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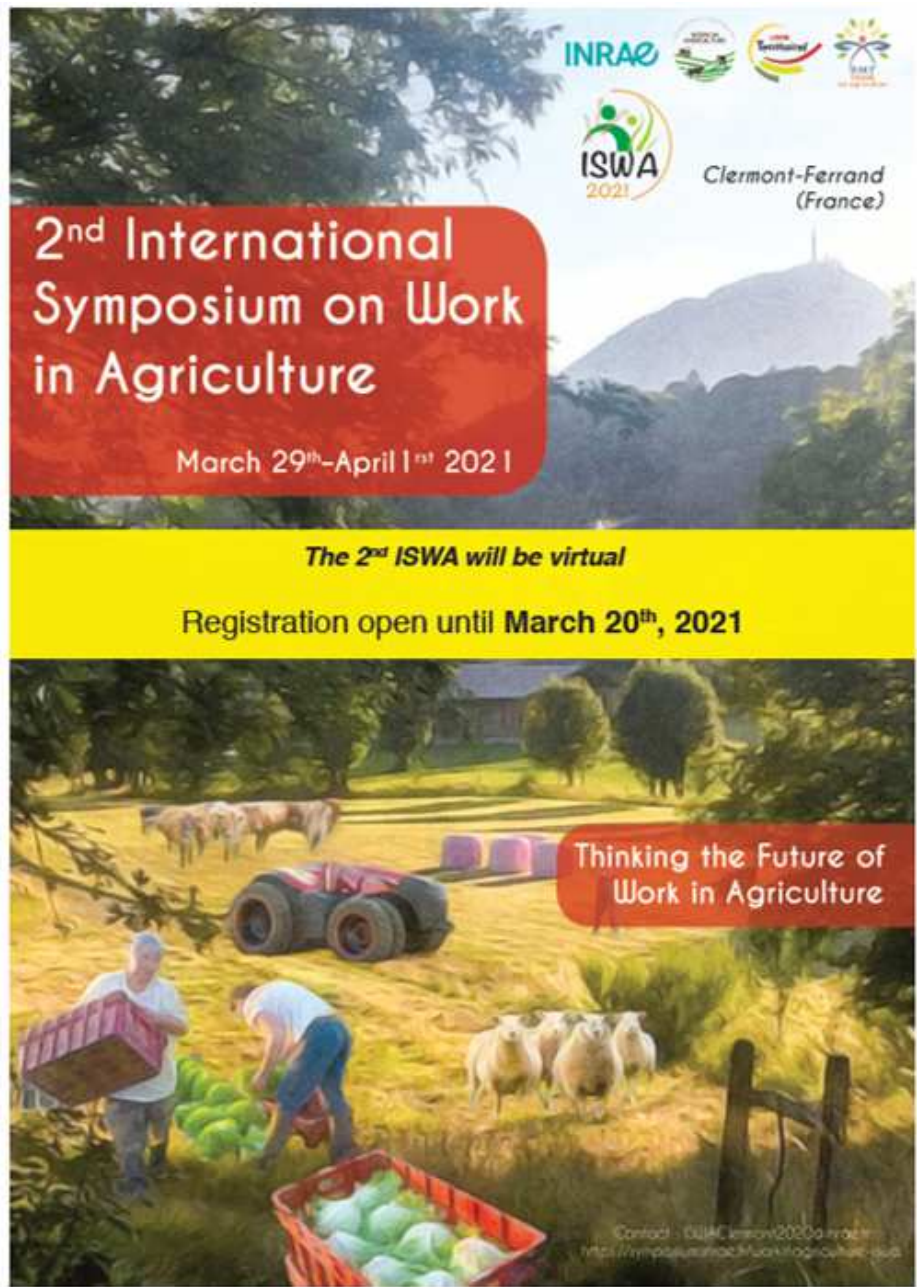
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A STYLE OF FARM WORK, INTENSIVE AND COLLECTIVE,
CONDUCTIVE FOR THE AGROECOLOGICAL TRANSITION

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A style of farm work, intensive and collective, conducive for the agroecological transition

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Abstract: The higher intensity of labour observed in many agroecological farming systems is barely examined by science, particularly in terms of work organization. Our research on the French farm machinery cooperatives, based on the farming styles framework, allows highlighting a particular style of farm work conducive for the agroecological transition. Farmers, member of these co-ops, have developed a long-standing reliance on the peer-to-peer cooperation, gradually shaping a labour-intensive and collective style of farm work to make viable their conventional farming systems. They then have easily re-mobilized the structuring basis of their initial on-farm work organization, i.e. labour intensity and peer-to-peer cooperation, by orientating them otherwise to develop agroecological practices.

