertility more efficiently through crop rotation without fallow, green manure with legumes and enrichment with hummus.

The research tradition, currently stylistically called agroecological, is, to a certain extent, the rescue of some of these "remanufactured" old empirics and concepts (such as dynamic balance and trophobiosis – among the specific theories), with a modern and agrotechnological guise (instrumentalizing research and sophisticating analysis – within methodologies), in the sense of a more sustainable proposal and respecting popular knowledge, to a certain extent (such as central axiology). A good theoretical and practical example of this new approach is organic agriculture, which responds in its technological results to great achievements, such as the prospect of meeting food demand on a large scale (being, therefore, the most promising aspect within agroecology). Noting that organic agriculture is a framework for solving conceptual and empirical problems, which generates responsive and valid theories within a segment of the agroecological tradition.

In addition, perhaps within a Laudanian vision, organic agriculture will soon be a new, consolidated tradition that will emerge from within the macro agroecological tradition (or even strengthen it, without dissociating from it). This is because organic agriculture combines specific theories of integrated management, integrated systems in regenerative agriculture, and good practices in low-carbon agriculture (to a certain extent currently shared by today's so-called conventional tradition) with field experimental methodologies that allow joint and scalable analyses (partially used also by the conventional tradition), and axiology that encompasses all the pillars of sustainability (balancing the environmental, social and economic aspects, as it aims to meet demands concerning food security, by aiming for larger-scale production).

What was called conventional agriculture here is the most predominant in scientific and technological practices, but that does not mean we could call it the prevalent paradigm in so-called normal science in the Kuhnian language. What it represents is just another macro tradition in agronomy, in which conceptual and empirical problems are solved, sometimes following methodological standards similar to agroecology, with detailed differences. What stands out in terms of difference are alleged values, where, internally, the biggest discrepancy would be the primacy of simplicity over conventional tradition, with tendencies criticized as reductionist. While the agroecological tradition values complexity among premises considered even systemic or holistic, exclusivist. In terms of influential external values, the greatest difference lies at superficial glances since, for the conventional, in many cases, economic values and fads prevail. In agroecology, environmental and sociological

values are predominant, with some ideological and political bias. However, both advocate ethical and suitable prerogatives in the imminent context of agricultural sustainability. However, it is worth highlighting here that Laudan focuses on the cognitive evaluation of theories, and external values do not appear significantly in this evaluation.

The important thing at the moment here is to indicate that, for Laudan, these external values are not the determinants of a tradition and do not make them incommensurable, not even essentially opposing, at most competitors in the theoretical or technological market of science. Even allowing researchers to act on one tradition or another or combine elements of both in a synthesis, which Laudan does not see as an impossibility but registers the historicity, as well as the possibility of such a circumstance.

Furthermore, it is worth indicating more characteristics of the conventional tradition (such as identitarians in Laudan) since Kuhnians may strive to frame it as a paradigm in crisis. The so-called conventional tradition (considered hegemonic), due to current anomalies or those that will come in the future, may even be a tradition that will become obsolete, being abandoned by future related scientific communities (or groups in Laudan) or giving rise, in the synthesis of current theories or the emergence of new specific theories, to a new research tradition. However, as already mentioned, it has elements in common with the agroecological tradition. What distinguishes it, in addition to the external values mentioned above, is its comparative progress with the agroecological tradition, which, by generating endless technological artifacts, generated voluminous questions regarding its marketing instrumentalization.

The effect of anomalies in Kuhn and Laudan may be close but have differences. For in Laudan, anomalies can destroy theories but not necessarily traditions. However, they can lead, at most, to the deflation and possible abandonment of a tradition (an important element). In this sense, anomalies are screened by the scientific community (Kuhn) or group (Laudan), and if anomalous problems are solved by theories, progress continues in Laudan. For Laudan, ad hoc hypotheses can be accepted to resolve anomalies or mainly generate progress in solving problems (different and more complex from acceptance in Popper).

