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A “silent” agroecology: the significance of unrecognized sociotechnical changes made by French farmers

Véronique Lucas¹

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Abstract

Agroecology has been a focus of intense debate in France since 2012, when the idea was explicitly adopted as a national policy objective by the Ministry of Agriculture. This article intervenes in this debate by documenting and describing an under-recognized, “silent” agroecology practiced by conventional farmers contending with a variety of threats—economic, technical, and climatic—to their farming systems. Inspired by the sociology of development, the research summarized here shows how these farmers have relied on peer-to-peer cooperation, and specifically on formal equipment-sharing arrangements, to develop a range of practices allowing for the ecological improvement of their farming systems. These farmers make few claims with regard to the environmental benefits of their innovations, however: instead, they emphasize their desire for improved farm autonomy. Out of respect for the social and professional dynamics within which they operate, moreover, these farmers tend to avoid ecological terms and topics in their peer-to-peer conversations. This “silence” is reinforced by the statistical tools used to report on French agriculture, which make little note of such farmers’ activities, effectively excluding these practices from assessments of the ecologization of French agriculture. Finally, given the challenges these farmers face in locating necessary resources elsewhere in the agrifood sector (suppliers, research and development, markets), the ecological benefits of these new practices are not always fully realized. Nevertheless, the scale and significance of this silent agroecology—the conditions for which are also present in other Western countries—suggest an urgent need to reorient public policy frameworks to better support the agroecological transition.

Keywords Agroecology · Ecologization · Autonomy · Invisibility · Farm machinery cooperatives · CUMA · Policy making

JEL classification Q01 · Q12 · Q13 · Q16

✉ Véronique Lucas
lucas.veronique.rd@gmail.com

Extended author information available on the last page of the article

Agroecology has emerged as a key term within agricultural and environmental policy discussions in France over the past decade. New policy instruments have been introduced with the explicit goal of fostering an “agroecological transition,” the legislative definition of which includes the idea of making farm operations more self-sufficient. These measures have in turn drawn attention to a variety of initiatives among groups of French farmers seeking to improve farm autonomy (Arnauld de Sartre et al. 2019; Bosc and Arrignon 2020), including the development of farming systems that are more diversified and less reliant on external inputs. For some farmers, however, these initiatives are undertaken discreetly, with little effort to gain recognition for the environmental benefits thus obtained (Cardona 2011; Levain 2015).

A similar discretion has been observed among farmers belonging to local agricultural equipment cooperatives (known as *Coopératives d'utilisation de matériel agricole*, or CUMA). CUMAs are the leading type of collective organization French farmers belong to, and figure among the beneficiaries of the new policy mechanisms intended to foster the agroecological transition (Lucas 2018). Yet many farmers belonging to CUMAs that have been supported by these policies do little to justify their efforts in terms of environmental benefits, emphasizing instead their desire to improve farm autonomy. Given the prevalence of ecologization¹ within current agricultural policy discussions, and given that their efforts to improve farm autonomy are recognized as contributing to the official agroecological framework, how can we understand these farmers' silence with respect to the environmental benefits of their work?

This article will explore the “silent” nature of these processes of change toward more diversified, less input-dependent farming systems, focusing specifically on those developed within CUMAs. How and why have CUMA members developed practices that contribute to the ecological improvement of their systems while rarely discussing them as such? And what are the consequences of this silence?

To answer these questions, this article describes an action-research project undertaken in collaboration with the National CUMA Federation (or FNCUMA, for *Fédération Nationale des Cuma*) (Lucas 2018).

The article will begin by summarizing the sequence of events that placed agroecology on the French national political agenda and describing how the CUMA network fits within this larger picture. The next section will present the research methods for the project, including the case-study approach as applied to six CUMAs featuring the use of forage legumes and/or conservation agriculture. Attention will be given to the specific technical changes implemented in order to improve farm autonomy and how these have been achieved through peer-to-peer cooperation. The subsequent section will show how ecological terminology is avoided by these farmers and discuss the absence of technical and economic conditions favorable to eliminating certain inputs, notably glyphosate. Here I will describe the functional logic internal to CUMAs, which bring together farmers with heterogeneous farming systems and so seek to limit the discussion of potentially contentious topics. The article will conclude by emphasizing the need for further research on this phenomenon, in France and elsewhere, so as to

¹ The term *ecologization* refers to the growing importance of environmental issues within agricultural policies and practices (Mormont 2009).

improve the conditions for the agroecological transition and genuinely empower farmers to be actors in this process.

The debate over agroecology in France since 2012

From agroecology’s origins in the Americas to its arrival in France

A significant body of research related to the concept of agroecology first emerged in the 1970s, among a group of scientists in California in collaboration with researchers and practitioners of traditional agricultural systems in Latin America (Altieri 1983; Gliessman et al. 1981). Developed as an explicit critique of agricultural modernization, this approach defined agroecological practices as those that are anchored in local ecosystem functioning, enhance genetic and species diversity, optimize processes of material and nutrient recycling, and seek to harness synergistic interactions. Such practices aim for high levels of sustainability and drastically reduce the use of external, non-renewable, and environmentally harmful inputs. In subsequent decades, work in this field has increasingly sought to consider the ecological, economic, and social dimensions implicated in agrifood systems, while at the same time, the idea of agroecology has been embraced by an array of social movements, especially peasant movements. By the late 2000s, the term agroecology was being applied to scientific studies, agricultural practices, social movements, and public policies, mostly in North and Latin America (Wezel et al. 2009).

Within the past decade, a series of high-profile international reports further elevated agroecology’s status (De Schutter 2011; IAASTD 2009). The concept made its first appearance among the research priorities of the French agricultural research establishment in 2010, independent of uses of the term among a relatively small number of French activists. According to the leadership of this research institute (*Institut national de la recherche agronomique*-INRA), agroecology was a new scientific field that sought to strengthen the links between agronomy and ecology. This definition represented a departure from the agroecological perspective of the American pioneers in the field, who had explicitly sought to incorporate the social dimensions of agriculture. It also largely disregarded the handful of agroecological approaches (not always in agreement amongst themselves) that had emerged within several INRA departments (Bellon and Ollivier 2018).