Keywords: farm work, farmers' collective, agroecology, farming style, farm machinery cooperative

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Introduction

A growing body of surveys highlights the larger employment benefits in the agroecological farming systems, compared with the conventional systems (Ploeg *et al.*, 2019; Midler *et al.*, 2019). This especially results from the more significant intensity of labour needed to develop agroecological practices (Massis & Hild, 2016; Bertin *et al.*, 2016; Devienne *et al.*, 2016; Ploeg *et al.*, 2019). However, the details through which the labour intensification occurs and is developed during the processes of agroecological transition, as well as the on-farm work organization that entails this labour intensification, are barely examined among the research focusing on these paths of change (Midler *et al.*, 2019).

The analysis of the processes of agroecological improvement engaged by French farmer members of machinery cooperatives has allowed studying such processes (Lucas, 2018). French agricultural equipment cooperatives (known as CUMA, for *Coopérative d'Utilisation de Matériel Agricole*) are the most widespread type of network for cooperation in farm work throughout France, with nearly 12 000 existing units, involving more than one third of all French farms (Jeanneaux & Capitaine, 2018; Lucas *et al.* 2019). Among the French farmers developing agroecological practices, a part of them mobilizes these cooperatives (Lucas, 2021). How was the farm work organization among the CUMA's members before changing their practises? How did it change during the transition process? What are then the new features of their agroecological farm work organization?

This article, based on a study of six CUMA, addresses these questions. Based on the farming styles approach, our investigation highlights a labour-intensive and collective style of farm work from studies on CUMA, whose members develop agroecological practices widely adopted through these cooperatives, namely conservation agriculture or legumes development.

The article starts by summarizing the state of the art about the CUMA in relation with work issues, as well as with agroecological issues. Next, it details the analytical and methodological framework for the research,

based on the farming styles approach. Then, it examines the long-standing labour intensification approach developed by the interviewed farmers, and its collective nature, through its reliance on peer-to-peer cooperation. It then analyses how this approach is recomposed to develop new practices that contribute to agroecological improvements in their farming systems. Finally, the article concludes by considering how further research could help to improve the understanding of this style of farm work.

The French farm machinery cooperatives

The CUMAs were created in 1945 to facilitate the mechanization and modernization of French agriculture. There now exist 11,740 of them, covering more than a third of farms in France. CUMAs allow sharing equipment and labour, even hired workers and buildings. Each of these local and self-managed agricultural cooperatives brings together an average of nearly 25 member farms (FNCUMA 2019).

The CUMA constitutes a heuristic object for analysing farmers' work, as it is based on the pooling and sharing of equipment and labour. Labour sharing is particularly developed through the Cuma, as working together is often the best way to share machinery, to avoid the competitive situation when everybody wishes to use the same common equipment at the same time. Then, diverse labour-sharing arrangements are organized, such as the joint organization of tasks, the time bank or mutual help. Work delegation is also an existing trend in the CUMAs, as nearly 15% of them employ hired workers (a total of 4,700) to maintain and/or drive the equipment (FNCUMA 2019).

In the western agricultures, farms are mostly mechanized, and the reliance on mechanization to replace the human labour is a strategic dimension of the modernization processes. This reliance on labour-saving technologies has induced a problematic lack of workforce in agriculture to manage the agroecological transition (Aubron *et al.*, 2016; Carlisle *et al.*, 2019). The Cuma has contributed to this evolution, as many members rely mainly on it for better access to high-capacity equipment to increase the labour productivity (Jeanneaux *et al.*, 2018; Harff and Lamarche, 1998). This can incentive specialization and then a high dependence on external inputs (Gabriel 2016).