At a certain point, the conventional research tradition is opposed to agroecology. Considering its precedents, agroecology remained stagnant in obsolescence for centuries or slow progress, supported by Greco-Roman concepts from the late Middle Ages and early modernity. In contrast, conventional agriculture, called by some modern (or "more modern"), gained great momentum with the so-called "green revolutions" or "revolutions" in agriculture at the end of the 19th and 20th centuries. Mazoyer, Roudart (2010) indicate that the second agricultural revolution of modern times was based on motorization, mechanization, mineral fertilization, synthetic pesticides, selection, and speciation. In other words, the machine revolution, late 19th century and early 20th century, lasting until today through automation, for example, agrochemicals involving fertilizers and pesticides, which also ranges from the end of the 19th century to the 20th century, taking on various current forms such as

bioproducts; and genetic improvement, which uses remote bases (19th century) but is notable in the 20th and 21st centuries, starting with the generation of varieties, hybrids, and later the use of biotechnological tools. This agrees with Thompson (2009) regarding technological construction and the transformation of agriculture.

The term revolution here allows for an underlying acceptance of Kuhn's thought, but this is not the case when analyzed in detail from a Laudanian perspective. The revolutions here were theoretical and within the conventional macro tradition. In which solutions to conceptual and empirical problems (pure science) established theories capable of generating technologies (applied science), which brought significant and striking innovations to the agricultural field, such as machines, chemicals (first fertilizers and then pesticides), genetic improvement, biotechnology, and now digital agriculture (using artificial intelligence and remote sensing). Therefore, the revolutions would be nothing more or nothing less than significant milestones in scientific and technological progress, assuming Laudan's stance, the most appropriate judging by the explanation.

A question that can be asked is whether the so-called conventional agriculture or the modern macro tradition of agriculture (or even arising from the second revolution in modern times) existed since the beginnings of agriculture, in its bases, as the agroecological macro tradition (or derived from the first revolution in modern times) in conception? It is difficult to explain in historiography here, and it would lead to another colossal debate. Perhaps the systematization of areas, with the theoretical and technological development of topography, drainage, and creation of levels, even before science as we know it today, would be a prelude. But the attributed emergence of modern (or more modern) agriculture is linked to the developments of natural or empirical sciences in the Western world and the creation of scientific communities (or groups in Laudan) around agricultural or agronomy institutes in Europe and then the United States, between the 19th and 20th centuries. Understanding this, the conventional term would no longer be appropriate if stripped of the Kuhnian vision, at least from a historical perspective. This is because when the modern tradition broke out and became established (or according to the agricultural revolution in modern times), what was conventional could be attributed to what is today called agroecological (or the legacy of the first agricultural revolution in modern times). Many theorists would disagree with this stance, but this is a subject for another argumentative development.

The argument is made here that both, in this historical construction, were or are in crisis, but that did not mean that accumulated anomalies allowed the collapse to the point of extinguishing or replacing them or even framing them as necessary competing paradigms in an eschatology of revolutionary successions (with one replacing the other in a short period. Both proved to be efficient traditions with a vast theoretical body and a very current approach to problem-solving, which would be within Laudan's normativity.

For Laudan, competing traditions can coexist, and the roles of traditions about specific theories are to delimit the domain of these theories, establish an ontology and

methodology to deal with problems, establish heuristics in constructing new theories, and rationalize and justify theories. In this way, it indicates the reticular aspect of its philosophical concept since traditions can, in their evolution, reticulate (or pass on through a tension that generates revision) belonging in methodological and ontological terms (without changing the tradition). Note that ontology refers to the objects that need to be analyzed (and the relationship between them), while methodology refers to the forms of access. In which the ontological elements in the tradition, in Laudan, are the commitments that can be open to the entry and exit of elements, being in a certain way similar to the metaphysical parts in Kuhn. However, methodologies and pluralities of methodologies are important points to consider in this context, as they are fundamental and differentiating in Laudan.