The Agroecological Project for France

Stéphane Le Foll, the French minister of agriculture from 2012 to 2017, drew on the technoscientific approach proposed by the INRA leadership in his appropriation of the term. Organic agriculture had been supported by public policies in France since the 1980s, and in 2012 represented 3.8% of French agricultural land area. Other mechanisms for agricultural ecologization, including both regulations and incentives, had also been developed over the previous two decades (Lamine et al. 2015). A series of economic crises, linked to liberalization at the European level, had likewise impacted the agricultural sector.

Departing from the traditional regulatory approach—which he considered to be negatively perceived by many farmers—Le Foll instead promoted the idea of a

widespread “ecological modernization” for French agriculture. By adopting the idea of agroecology, up to that point relatively unknown in France but endowed with a certain scientific legitimacy, Le Foll positioned himself above the terminological skirmishes underway in the professional field, where the growth of organic agriculture and an accumulation of environmental regulations had led to the development of multiple labels for agricultural sustainability by France’s farmers’ unions and other agrifood actors (Lamine et al. 2015). Announced in late 2012, Le Foll’s “Agroecological Project for France” (APF) presented agroecology as an overarching concept embracing all types of ecological agriculture, including organic farming but also conservation agriculture and agroforestry. The minister’s many speeches on the idea emphasized the “environmental and economic multi-functionality” of agroecology, its ability to improve both the competitiveness of French agriculture and the autonomy of French farms *via* the replacement of external inputs with ecosystem services. Le Foll frequently illustrated his argument with the example of livestock farming, a sector that was struggling economically and could thus benefit from shifting to on-farm production of legume-based forages as opposed to purchased protein supplements for animal feeding (Bosc and Arrignon 2020). Finally, he portrayed farmers as the key actors capable of implementing the changes required to create an “ecologically and intellectually intensive” agroecology, a form of agriculture based more firmly on knowledge-production by its practitioners (Thomas 2018).

Written into law in late 2014, the APF brought together existing programs for agricultural ecologization while at the same time reorganizing other programs overseen by the Ministry of Agriculture, such as agricultural education, under the agroecology banner. Added to this was a new policy instrument, known as the GIEE (*Groupement d'intérêt économique et environnemental*, or Economic and Environmental Interest Group), for recognizing groups of farmers engaged in the agroecological transition. Designation as belonging to a GIEE makes farmers eligible for higher levels of public subsidies (Ajates Gonzalez et al. 2018; Bosc and Arrignon 2020).

Controversy and other reactions from civil society

The APF drew criticism on two fronts. On one side, a “Coalition in favor of a peasant agroecology” (*Collectif pour une agroécologie paysanne*) brought together environmental groups and farmers’ organizations such as the *Confédération Paysanne* (a French farmers’ union belonging to the *Via Campesina* network). This group was critical of what it saw as the stripped-down version of agroecology being promoted by the French government, insisting instead that addressing socioeconomic inequality, for example, was “fundamental” to the true definition of agroecology. On the other side, France’s most powerful farmers’ union, the FNSEA (*Fédération nationale des syndicats d'exploitants agricoles*), joined other agrifood actors in arguing for the need to boost the competitiveness of French agriculture by easing labor and environmental regulations (Bosc and Arrignon 2020). For these actors, the APF reinforced the idea that French agriculture was being pushed toward ecologization, 5 years after the previous government had launched a 10-year program to reduce pesticide use in France by half. This plan had already sent a strong symbolic message, signaling a shift in agricultural policy

toward ecologization for all of French agriculture as opposed to an earlier logic based on voluntary programs for motivated farmers (Guichard et al. 2017).

Other agricultural organizations, such as the National Federation for Organic Farming (FNAB) and the National CUMA Federation, sought to direct the APF to their own ends (see following section).

Finally, increased media attention to the idea of agroecology—from parliamentary debates on the APF to various documentaries and environmental campaigns related to pesticide use—associated a range of other models with the concept, including organic agriculture, permaculture, or the use of digital and robotic technologies in farming (Bellon and Ollivier 2018).

Assessing the implementation of the APF

The APF was introduced following some 15 years of research on the conditions of agricultural ecologization in Western countries, the results of which pointed to barriers at multiple levels of the agricultural and agrifood sectors and the many changes needed to remove these barriers (Cowan and Gunby 1996; Lamine 2011; Vanloqueren and Baret 2009). Analyses of the APF have noted its almost exclusive focus on farmers, agricultural training programs, and farmer advisory services, with few strategic actions targeting the agrifood sector, for example (Guichard et al. 2017; Zakeossian et al. 2017). Other assessments have remarked on the insufficient level of funding allocated to implement the new policies (Ajates Gonzalez et al. 2018; Bosc and Arrignon 2020).

Moreover, some authors have questioned the importance ascribed to farmers and farmers’ knowledge under cover of the idea of participation and the place-based nature of agroecological practices. Such authors interpret this as a strategy of legitimization for reducing direct intervention by the state and shifting responsibility onto local actors, to the detriment of public investment in structural change (Bosc and Arrignon 2020; Thomas 2018).

Finally, some observers have spoken of the failure of the APF, pointing, for example, to the rise in pesticide use in France since 2012² (Guichard et al. 2017) or the fact that the 500 GIEE recognized in 2019 amounted to barely 2% of French farms (Ministère de l’Agriculture 2019). More broadly speaking, the idea of “counting” the number of farmers engaged in agroecological practices has given rise to a variety of discussions and approximations, echoing earlier observations with regard to the absence of relevant data to assess policies for agricultural ecologization, in France and in Europe as a whole. These policies have been in place for 20 years or more; meanwhile, public funding for agricultural statistics services has been cut (Laurent and Landel 2017; Uthes et al. 2020). As a result, many processes of agricultural ecologization suffer from a problem of institutional invisibility which the APF does not address, notwithstanding its stated policy objectives (Altukhova-Nys et al. 2017; Bosc and Arrignon 2020).

² This despite a near doubling of the percentage of farmland under organic management from 2012 to 2018 (reaching 7.5% of French agricultural land area), in part as a response to the economic crises impacting agriculture during this period (Agence Bio 2019).