However, the network of CUMA also forms the backdrop for a renewed interest of farmers to develop practices ecologically improving their farming systems. Over the past several decades, some Cuma have developed initiatives that relate to agroecology: facilitating agronomic synergies between adjacent specialized farming systems; helping farmers within a given catchment area improve their practices with respect to water quality; or supporting the development of local wood-energy supply chains or collective biogas production (Moraine *et al.*, 2019; Pierre, 2009). More recently, new French public policy tools aiming at supporting the agroecological transition have rendered more visible a movement of farmer-initiated collective projects among the Cuma, with increased pooling of new productive resources (harvests, knowledge). These initiatives give rise to collective investments in new shared specific machinery (Lucas *et al.*, 2019).

The development of agroecological practices through the Cuma then raises new questions: How do some farmers, member of Cuma, develop agroecological practices whilst increasing their collective investments in machinery? What are their effects on work organization?

A research approach based on case studies

The farming styles approach

The approach of the farming styles has been mainly worked by the Dutch rural sociologist Ploeg (2003; 2012; 2018) to offer a framework to understand the heterogeneity among farmers practising the same production in a same local environment. This approach mainly considers how the farming processes

and systems are linked to technology and markets, and thus access to and use of resources (including land, labour, capital, water and knowledge). This allows conceptualizing the specific ways in which the labour process in farming is organized (that is, how the process of production is organized as well as how the farm develops through time) (Ploeg, 2003). Thus, farming styles are patterns of selection of technologies and market relations determining a specific structuring of the process of production. The approach of the farming styles has been mobilized to characterize the features of some agroecological farming systems (see for instance Ploeg, 2000; Schmitzberger, 2005; DuPuis and Block, 2008).

First, by focusing on technologies, this approach deals with the equipment issue, which is deeply interlinked with work issues. Secondly, by focusing on markets, this approach deals with the production process and the labour it entails, as it gives attention to the use of external productive resources compared with internal resources, as well as to the ways through which the products are valued (recycled in the farm system, sold through long or short marketing channels, exchanged with colleagues, etc.).

The approach of the farming styles has then invited us to consider the two following dimensions:

- First, the farmers' relation with the markets, *i.e.* the way farmers mobilize their resources and value their products, and their consequences on the work dimension in the farming systems.
- Secondly, the farmers' relation with technology, *i.e.* the way farmers mobilize the equipment and other technical devices, and their consequences on the work dimension in the farming systems.

Selection of case studies

Geographical area	Farms surveyed in each CUMA	Main collective activities	Farm practices developed
Basque Country Foothill pastures	3 farms: 2 dairy sheep farms, 1 dairy goat and sheep farm	Sharing of a collective hay dryer, training programme for members	Development of forage legumes
Tarn Arable & crop-livestock farming	6 farms: 2 dairy farms with milking robot (1 organic), 4 grain farms (1 organic)	Sharing of direct seeding/minimum tillage equipment, mutual help, seed exchanges	Minimum tillage and direct seeding, winter cover crop, crop diversification
Ain Crop-livestock farming	6 farms: 4 dairy farms, 1 dairy goat farm, 1 grain farm	Sharing of a collective hay dryer, with a shared employee, mutual help	Development of forage legumes, crop diversification
Aube Arable farming	5 farms: 2 sheep-meat farms, 1 cattle-meat farm, 3 grain farms	Sharing of direct seeding/minimum tillage equipment, mutual help through a time bank, seed exchanges, cross-farm grazing of cover crops	Minimum tillage and direct seeding, winter cover crop, crop diversification
Touraine Crop-livestock farming	10 farms: 2 dairy goat farms, 7 dairy farms (5 with milking robots), 1 cattle-meat farm	Sharing of hay-making equipment adapted to legumes, collective experimentation programme, arrangements between livestock farmers and grain farmers	Development of forage legumes and winter cover crop, crop diversification
Loire-Atlantique Crop-livestock farming	4 farms: 3 dairy farms, 1 grain farm	Sharing of tractor and no-till equipment, comparison of results and agronomic training	Development of no-till agriculture and winter cover crop

Table 1. Characteristics of the CUMAs surveyed.