It is also noteworthy that Laudan talks about comparing competing traditions, corroborating Lakatos, who also writes about comparison (from which Laudan apparently borrows but would also be close to Feyerabend). For Laudan, although identity-based, traditions can borrow methodologies from other traditions and be compared. Thus, they would be commensurable as there are comparable elements. Laudan and Feyerabend compare and understand the importance of interfaces in plurality. Hence, Laudan discards Kuhnian rigid incommensurability and emphasizes problem-solving, highlighting the need to evaluate the rate of progress in consolidating traditions (which may be open to new theories, as in Feyerabend).

As Bezerra (2012, p. 484) admits, "The scope of incommensurability is drastically limited in relation to Kuhn's original claims." And, even agreeing that Kuhn opened new paths and that "some of his intuitions are insightful," it is also highlighted that "the resources inherent to his image of science often prove to be insufficient, unsatisfactory, to deal with the problems of progress and rationality" (2012, p. 485).

And, from the brief agronomic example presented, it is clear, as in Laudan, that a tradition of research in agronomy, as in other areas, is a "set of assumptions about the entities and processes of an area of study and the methods suitable to be used to investigate problems and build theories in this area of knowledge" (2011, p. 115). And, although tenuous, the distinction in the illustrated case exists because in a tradition, for Laudan, it is "vital to distinguish the ontological and methodological components" (metaphysical and normative parts) but can be related within the tradition and between traditions because "the ideas we have about appropriate research methods are generally compatible with those we have about the objects of investigation" (2011, p. 110). While some theories of an "evolving research tradition will be incompatible" (unlike Kuhn, where this would be unacceptable), they may represent an attempt within the framework of the tradition to improve or correct previous ones (LAUDAN, 2011, p .116). All within the logic of the reticular model, covariant rationalism (of joint variation), where theories, axiology, and methodology can change without changing the tradition. In these terms, the evolution of a research tradition can reach a certain point that it is almost not recognized at first.

In the internal diversity in the macro traditions of agronomic research, one can glimpse these nuances indicated by Laudan. All these two assumed traditions "will be

associated with a series of specific theories, designed to particularize the ontology of the research tradition and to illustrate or satisfy its specific methodology" (LAUDAN, 2011, p.115). Apparent incongruities pointed out by one tradition to another may come to light, but if it is an inadequate theory, "it will have strong arguments in its favor if it is linked to a successful research tradition." As we have seen, both traditions of agronomic research appear to have strengths and virtues in techno-scientific competition while at the same time overlapping in a certain sense. This also corroborates Laudan, who accepts "at least two specific ways in which theories and research traditions relate: one is historical and the other, conceptual" (2011, p. 121), as seen in previous arguments as well.

Up to this point in the argument, it can be seen how agronomic science or technoscience advances and progresses, even in the face of possible polarizations (not as an exclusive hegemony, as in the case of paradigms in Kuhn), between the macro traditions currently in force (understanding tradition as historical entities). According to Laudan (2011, p. 171-204), it is possible to denote "significant questions regarding the historical evolution and cognitive status" of agronomy. And yet, against the premise of "revolutions" in Kuhn, it is possible to observe in agronomic science, finally, like Laudan, a "perennial coexistence of conflicting research traditions," which in itself "makes the emphasis given to the revolutionary times." For Laudan, traditions are in "constant evolution, their relative fortunes change over time, old traditions are replaced, to a large extent, by others, but in general, it is not useful to focus attention on certain phases." There is commensurability in traditions in agronomy, as problems are shared, which fully corroborates Laudan, who states that "shared problems offer a basis for the rational assessment of the relative effectiveness in solving problems of competing research traditions."