CUMAs in the age of agroecology

Nearly 12,000 CUMAs, involving more than a third of all agricultural operations, enable farmers in France to share agricultural equipment and labor, including buildings and employees. Originally created in 1945 to facilitate the modernization of small and medium-sized farms, the CUMA model has come to support a variety of activities and farm types. The prevailing goal within the CUMA network is to improve work productivity *via* shared access to larger-scale equipment (Jeanneaux et al. 2018). Locally based and self-organized, each CUMA on average includes approximately 25 farms.

Studies have identified a wide range of agroecological practices facilitated by CUMA structures, some of which have been in place for more than 30 years. Some are familiar, other less so: joint purchases of specialized equipment necessary for more diversified farming systems; cooperatives to transform waste wood from the maintenance of farmland hedges into wood chips for local heating systems; shared facilities for composting or methane production from local biomass materials (Meynard et al. 2018; Pierre 2009). CUMAs can also assist in the relocalization of strategic resources for agroecological adaptation, for instance by making shared investments in seed-cleaning or seed-sorting equipment or in collective kitchens for local food processing (Mundler et al. 2014).

In embracing the APF, the National CUMA Federation adopted agroecology as a way to “reconcile economic and environmental performance through a reliance on ecosystem services and group initiatives” (FNCuma 2014). The FNCUMA looked on this policy favorably above all because of the importance it attributed to local farmer collectives, an idea which Minister Le Foll often illustrated by pointing to CUMAs. The FNCUMA stands out among agricultural organizations in promoting local farmer-to-farmer cooperation, a strategy that has received relatively little attention in recent decades, including within the framework of agricultural policy. For example, national statistical surveys do not count the number of farms belonging to formal farmer collectives (Assens 2002), despite the fact that a growing number of policy tools supporting agricultural ecologization rely on farmers’ groups, notably at the local level (Arnauld de Sartre et al. 2019). The FNCUMA drew up recommendations to support the Ministry of Agriculture’s development of the GIEE concept (particularly with regard to the group organization of projects), and then promoted this measure within its network. In 2017, an internal review found that out of 391 officially designated GIEE in France, at least 28% involved CUMAs. The most common topics were related to nitrogen management, agronomic practices for soil conservation, and feed autonomy for livestock farms (Lucas 2018).

GIEE has typically been used by CUMAs to obtain support for innovative projects. For example, the GIEE mechanism is seen as a way to pay for an external facilitator or consultant (e.g., an advisor from the CUMA Federation) to assist in the development of agroecological practices. These projects are considered innovative in that they go beyond simply sharing equipment and labor—in addition to the use of new tools, they require the development of new agronomic and/or livestock practices; hence the increasing use of experiments and/or training sessions to support the acquisition of new skills and information (Lucas 2018). Previous work has pointed to an expanded role for CUMAs as sites for the co-design of innovations that are multi-dimensional in

nature, requiring multiple resources in addition to equipment, with strategic mediation provided by an external coordinator, typically financed through public programs (Assens 2002).

To better understand the role of CUMAs in the development of agroecological practices, the National CUMA Federation engaged in an action-research program from 2014 to 2018. Initial exploratory observations highlighted farmers’ “silence” with respect to the environmental benefits of their work—they preferred instead to talk about their goals for farm autonomy. The subsequent research program thus sought to describe the new practices being adopted by CUMA farmers; to understand what these farmers meant by their search for farm autonomy; and above all to explain their silence as to the ecological benefits obtained.

Research methods

The research was based on the study of six CUMAs (see Table 1), using an analytical framework constructed according to an iterative process, following the principles of the sociology of development (Long 2001).

Table 1 Characteristics of the six case-study CUMA

Geographic area	Farm operations surveyed within each CUMA	Principal collective activities	Practices developed on-farm
Basque country	2 sheep dairies, 1 sheep and goat dairy	Shared hay-drying barn, training program for members	Increased use of forage legumes
Tarn	2 cow dairies with robotic milking systems (1 organic), 4 grain farms (1 organic)	Shared equipment for no-till seeding/RT*, mutual help, seed exchange	RT and no-till seeding, development of mixed-species cover crops, crop diversification
Ain	4 cow dairies, 1 goat dairy, 1 grain and beef farm	Shared hay-drying barn with a shared employee, mutual help	Increased use of forage legumes, crop diversification
Aube	2 sheep meat farms, 1 beef farm, 2 grain farms	Shared equipment for no-till seeding/RT, mutual help with a time bank, seed exchange, inter-farm movement of sheep to graze cover crops	RT and no-till seeding, development of mixed-species cover crops, crop diversification
Touraine	2 goat dairies, 7 cow dairies (5 with robotic milking systems), 1 beef farm	Shared haying equipment for legume-based grasslands, group experimentation, coordination between grain producers and livestock producers.	RT, increased use of forage legumes and mixed-species cover crops, crop diversification
Loire-Atlantique	3 cow dairies, 1 grain farm	Shared tractor with RT attachments, comparison of results, agronomic training	RT and introduction of cover crops

*RT reduced tillage

Analysis of the processes of change (the implementation of new individual and collective sociotechnical practices, the conditions under which these emerge and develop, how they are justified or explained) followed the work of Ploeg (2008). Ploeg identified six mechanisms by which farmers achieve greater autonomy, including a reliance on local cooperation and the implementation of agroecological principles. In addition, I drew on the work of Darré (1996) to examine how farmers' engagement in agricultural change is accompanied by a shift in their ways of knowing and interpreting reality. Finally, research on professional cooperation in agriculture at the local level (Chiffolleau 2005; Darré 1996) suggested the value of examining the cognitive, symbolic, and material dimensions of place-based cooperation.

Using these theoretical bases, I examined CUMA farmers' individual and collective strategies for developing new practices, for mobilizing the necessary resources, and for adding value to their products. My focus was on the farmers' point of view: their goals, the relationship between their goals and their practices, and their insertion within socio-professional networks. (For more details on the analytical framework, see Lucas 2018; Lucas 2019; Lucas et al. 2019; Lucas and Gasselin 2018.)