The research project aimed to provide an understanding of the collective processes within the CUMAs facilitating the development of agroecological practices. We selected six CUMAs, located in Touraine,

Tarn, Basque Country, Ain, Aube and Loire-Atlantique (see Table 1), because their pooled resources facilitate two types of practices that can contribute to the agroecological improvement of farming systems, and particularly developed among members: the cultivation of forage legumes¹ and/or conservation agriculture² with a moderate use of herbicides.

Indeed, at the national level, there is an increase in the equipment being acquired by CUMAs to develop these practices, and which is leading to new sharing processes. For instance, Landel (2015) identified a significant role being played by CUMAs in existing initiatives of farmer groups experimenting with conservation agriculture with limited use of herbicides. In a similar way, CUMAs are investing in collective fodder dryers to facilitate the development of legume cultivation, resulting in an unprecedented sharing of hay of farmers during the use of this equipment (Valorge *et al.*, 2021).

Methodology

After studying the literature mentioned above, we decided to focus on the individual and collective methods of mobilization of productive resources by the farmers surveyed and of deriving value from their products, as well as their consideration of technologies and equipment. We also examined if and how each practice raised new issues or workloads to manage. Finally, we examined the ways in which farmers seek to mitigate these induced constraints.

We conducted semi-structured individual interviews with farmers from 34 farms in the six selected CUMAs in the autumn and winter of 2015-2016. These interviews were designed to ascertain these farmers' justification of the practices they developed on their farms to this end, as well as their trajectories of involvement in their CUMAs.

We recorded the narratives and from this material, analysis first made it possible to identify these farmers' justifications, which we correlated with the strategic choices made at the farm and CUMA levels. Then, a group analysis was carried out at the level of each CUMA studied to identify the specific aspects as well as points common to all farms, before finally identifying the characteristics that were common across all of these case studies. Our interpretations were submitted to each CUMA through collective feedback workshops (run between May and August 2017), which allowed us to complete and correct our analysis. We also had regular opportunities to present our analysis to farmer leaders and staff of the national federation of the CUMA. This allowed us to better assess the significance of our results beyond our case studies.

A labour-intensive and collective style of work within the Cuma

The analysis of the previous style of farm work among the CUMA farmer-members we surveyed, reveals its labour-intensive and collective nature, through cooperation.

A labour-intensive style to achieve efficiency and relative autonomy

In relation to the output markets, the surveyed farms appear to be specialized in a main production. However, to differentiate and diversify their products and seek new outlets, farmers undertake activities complementary to primary production and strive to add value to their products or access multiple markets. The diversification of activities or outlets, even if it appears to be not very significant in scope in comparison to the scale of their main production or outlet, aims to take advantage of the synergies

1 Forage legumes are species with the ability to use gaseous nitrogen, thus limiting the need for synthetic nitrogen fertilizers. However, harvesting of their hay requires special care and generates losses if suitable and expensive equipment is not used. Consequently, their cultivation in France remains limited despite their agroecological benefits and their high protein content.

2 Conservation agriculture is based on no-till farming, winter cover crop and crop diversification with the aim of restoring soils. It is mainly practiced using glyphosate herbicides.

possible within the farming system, for example through complementary livestock activities in order to profitably use their main herd's co-products. Grain farmers diversify their crops to improve agronomic synergies. Other activities such as contracting commercially for other farmers, production of renewable energy or agro-tourism aim to make the most of the available time or farm assets such as old buildings. Four farmers transform and direct sell the majority of their productions, while six others do so partially, selling only within their family and friends networks. Many farmers who sell their products through traditional long supply chains use quality labels and/or adopt value-addition strategies (such as commercial seed production undertaken by grain farmers).

In relations to techniques, farmers strive to increase the efficiency of the productive processes. They seek to improve the monitoring and observation of their herds and/or crops, especially through participation in groups for the sharing of best practices, and for the comparison of results. They also seek to improve their skills by working with professional experts.