GRONOMY FROM THE INTERSECTIONS BETWEEN GADAMER AND LAUDAN

The following discussion will not permeate the debate on the implications and applications of philosophical hermeneutics in natural sciences such as the author-text-reader relationship, hermeneutic circle, hermeneutic philosophy of science and technology, relativism, rationality, conciliation, and opposition between philosophy of science and hermeneutics, as discussed in Galindo (2005), Silva (2013), Videira (2013), and Babich (2016). The arguments focus on the tradition in Gadamer and Laudan and its implications and applications in understanding agronomy, which, in itself, is a complex undertaking and not exhausted here.

The possible intersection between Gadamerian philosophical hermeneutics and the philosophies of natural sciences and technologies is still a current challenge. However, what was observed in Gadamer and Laudan, allows a glimpse of aspects that share and denote the likelihood of new studies and deepening of the topic. One of the central points for these intersections between the philosophies of Gadamer and Laudan is rationality in the historicist framework of traditions, which corroborates

Galindo (2005). By explaining this, Gadamer states that "between tradition and reason, there is no opposition that is so unconditional" (2021, p. 373).

Both authors, Gadamer and Laudan, in their philosophies, base their starting point on history, therefore, historicists in essence. Laudan follows the philosophical tradition inaugurated by Kuhn, even disagreeing with him in many aspects, as previously discussed. But, that said, Laudan is, so to speak, from the historicist school in philosophy of science and also applicable to philosophy of technology. In Gadamer, there is an expansion of historicism applied to the understanding of science, including the importance of prejudgments.

> In fact, it is not history that belongs to us, but we are the ones who belong to it. Long before we understand ourselves when reflecting on the past, we already understand ourselves naturally in the family, society, and the State in which we live. The lens of subjectivity is a deforming mirror. The individual's self-reflection is but a faint light in the thick current of historical life. Therefore, an individual's prejudgments, much more than their judgments, constitute the historical reality of their being (2021, p. 367-369). [...] There is certainly no understanding completely free from prejudgments, although the desire for our knowledge must always seek to escape all our prejudgments. [...] The certainty provided by scientific methods is not enough to guarantee the truth. [...] But in no way does it mean a reduction in its scientificity. [...] The fact that the being of the person who knows also comes into play in the act of knowing certainly marks the limit of the "method" but not that of science. What the "method" instrument cannot achieve must and can actually be achieved by a discipline of asking and investigating [...] (2021, p. 631).

For both, traditions are valid within a context despite not strictly sharing the same concept of tradition. However, the role of traditions in epistemic construction is a recurring point for the aforementioned authors. While Gadamer proposes tradition as a given "pool" of prejudgments and presuppositions in the hermeneutic configuration, Laudan understands traditions (in the context of research) as a group of "ontological and methodological components" in common. In summary, the role of prejudgments (even if they are called ontological and methodological components) and the historical context is implicit, if not explicit, as the foundation for constructing the epistemology of science or technoscience, such as agronomy.

In establishing a research tradition in Laudan, as in evaluating a tradition in Gadamer, the role of the community and authority in this scientific community makes it possible to delimit the permanence and validity of a tradition.

> In fact, authority is, first and foremost, an attribution to people. But the authority of people does not have its ultimate foundation in an act of submission and abdication of reason but rather an act of recognition

> and knowledge: it is recognized that the other is above us in judgment and vision and that, consequently, their judgment precedes, that is, it has primacy about our own judgment [...] The correct understanding of this sense of authority has nothing to do with blind obedience to a command. In reality, authority is not about obedience but about knowledge. [...] Its true foundation is, here too, an act of freedom and reason, which grants authority to the superior [...]. [...] What the authority says is not irrational arbitrariness but something that, in principle, can be understood. (GADAMER, 2021, p. 371).