My understanding of the changes in individual and professional identity among the farmers in the study sample was shaped by Lémery's study (2003) of the "fashioning of new agricultures." In that article, Lémery described a redefinition of livestock farmers' activities based on their ways of understanding and performing their work. To do so, he considered their self-positioning with respect to three dimensions: techniques, professional networks, and societal expectations. These three dimensions guide my analysis of the CUMA farmers' practices and their justifications of those practices.

Case studies were identified with the assistance of the National CUMA Federation, and were intentionally chosen to include a range of both geographies (different parts of France) and farming systems. In addition, the six case-study CUMAs were selected because their cooperative activities supported two types of practices: (1) the introduction of forage legumes into the farming system; and/or (2) a shift toward conservation agriculture with reduced herbicide use (see Box 1). FNCUMA data show that shared investments in equipment specific to these two types of practices have increased in recent years and are strongly represented within GIEE-designated projects involving CUMA (FNCuma 2017).

Thirty-four individual interviews were conducted with farmers belonging to these CUMAs. Since the sharing of equipment suitable for legume-based forages and/or conservation agriculture were not practiced by all members of the case-study CUMA (with the exception of the CUMA in Ain), interviews were focused on members actively involved in these practices.

The interviews sought to document the details, impacts, and justifications used to describe (1) the new practices developed on these farms and (2) the farmers' involvement with their CUMA and other cooperative undertakings. My goal was to examine how the farmers justified the changes they had made when asked about their new practices, including those developed at the individual farm level and those developed at the level of the CUMA. For each CUMA, the singularities and points in common across all farms were identified, followed by a transversal analysis of the six case studies. The results were then discussed with

each CUMA as well as with representatives of the National CUMA Federation, in order to better assess the relevance of the analysis beyond the case-study farms.

Box 1 Conservation agriculture, legumes, and agroecology

Conservation agriculture seeks to restore soil fertility and improve soil quality based on three principles: reduced tillage, diversification of crops and crops rotations, and protection of soils through the use of cover crops. Studies have emphasized the environmental benefits of conservation agriculture (reduced consumption of fossil fuels, development of soil conditions more favorable to soil biota, reduced erosion, increased soil organic matter and soil carbon storage), but also some negative impacts associated with the use of herbicides to compensate for the weed-control effects of soil tillage (Kassam et al. 2009). While the French Ministry of Agriculture has frequently highlighted conservation agriculture within its definition of agroecology, the approach remains controversial because of its association with herbicide use (Lucas et al. 2018; Thomas 2018). Landel (2015) found that CUMAs played a significant role among the minority of farmers who practice conservation agriculture with a reduced use of herbicides.

Because of their ability to transform atmospheric nitrogen into plant-available form, forage legumes can help reduce pollutants associated with synthetic fertilizers while at the same time promoting agrobiodiversity, which in turn has the potential to reduce pesticide use. Making hay from leguminous species requires specialized equipment, however, which explains in part why legumes are not used more often for hay crops in France, despite their agroecological benefits. Instead, livestock farmers frequently purchase supplemental protein for animal feed in the form of imported soybeans (Schneider and Huyghe 2015). New strategies for cooperation and equipment sharing have emerged within CUMAs in recent years to address this dilemma, including investments in shared hay-drying barns to facilitate the integration of forage legumes into farming systems (Valorge et al. 2021).

Increased farm autonomy achieved through cooperation

In this section, following Lémery's (2003) dimension of the relation to techniques, I will describe the technical characteristics of the farms in the study sample, the individual and group changes implemented to support the adoption of forage legumes and/or conservation agriculture, and the motivations underlying those changes.

Farmers already in the habit of cooperating

The 34 farms in the study sample include 7 grain farms and 27 livestock farms. Among the latter, 24 are grain-and-livestock systems and 3 (all in the Basque country) are grass-based livestock systems. While farms tend to specialize in either livestock or grain production, most farmers in the sample (24/34) have added a secondary activity such as livestock fattening, seed production, or the sale of breeding animals (for 5 of the livestock farms engaged in the genetic improvement of their herd). Three livestock farms process and sell most of their animal products directly to consumers, while the remainder relies on indirect marketing channels, in some cases using quality labeling schemes (12/34), in other cases engaging in some direct sales as well (10/34). Eight livestock farms are mostly pasture-based, and 2 farms are organic. Seven of the 16 cow dairies (including 1 organic dairy farm) have a robotic milking system. Four farms engage in pluriactivity, including 2 that perform agricultural work as contractors for other farms.

Many of the farmers in the study sample are second-generation members of their CUMA. In general, they describe their CUMA as essential to their ability to invest in value-added activities for their farm. Many farmers also belong to other types of farmers' groups, either to reduce costs, for example *via* group purchasing of inputs (12/34), or to benefit from formal, peer-to-peer information exchange *via* discussion groups (CETA, GDA³). The purpose of these groups is to share experiences and compare results from year to year, as well as to organize participation in group training programs.

Incremental changes to improve farm autonomy

For these farmers, the primary driver of change was not a goal of ecologization but rather a need to respond to specific problems faced by their farms. Some farmers practicing conservation agriculture had decided to reduce soil tillage as a way of limiting soil degradation, to reduce expenses, and/or to reduce the amount of time spent plowing. Other farmers had become interested in conservation agriculture after introducing cover crops into their cropping plan, whether in obedience to environmental regulations prohibiting bare soil in winter or as a way of producing high-protein forages on-farm. The adoption of legume-based forages had been made in order to reduce purchases of supplemental protein (especially imported soybeans) for livestock, to respond to new quality requirements imposed by origin-based labels, or in some cases to provide supplemental forages in case of drought (which has become more frequent due to climate change).