In relation to the input markets, farmers seek to limit intermediate consumption or its costs. For instance, self-provisioning can help produce a part of the feed supplement required for some livestock farmers, while the practice of producing farm seeds is, on the whole, widespread amongst farmers growing wheat. Buying clubs makes it possible to limit input costs. To better determine which inputs to purchase, technical advice received from input vendors is compared with information from disinterested actors: technicians of extension organizations, peers, professional experts.

Thus, farmers dedicate a part of their labour time to improve their skills and knowledge, particularly thanks to discussions with peers. Because of their differentiation and efficiency-based strategies, they continuously seek to better value their used resources through observations and experimentations, which is labour and knowledge intensive.

Cooperation as a mechanism to consolidate these strategies

These practices of diversification and differentiation, of technical efficiency and of limiting input costs are nevertheless expensive in terms of equipment, in addition to labour. To deal with increased workloads, a part of the human labour is replaced by capital (buildings repurposed and reconfigured to facilitate the use of mechanical equipment, investment in new machinery, even robotization of milking in dairy farming) and less important or secondary tasks are simplified or outsourced.

Peer-to-peer cooperation is also a way of mitigating increased workloads, primarily through the farmers' memberships in their CUMA, by sharing machinery costs.

In addition to the CUMA, farmers enter into a variety of arrangements, often informal, for sharing and exchanging resources concerning equipment acquired individually or in co-ownership, labour (through joint operation), material (for example, the exchange of livestock manure for straw from grain farms) and services. Moreover, local farmers' discussion groups led by professionals (technicians, advisors, engineers), where such groups exist, strengthen peer-to-peer cooperation, primarily by facilitating the sharing of experiences and knowledge, comparison of results, and the organization of collective training (conducted by external experts). They are also strategic arenas for improving the mutual acquaintance of each other's practices, helping to qualify technical dialogues and facilitating informal arrangements.

A collective work organization allowing a labour-intensive farming style

Thus, cooperation between peers has helped the farmers minimize the input and equipment costs in their farming systems. The design or adaptation of the farm practices is distributed between the farm and the discussion groups. Execution tasks give rise to mutual help, joint operation and the delegation to hired

workers, who are shared between several farms or employed by the CUMA. The work needed to access the productive resources (inputs, equipment, fodder, feed) occurs at the farm level, as well as through the CUMA and with the other farmers who are partners for bilateral exchanges and buying clubs. This distribution of the work among diverse spheres (at the farm level and through several collectives and arrangements) allows improving the farmers' skills, to optimize internal synergies within the farm system, and to increase the value-added from the set of internal resources and purchased inputs. All that then shape a labour-intensive farming style, with a relatively moderate use of external inputs.

However, in the last 15 years, this farming style and its associated distributed work organization, have been unable to cope with a combination of various recent problems and issues that are making these farmers more vulnerable.

Recomposition of the farm work style for the agroecological adaptation

To cope with new problems, farmers are cultivating legumes or developing conservation agriculture on their farms. In this way, they rely on the ecological functioning of the agroecosystem, and further reduce the use of external input. However, these practices also lead to additional workloads or new constraints.

Conservation agriculture and cultivation of legumes to respond to new problems

Farmers are turning to conservation agriculture to deal with soil degradation and/or to reduce costs and workloads. Winter cover crop is aimed at improving soil fertility, while also meeting the growing number of regulatory injunctions against uncovered soils in winter. The majority of livestock farmers use this practice to produce additional fodder. Other new crops, such as alfalfa, are sometimes cultivated for self-provisioning or for agronomic improvement through crop diversification.

Legume cultivation allows for more protein production from pastures and winter cover crop, thus improving the quality of fodder production and thus of animal nutrition. For some dairy farmers in Ain, Basque Country and Touraine who are involved in direct sales or in geographical indication, this practice aims to reduce purchases of feed supplements, whose use is increasingly being limited by the relevant specifications since the 2000s, especially after public campaigns against the imports of transgenic soya by European livestock farmers (Escobar 2014).

Conservation agriculture and the cultivation of legumes are also perceived by some producers as means of adapting to climate change. For instance, winter cover crop, as a basis of conservation agriculture, provides an opportunity to produce additional fodder to complete the feed stocks nowadays threatened by the more frequent occurrence of climatic accidents.