Thus, in Gadamer and Laudan, interpretation and understanding can be a historical enterprise related to authority but also pluralistic, commensurable, dynamic, not necessarily relativistic, but pragmatic, rational, instrumental, and progressive. For Laudan and Gadamer, traditions, as the basis of assumptions for scientific construction, are preserved but not intact; they change in the world, in its constituent elements, plurality, and dialogue. In which the

> [...] more tumultuous transformations, as in revolutionary times, amid the supposed change of all things, much more of the old is conserved than one might believe, integrating with the new in a form of validity. In any case, conservation represents a conduct as free as destruction and innovation (p. 374). [...] In our constant behavior about the past, what is really at issue is neither distance nor freedom from what has been transmitted. On the contrary, we are always inserted into tradition, and this is not an objective insertion, as if what tradition tells us could be thought of as strange or alien; it is always something of one's own, model and intimidation, a recognition of oneself in which our later historical judgment will not see so much knowledge as a spontaneous and imperceptible transformation of tradition (p. 374). The phenomenon of understanding permeates not only all human references to the world but also presents its own validity in the field of science, resisting the attempt to be transformed into a method of science. [...] Resistance that has been asserting itself within the scope of modern science against the claim of universality of scientific methodology (Gadamer, 2021, p. 29-30).

Therefore, in agronomy, as in other sciences, traditions that gather theories to solve conceptual and empirical problems take on different forms as new problems emanate in their relationship with the world. As in hermeneutics, these traditions, even if in metamorphosis, dictate the constitutive bases for the historical formation of knowledge in the agronomic area. Thus,

> [...] such a hermeneutics does not measure or reject tradition based on the criteria of natural reason. But, as far as it exists, this hermeneutics remains essentially faithful to the task of all traditional hermeneutics, namely, through understanding to reach an understanding of the

> content (Gadamer, 2021, p. 387-388). [...] It is not just because historical tradition and the natural ordering of life constitute the unity of the world in which men live; the way we experience each other, the way we experience historical traditions, the natural occurrences of our existence and our world, this is what forms a truly hermeneutic universe. We are not enclosed in it as if between insurmountable barriers; on the contrary, we are always open to the world (p. 32).

The research traditions already discussed here, agroecological and so-called conventional, are advancing and creating nuances and changing historically as if historically mediated by a Gadamerian hermeneutic circle. Perhaps these traditions will merge almost in a dialectical process, resulting in a new tradition. However, these same traditions are the basis for the origin and change of theories, technologies, or agrotechnologies in the agronomic context within these traditions.

Creations and changes within traditions, even assuming their current ontological and methodological components, can endogenously and gradually influence them to the point of deforming or configuring them or reticulating them (in Laudan's terms) into a new tradition, very different from what was previously named. This possibility is not ruled out in Gadamer or Laudan, in their historicisms, and is striking in agronomy, as we understand that research traditions, such as conventional research, have been adopting ontological and methodological adjustments, that is, new assumptions to their "pool" of prejudgments (in other words and using Gadamerian and Laudanian terms interchangeably).

In this way, the understanding of the role of prejudgments or assumptions in the construction and validation of the ontological and methodological components of Laudanian research traditions, the role of Gadamerian traditions within the knowledge progress in agronomy, added to the hermeneutic experience in the interpretation of historical and rational development of agronomic technoscience, allow us to conjecture the use of philosophical hermeneutics in the philosophy of agronomy. In this sense, Gadamer and Laudan can be reconcilable and complementary in the philosophical investigation of agronomy.

However, this simplified essay is only an introductory and limited construct, which can be deepened and broken down in future philosophical studies. More research is still required on the relationship between Laudan and Gadamer, and studies on the application of these authors' philosophies to agronomy are lacking. This highlights the importance of the theme and the continuity of the philosophical enterprise in this sense.

FINAL CONSIDERATIONS

Gadamerian philosophical hermeneutics can be applied to natural sciences, agronomic science, and technoscience. Probably, the Laudanian perspective is the most compatible with the apprehension of the development of agronomic science and technoscience, especially from the concept of research traditions. There is the

possibility of historicist interpretation and understanding of agronomy based on the combination of the meanings of tradition in Gadamer and Laudan. Therefore, philosophical hermeneutics and hermeneutic experience apply to understanding agronomy.

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Submetido: 27 de novembro de 2023

Aceito: 23 de dezembro de 2023