While all these challenges pushed farmers to pursue greater farm autonomy, another key factor was the volatility in agricultural markets since 2007. Economic conditions were described as the tipping point ("the straw that broke the camel's back") that forced them to embrace new strategies to regain their independence. The search for autonomy signaled these farmers' desire both to reduce their dependence on input suppliers and to better control the conditions of their work:

"We had two spikes in [milk] prices [...]. Funny how the price of inputs often went up too ...! So [...] as good as we could get in the market for finished products, we often saw it disappear in expenses...." (Farmer in Loire-Atlantique)

"What we have been trying to do for the past several years is just to get by, to avoid going under and going under again, that's it." (Farmer in the Tarn)

"What also got things moving in my opinion were the economic crises... 2009,⁴ that reset everyone's clocks, because if you want to survive, you have no choice,

³ CETA: *Centre d'études techniques agricoles*-Center for the study of agricultural techniques; GDA: *Groupe de développement agricole*-Agricultural development group. CETA and GDA are the two main types of local farmers' discussion groups in France, existing since the post-war period, and variously present in different regions.

⁴ In 2009, there was a significant fall in milk prices.

you lay everything out and you say, what am I going to do? [...] That's the beginning of it... that changed everything [...] we had to start again almost from nothing.” (Farmer in Touraine)

“*To improve farm autonomy,*” “*to improve feed autonomy for the herd*”—these are the ways farmers typically justified their strategies for reducing costs and making better use of on-farm resources *via* the introduction of legumes or a shift to conservation agriculture.

As they sought to adopt these practices, however, the farmers I interviewed were often unable to find suitable support from their usual agricultural suppliers and information providers (see the following section). They were thus obliged to develop the necessary resources (seeds, specialized equipment, knowledge) themselves. To find the time and money to do so, they sought to improve the labor productivity of certain tasks, or develop multiple uses for single pieces of equipment. These additional modifications gradually reconfigured their farming systems to varying degrees, depending on the farm.

A partial ecological improvement of farming systems

The farms in the study sample had moved toward maintaining more soil cover, performing less mechanical tillage, and promoting increased agrobiodiversity thanks to their increased use of mixed-species cover crops or hay crops, including legumes. The extent to which the farms had been able to implement these new practices varied, however, as did their success in reducing the use of external inputs. For instance, the purchase of nitrogenous fertilizers varied: most farmers considered legume-based crops to be primarily a way to improve animal feeding and to improve soil organic matter, but they have trouble getting advice on how to estimate the amount of N supplied by the legumes, and this limits their ability to reduce N inputs (and in fact the science on this topic is still evolving) (Schneider and Huyghe 2015). With regard to pesticide and herbicide use, the farmers’ reliance on glyphosate generally increased in the initial years of a shift to reduced tillage. After that, some farmers (see below) reduced their glyphosate use, and often their use of other pesticides as well. Purchases of forages and proteinaceous feeds, especially imported soybeans, tended to diminish overall, along with fossil-fuel consumption. Reducing the use of external inputs for animal feeding reinforced some of the farmers’ engagement in quality labeling schemes, particularly in an economic context that favors quality over volume.

These findings illustrate farmers’ desire to improve farm autonomy with respect to their use of traditional input supply chains. The reduction of intermediate consumption varied from farm to farm, however, depending on the farmers’ unequal capacity to rely on peer-to-peer cooperation and their difficulties in overcoming specific fears or technical problems due to a lack of appropriate knowledge (see below). Some farmers described themselves as “in transition,” expressing the hope that they would eventually be able to further reduce their use of certain inputs, for example, when they saw an improvement in the structure and fertility of their soils.

Changes achieved through cooperation

The farmers in the study sample turned to their peers to help them address the questions and other needs they encountered as they sought to adopt these new practices.

First, they mobilized their CUMA to acquire the equipment required for the introduction of forage legumes and the shift to conservation agriculture. These new investments often involved novel types of sharing arrangements, such as the making, storing, and using of hay in common with a single hay-drying barn to minimize costs.

Second, the farmers developed new sharing and exchange arrangements, in addition to their existing arrangements, often informally organized (co-ownership, mutual help, the exchange of straw for manure). Swapping farm-grown seed, for example, is a practice that has emerged recently, particularly for the multi-species seed mixes sown for cover crops.

Third, the farmers mobilized their existing peer-to-peer discussion groups, or joined or created new ones, as a way of comparing and discussing their results, and for organizing training sessions with specialists.

Each of these cooperative arrangements requires time, skill, and social capital however, and individual farmers are more or less able to make use of them. Farmers managing off-farm work or those with tasks to perform on a fixed schedule (including on-farm processing or direct sales) tend to have greater time constraints; the possession of various social resources will likewise affect a farmer's capacity to perfect new practices. Generally speaking, however, the more farmers are able to draw on multiple forms of peer-to-peer cooperation, the greater their success in reducing external inputs and benefiting from the ecological functionalities of their system. The example of the CUMA in the Tarn, described in Box 2, illustrates how the dynamics of farmers' place-based cooperative efforts enable them to co-produce knowledge, to optimize the synergies among their farms, and to maximize the efficient use of shared resources.

Box 2 Multiple cooperative arrangements to support conservation agriculture without herbicides

Seven farms belonging to the CUMA in the Tarn have acquired specialized equipment for conservation agriculture since 2013. Two of these farms are organic (designated here as Farm A and Farm B).

Six of these farms also belong to a local discussion group (CETA) for comparing technical and economic results and participating in training sessions; as well as to another local group (with GIEE status) for sharing experiences in the practice of conservation agriculture. Both of these groups receive technical support from trained agronomists employed by an organization that includes approximately 50 such CETA and also coordinates group purchases of inputs. This organization is funded by fees paid by the farmers and by public mechanisms such as GIEE. Finally, 5 of these CUMA farms also participate in a national network for peer-to-peer discussion of conservation agriculture, with the assistance of which they organize an annual study trip to visit farms elsewhere in France or in other countries.

For all of these farms, increased participation within the CUMA has led to new types of sharing and exchange: whereas previously, these arrangements included mutual help during the harvest period and co-ownership of equipment; for example, they now also include the exchange of farm seed and the collective organization of silage cutting, a new task linked to the introduction of cover crops that entails significant labor demands at an already busy time of year.