In this context, price volatility, especially exacerbated since 2007, has turned out to be the 'straw that breaks the camel's back' for farmers. This factor has only led to an intensification of their desire to be more autonomous by reducing the purchase of external inputs.

The level of adoption of new practices and of the reduction in inputs differ from one farm to the next, depending especially on the farmer's intensity of involvement in peer-to-peer cooperation. Some farmers have been able to significantly reduce their purchases of feed supplements and fodder, sometimes even beyond their own expectations. This has allowed a few of them to become part of more remunerative supply chains but which require greater autonomy. For example, a producer in Tarn has converted to organic farming, and a dairy farmer from Touraine has enrolled in a geographical indication label which forbids the purchase of transgenic soya. Many farmers consider themselves as being in a phase of transition and expect to further reduce their use of external inputs, while for others, these decreases are still minimal. Few farmers have significantly decreased the level of animal and vegetal productivity.

Cooperating to give themselves greater room for manoeuvre

However, these practices induce new constraints, additional workloads and lead to problems in obtaining the necessary resources. Most farmers have difficulty obtaining certain seeds, especially for legumes and cover crops. Their usual suppliers do not always offer the diversity of the desired species at the right time and at affordable prices. This has led a majority of them to self-produce farm-saved seeds, which leads to new operations or even new needed equipment (sorting, storage and drying for example). Farmers seeking to enrich their pastures with legumes also have difficulty obtaining adequate information on their management from their usual suppliers, who have sometimes provided wrong information. Self-provisioning strategies require additional farm operations, such as the management and harvesting of winter cover crops. Producers adopting conservation agriculture have initially increased their use of herbicides to deal with weed growth, though some of them have managed to reduce this reliance on herbicides over time. On two farms in Tarn that have switched to organic farming, conservation agriculture is being practised today without any use of herbicides.

In order to implement their new practices and to cope with the constraints and the issues they raise, these farmers are remobilizing and deepening the three forms of cooperation they were already using. They rely on their CUMAs to invest in tools for conservation agriculture and hay-making equipment suitable for forage legume, sometimes by purchasing high-capacity machinery to increase labour productivity or even storage and processing equipment needed by self-provisioning strategies. To this end, new sharing processes are emerging within CUMAs, such as the pooling of members' hay in collective artificial dryers, the employment of workers, and the organization of new collective harvesting operations, and even collective training processes.

Farmers are also entering into new exchange and resource-sharing arrangements, such as the exchange of farm-saved seeds. This allows a farmer to obtain the diversity of desired species without having to produce himself the full range of necessary seeds.

In order to address the lack of references and knowledge about conservation agriculture and legume cultivation, farmers are relying on or creating new spaces for sharing experiences and collective training through their discussion groups. In the absence of such local groups working on these issues, the CUMAs of the Basque Country, Loire-Atlantique and Touraine organized such discussion and training mechanisms by enlisting the help of external experts and facilitators. This approach of internalizing the discussion group and training function within CUMAs is an emerging trend in the CUMA network and is aimed at compensating for the low investment in these domains by existing research and extension organizations. In this way, increased cooperation offers farmers greater room for manoeuvre. Through collective investments and joint field operations, they can exceed their farms' existing organizational limits. Seed exchanges as well as discussion groups help them cope with the lack of adequate resources. Labour and resource sharing help to mitigate induced workloads, as shown by the CUMA of Aube: two of its members decided to jointly employ a worker to work on both of their farms to free up their time, allowing one of them to spend more time developing his new practices and to participate in discussion groups. The other, a sheep farmer, had the idea of grazing his herd on the winter cover crops. He now moves his herd to five other grain farms each winter for the grazing of their winter cover crops, which has the benefit of reducing the quantity of herbicides used to terminate them.

Deepening the labour-intensive and collective work style

The development of agroecological practices strengthens the labour-intensive farming style. Thanks to the collective improvement of the farmers' skills, these new practices have increased the self-

provisioning strategies and the optimization of internal resources, until then barely valued (activating the biological life in the soil by practising conservation agriculture, stimulating the symbiotic biological nitrogen fixation with the introduction of legumes).