The two organic farms, which have practiced no-till without herbicides since 2016, have joined a group active across southwestern France that works with a private consultant to assist in the development and discussion of this technique. These two farms have also worked together with a local fabricator to design an implement to kill cover crops mechanically (instead of with herbicides). Farm A, which has a robotic milking system and keeps its cows on pasture, has also formed a regional study group for rotational grazing. These two organic farms thus participate in a total of five peer-to-peer exchange groups, some at the supra-regional level, to support their practice of conservation agriculture without herbicides. In our interviews, both farms emphasized

the significant amount of time they invest in these groups as well as the technical complexity of their new farming practices, which they were still working to perfect.

Since 2013, the members of this CUMA have relied heavily on the experience of Farmer A, a pioneer in conservation agriculture since the 1990s. Farmer A recently converted to organic agriculture and thus now cooperates more closely with Farmer B, a newer member of the CUMA. This shift was regarded with some circumspection by Farmer A's non-organic colleagues, who feared they might no longer be able to benefit from his advice. These concerns dissipated however, as they realized they still had complementary interests; for example, new shared equipment purchased specifically for organic management was also of use to the non-organic farmers. Nevertheless, discussions within the CUMA focus on the technical, practical aspects of their work, without getting into the underlying motivations of different farming methods. Interestingly, whereas Farmer B suggested in our interview that his non-organic colleagues would eventually convert to organic, the latter said they could not imagine converting to organic. Farmer A also said that "sometimes, it troubles me to say I'm organic," because of organic farming's association with frequent tillage. Farmer A's discourse places a high value on cooperation with his non-organic colleagues, whose expertise, he says, is complementary to his own.

Ecological benefits and persistent challenges are rarely discussed

In this section, we will consider how CUMA farmers' descriptions of their new practices relate to their management of societal expectations. As we will see, these farmers' reluctance to engage in discussions of the ecological benefits and persistent challenges of their farming practices can best be understood in terms of the social dynamics prevailing within their professional organizations, and above all within their CUMA.

Avoidance of ecological terminology

All but five of the case study farmers are involved in GIEE: either directly in that their CUMA had been given GIEE status (Loire-Atlantique, Touraine, Basque country) or through another discussion group (CETA or GDA) they belong to being recognized as a GIEE (Aube, Tarn, Ain). Strikingly, however, notwithstanding this involvement with one of the primary incentive mechanisms established by the APF, and despite the alignment of their professional motivations with the advertised goals of the program (increased autonomy, reduction of costs), nearly all the farmers in the case study group sought to distance themselves from the APF's agroecological message.

The few farmers I met with who spoke explicitly about agroecology were either in leadership positions at the regional or national level of the CUMA network, which has explicitly promoted Ministry of Agriculture policy, or were involved in conservation agriculture networks, the primary technical model advanced by Minister Le Foll. Many farmers, on the other hand, seemed unfamiliar with the details of agroecology or seemed to regard it as merely the latest rhetorical packaging for agri-environmental regulations.

These farmers likewise tended to avoid references to ecology; the terms of which are tainted by their association with environmentalists, assumed to be critical of agriculture. For the case study farmers, subscribing to the ideas of ecology or agroecology would amount to accepting the environmentalist critique of agriculture. Instead, the farmers employ their own terms, mostly agronomic,

to refer to the ecological benefits of their farming practices: “Being self-sufficient is a question of costs [...], but adopting no-till, introducing legumes into the rotation and everything, [...] always keeping the soil covered, it improves the system. There are savings that will go along with that, in terms of work hours, wear and tear on equipment, labor costs... [...]. The economics are one thing, and the agronomy is another thing; it’s connected. But agronomy goes beyond economics. [Before,] in terms of agronomy, we were lousy. The truth is we just used the soil as a support, a substrate, nothing else” (Farmer in the Tarn). Some farmers seemed to struggle to find a way to describe their contribution to environmental objectives while avoiding terms with any kind of ecological connotation. Instead, they used phrases like “a different agriculture,” “a less destructive agriculture,” “a reduction of impacts,” etc.

Rhetorical challenges exacerbated by technical challenges

Farmers’ difficulties in justifying their practices in terms of environmental benefits can also be explained by their lack of resources and suitable conditions to reduce inputs.

Seeking to expand their use of legumes for hay, for example, the farmers find it difficult to obtain the necessary seed and technical information to incorporate these practices into their farming systems. The farmers’ traditional sources of inputs and information (e.g., the agricultural cooperatives) are rarely able to provide guidelines on the management of these types of hayfields (choice of species, stand establishment, fertilization requirements, weed control, etc.).

For the CUMAs practicing conservation agriculture, the use of glyphosate remains key, even if only at reduced rates. The farmers themselves have perfected several strategies for reducing glyphosate use, including equipment modifications, improved use of cover crops, and paying attention to soil biological activity. Mobilizing multiple domains of competence in this way is challenging for a farmer to manage on his or her own; hence the reliance on sharing experiences and information among peers, and on drawing on external sources of information, primarily private consultants (see Box 2). Farmers emphasized how hard it is to get to the point where you can give up glyphosate entirely: “Judging by the news, it won’t be a surprise if Roundup⁵ doesn’t get reapproved. For me, I have to say, for a while now I’ve been saying both to [the grain coop] and in my other discussion groups... we need to think about life after Roundup And so we try to think about it, we study the problem, but it’s not that easy” (Farmer in the Aube). Others, while admitting their discomfort in being dependent on this herbicide, say they just hope that a ban will force agricultural researchers and technicians to come up with effective alternatives.

Difficulties like these limit the degree to which farmers can perfect the ecological improvements they have begun, and make it awkward for them to lay claim to the (albeit partial) environmental benefits they have achieved.

⁵ Roundup® is the brand name of one of the most common herbicides containing glyphosate.

Taken together, these constraints act to discourage farmers from explaining what they are doing. As a rule, farmers say, their practices are singled out “for what they get wrong, never for what they get right. Or we are shown people who do direct sales, little new things, those types of farmers have found their niche. But if I take us as an example, we are not doing direct sales, but we are doing something different even so. Except that we are still in a normal value chain” (Farmer in Touraine). Similar frustrations and miscomprehensions were also expressed by the leader of the Basque country CUMA, which has, with some difficulty, succeeded in setting up a shared hay-drying barn: “We need to find our own solutions, because we are dealing with questions we didn’t expect, and the support is pretty limited... there is a disconnect between what is said politically about agriculture and the realities you run into when you actually do something... People say to us, ‘it’s great what you are doing,’ [but they have no idea] what we have gone through to get the project going.... Sometimes it’s tough to carry on.”

The tacit silence within CUMA

Finally, in addition to the CUMA farmers’ difficulties in giving voice to the ecological benefits of their innovative practices, the CUMA itself proves in some ways to be insufficient as a venue for discussion. By convention, both the National CUMA Federation and individual CUMA groups maintain a policy of neutrality with respect to different agricultural paradigms, so as to avoid potential conflicts among members practicing different systems. As CUMA actors often put it, within the CUMA “we leave our opinions at the door”—in other words, farmers are able to cooperate on technical matters by observing a tacit silence with regard to topics that may lead to disagreements within the group (between organic and non-organic farmers, between members belonging to different farmers’ unions, etc.). These tensions are real: the CUMA in the Aube, for example, confronted a division among its members between two divergent orientations in conservation agriculture: one seeking to avoid all use of herbicides while maintaining minimal soil tillage; the other seeking to make no-till the standard practice, even if it required some use of herbicides. These two orientations pointed to two different objectives in terms of equipment investments to make, both of which foundered because of an insufficient number of members in favor when the investment was proposed. This created frustration on both sides; but at the same time, the farmers avoided dwelling on the question in order to preserve the integrity of their CUMA, which was essential to the viability of their farms. This avoidance of debate thus reinforces farmers’ deficit of argumentation with regard to “ecological” issues.

Some farmers express disappointment that their strategies for farm autonomy are not more strongly supported by professional organizations outside of their CUMA and other discussion groups. Some express their defiance of the agricultural unions. Others, who do belong to farmers unions, say that their commitment goes no farther than simple membership and that they see more value in finding solutions (particularly *via* their CUMA) than in protesting or expressing opposition. Their discourse avoids focusing on the most intractable

challenges they face. Instead, they highlight their advances and the initiative they have shown in overcoming certain problems. Thus, the head of the Basque country CUMA, after expressing his frustration with the difficulties he was facing, concluded “It forces us to be more technically proficient, it pushes us to take charge of our work and our profession.” This impulse to euphemize the very real challenges farmers face limits the extent to which professional questions can be shared and examined.

Discussion: a meaningful movement?

Silence is both revealing and problematic

The results presented above reveal a movement for technical change initiated by farmers seeking to improve farm autonomy. This movement is largely silent in nature, has yielded partial reductions in input use, and is limited in its scope by a variety of constraints elsewhere within the agrifood sector. Several dimensions with regard to the “silence” of this movement may be explored.

First, the changes implemented by these farmers do not respond directly to calls for agricultural ecologization. Rather, these innovations seek to address technical and economic challenges, and are developed within the framework of a search for autonomy, the terms of which tend to obscure the ecological aspect. The fact is that farmers’ dependence on intermediate consumption has been called into question on two fronts: by an economic context characterized by extreme market volatility, and by the problematic nature of certain key inputs (e.g., soil degradation by mechanization, pesticide resistance, consumers’ rejection of the use of imported transgenic soybeans). In this context, better responding to societal expectations by reducing the use of environmentally damaging inputs appears as an incidental advantage, rather than a primary motivation.

Second, the silence of this movement can be understood as a response to the contradictions within which farmers are forced to operate—tensions that exist both at the level of agricultural policy and at the level of farmers’ professional networks. On the one hand, French agricultural policy makes repeated calls for agricultural ecologization and yet does little to address the structural barriers impeding the more widespread development of ecological systems. Farmers thus remain skeptical of these policies, in some cases expressing frustration, disengagement, or resentment. On the other hand, notwithstanding this unfavorable sectorial context, some farmers succeed in making ecological improvements thanks to their effective mobilization of peer-to-peer cooperation networks. Doing so requires specific resources (time, skills, social capital) which are unevenly distributed among farmers. Farmers’ silence on these matters thus represents a form of professional loyalty to their colleagues, who may be less able to reduce their use of inputs. This loyalty is essential to maintaining farmers’ socio-professional ties, particularly for farmers who have a long-established interdependence with their peers, owning and managing equipment and other resources in common.

Farmers thus avoid debates of a political nature in the interest of preserving their peer-to-peer networks. But this avoidance comes at a price, since it also acts to inhibit the professional affirmation of farmers’ specific situations. These challenges thus

remain in the shadows, and even more so in that lacunae in agricultural statistics help to render them invisible. As a result, the concrete realities faced by these farmers, their successes as well as their difficulties, fail to find a place within current discussions of the agroecological transition. This in turn deprives policymakers, civil servants, research institutions, and agricultural education programs of key information needed to improve the ways in which agriculture is supported, regulated, and reproduced.

“Silent” agricultural change in other countries and contexts

What is the scale of this silent movement? Existing agricultural statistics do not allow us to assess the degree of development, across all of French agriculture, of specific changes in practices and forms of organization engaged in by farmers. As noted above, key processes of agricultural ecologization and farmer-led initiatives suffer from widespread institutional invisibility: the State is currently unable to produce the necessary statistics to measure the transformations it is nominally trying to bring about. Despite this lack of data, however, a variety of work suggests that the dynamics underlying this movement are gaining ground, both in France and beyond.

The search for autonomy, which has long been recognized as a key characteristic of neo-peasant and ecological forms of agriculture (Coolsaet 2016; Morgan and Murdoch 2000), in fact is also found within the sphere of conventional agriculture. In France, it was the theme of the 2018 congress organized by the Young Farmers union (*Jeunes Agriculteurs*), a traditional ally of the FNSEA (*Jeunes Agriculteurs* 2018). Both in France (Arnauld de Sartre et al. 2019; Thomas 2018) and elsewhere (Carrosio 2014; Lebacqz et al. 2015; Schneider and Niederle 2010), the search for autonomy is motivating a growing number of conventional farmers to develop practices for ecological improvement. The incompleteness of this search for autonomy has also been documented in various countries (Dumont and Baret 2017; Forney 2016; Goulet and Vinck 2012; Kolinjivadi et al. 2019; Nicourt 2013). These studies highlight the compromises farmers make to achieve their goals for farm autonomy in the absence of more suitable conditions within the broader agrifood sector (relevant knowledge, profitable outlets, etc.).