In addition, the work distribution between the farm system and the collective arrangements is deepened. Farmers' skills are adapted through the discussion groups, and the increased workload is minimized by several collective processes: work delegation to hired workers, increasing labour productivity through collective investments in high-capacity machinery, and/or through new form of joint operation (for the silage of the cover crops, for the elaboration of the species mixture to sow the cover crops). And finally, self-provisioning is eased by new sharing arrangements between farmers.

However, each farmer relies differently on the peer-to-peer cooperation, which requires available time, cooperative skills and enlarged social capital: all the farmers do not equally have these resources necessary to collaborate between peers. Then, farmers more provided with these social resources, manage to intensively activate the diverse mode of peer-to-peer cooperation and then to more deeply develop agroecological practices.

Discussion – Conclusion

In the Cuma we have surveyed, farmer members have developed a labour-intensive farming style for a long time, and thanks to the involvement in collectives and sharing arrangements. In this way, they had adopted a conventional agricultural model using external inputs and powerful equipment, made viable by intensively relying on inter-farm cooperation, inducing a distributed work organization. The peer-to-peer cooperation had allowed them to achieve scale and scope economies. For instance, they were involved in buying clubs to manage to purchase inputs at lower prices, as well in study groups to achieve technical efficiency by peer-to-peer comparisons of technical results and experience sharing. In addition, the Cuma had allowed them to share their investment in high-capacity machinery to increase their labour productivity, especially for field operations. Gradually, they have improved their professional skills, as well as the labour productivity thanks to the high capacity machinery acquired through the Cuma, and they have mitigated the costs of the external inputs by self-provisioning strategies and buying clubs.

This long-standing reliance on the peer-to-peer cooperation, especially to manage the resources (mainly labour, equipment and knowledge), has shaped an initial style of work organization that has facilitated the process of change towards the development of agroecological practices. Indeed, to solve several problems, they have recently developed new practices to reduce the use of external inputs, which has faced them to new constraints and questions. They then have newly mobilized and recomposed the peer-to-peer cooperation to manage to ecologically adapt their farming systems. The structuring basis of this long-standing style of farm work has been newly mobilized to further ground the farming system on the ecological flows and resources of the local ecosystem. For instance, the Cuma has been newly mobilized to access a wide range of machinery, needed to diversify crops, which induces to use machinery that is more specific. They also had to collectively produce new site-specific knowledge by pooling their observation of their common local ecosystem and by sharing the results of their experimentations to manage to draw valid conclusions from their on-farm experiences. To do so, they have newly mobilized discussion groups. Finally, they have organized new sharing arrangements to access the strategic resources, such as seed sharing to be able to grow a larger range of species to diversify their crops. Thus, they have easily re-mobilized the structuring basis of their initial farm work style, *i.e.* labour intensity and peer-to-peer cooperation, by orientating them otherwise to develop agroecological practices.

These results help to understand the current persistence of the Cuma in France, despite the development of alternatives, such as the delegation to contractors. Members of the Cuma are mainly mid-scale farms relying on cooperation with access to high-capacity equipment, then increasing their labour productivity (Jeanneaux *et al.*, 2018; Harff & Lamarche, 1998). Simultaneously, they manage to achieve efficiency of the input use, owing to two factors: 1) their capacity to monitor and master the sub-elements of their farming systems, 2) the continuous improvement of their skills by taking part in discussion groups. They also collectively employ more qualified hired workers who benefit of better working conditions. Indeed, workers hired by the Cuma have the best wage and working conditions in comparison with the other categories of hired workers in French agriculture (Forget *et al.*, 2019). In addition, their labour-intensive farming style associated with a distributed work organization through different collectives and arrangements, give them more interesting conditions to develop agroecological practices.

However, these assets of this farm work style are barely visible through the available data and surveys in relation to agriculture, mainly focused on the farm level (then masking collective processes) and relied on monetary operations (then masking labour processes) (Altukhova *et al.*, 2017; Lucas *et al.*, 2020). New research is then required to better highlight the nature and recomposition of the labour processes occurring during the agroecological transition, to better targeting support devices to foster this much needed transition. Such research could also examine the economic and social dimensions of this work model within agroecological farm systems.

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