The avoidance of terms with an ecological connotation by CUMA farmers who are simultaneously benefitting from GIEE support is similar to the “cognitive distance” (Candau and Ginelli 2011) exhibited by farmers in Western countries more generally, who voluntarily participate in publicly funded programs for agricultural ecologization without necessarily subscribing to these programs’ stated objectives. Instead, farmers tend to justify their actions according to their own practical considerations and production needs (Bryan 2012; Candau and Ginelli 2011; Petit and Vandenbroucke 2017).

The deficit in group discussion within CUMA networks aligns with similar observations underlining a weakening of professional debate within farmer organizations in France and other countries (Lémery 2011; Pongo 2017; Thareau et al. 2015). Other studies have likewise noted how innovative farmers show “loyalty” to their (non-innovating) peers by means of silence or self-censorship (De Rooij et al. 2010; Levain 2015).

As Lémery concluded (2003) in his analysis of the fashioning of new forms of agriculture, one outcome of this absence of debate is an increased investment by farmers in their technical, relational, and organizational skills. This analysis is supported by a variety of other studies of how Western farmers contend with the uncertainty of

the contemporary context: farmers' adaptive strategies rely heavily on their capacity for self-directed collective organization (Darnhofer et al. 2010). The avoidance of potentially contentious topics helps protect group work arrangements, which are critical to managing the strategic resources needed to adapt to changing circumstances. Among the CUMAs examined here, local inter-farm cooperation has been extended to new tools and modes of sharing and exchange, creating local networks with multiple, overlapping links among farms. This likewise accords with the emphasis placed by other authors on the importance of place-based coordination as an essential condition for ensuring agroecological transitions and innovation (Lucas et al. 2019; Tittonell et al. 2016; Wezel et al. 2016).

At the same time, the difficulties encountered by these CUMA farmers highlight the gap that exists between the stated objectives of public policy (in favor of sustainability or the agroecological transition) and the structural changes—economic, regulatory, scientific, etc.—that would be necessary to get there (Guichard et al. 2017; Horlings and Marsden 2011; Landel 2015; Vanloqueren and Baret 2009). As some authors have noted, this is a form of social injustice: in attempting to respond to ecological and climatic crisis (in agriculture and other sectors), certain public policies impose environmental efforts on social groups that lack the capacity to carry them out (Deldrève and Candau 2020).

Conclusion

The research described here suggests that a farmer-led movement for agricultural change exists that is largely unrecognized and poorly understood, even as the French government has foregrounded the concept of agroecology and pointed to a wide range of farming systems and experiences to illustrate that concept. I have described this movement as a silent agroecology.

This silent agroecology, currently in development within the CUMA network, has emerged out of farmers' efforts to implement agroecological principles not advertised as such, but instead justified in terms of the search for farm autonomy. This search for autonomy can be understood as a response to the difficult circumstances farmers currently face (economic, climatic, etc.) and as an effort to address technical problems within their farming systems (e.g., soil degradation). Within the six CUMAs studied here, this silent agroecology has taken shape through processes of technical change and adaptation, with little outside assistance to support further reductions in purchased inputs or a greater reliance on ecological functioning. To meet this challenge, these farmers have intensified their dynamics of peer-to-peer cooperation both within their CUMA and through other types of study groups and informal arrangements. These efforts remain, however, poorly visible to the relevant institutions.

CUMA farmers' search for autonomy is central to their discourse in part because they are reluctant to articulate the environmental benefits of their new practices. This can be explained both by their avoidance of terms with an ecological connotation, so as to distance themselves from environmentalist critique, and by the technical and informational challenges they face, which limit their ability to make ecological improvements. All of these factors make it difficult for farmers to lay claim to the (partial) environmental advances they have achieved. Ecological questions are rarely discussed

among their peers or by their professional organizations, or are couched in different terms so as to emphasize farmers' improvements and innovations in addressing certain problems. At the same time, this avoidance of environmental questions helps protect the cohesion of the CUMA group, otherwise susceptible to processes of internal differentiation resulting from farmers' unequal capacity to respond to agroecological injunctions.

Strategies of self-organization and innovation are thus neither generalizable to all farmers nor sufficient for overcoming all farming system problems. The knowledge and skills necessary to fully support agroecological transformation are lacking within farmers' technical environment. Outlets or methods for the commercial differentiation of "agroecological" farm products are also lacking.

The research presented here thus uncovers experiences that are silent, poorly recognized as processes of ecological improvement. These farmers are neither heroes nor proselytes, and are working largely outside of the political, popular, and scientific focus on agroecology. Despite the absence of data to fully estimate the scope of this movement, my findings align with numerous other observations of conventional farmers in Western countries. They show the interest of working to understand and then accompany farmers who do not identify with agroecology presented as a political or market injunction or as a social movement. More research is needed to document this type of "ordinary innovation" (Alter 2000; De Certeau 1984); that is, the multiplicity of farmers' individual and group methods of adaptation to the current context, with a particular focus on their search for autonomy. Future research should also seek to identify the impediments that limit farmers' ecological improvement of their farming systems. Finally, future work could assist in updating the statistical tools used to monitor and understand the current state of French agriculture, helping in turn to shift agricultural policy toward more meaningful, structural change.

Further research in these areas, accompanied by policy adjustments, is essential to bringing this silent, invisible agroecology out into the open. Recognizing what such farmers have learned and accomplished, and helping to solve the challenges they face, is critical to addressing the resentment and institutional defiance that exists among farmers, and thus, the threats to democracy such attitudes may eventually present.

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Data availability The data are verbatim of interviews. Given the monographic nature of the research, the interviews cannot be anonymized. The data are therefore not available.

Code availability Not applicable.

Declarations

Consent to participate Informed consent was obtained from all individual participants included in the study.

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Affiliations

Véronique Lucas¹

¹ UMR Innovation, University of Montpellier, CIRAD, INRAE, Institut Agro, Montpellier, France