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Creating commons in the context of hegemonic struggles: the stakes of knowledge sharing via digital tools in agroecological movements

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Introduction

Today, the pillars of the industrial agricultural model are increasingly questioned because of their perverse effects on the environment and on the stakeholders of the agricultural sector (Nicolopoulou-Stamati et al, 2016; Gebhard et al, 2015). Agroecology is one of the possible ways towards a sustainable agriculture that could reconcile sufficient production and respect for the environment and farmers (Wezel et al, 2009). The literature attests to the polysemous nature of the term agroecology. This polysemy is reflected in a certain denaturation of the notion of agroecology, which is beginning to be discursively appropriated and used for purposes other than those originally intended. That is to say being able to use the term agroecology as well as part of its principles with the aim of establishing a hegemony, of making more profit, in particular in the industrial environment of agriculture and food systems, thus serving mainly the industrial groups.

In the context of the agroecological transition and especially in these times of crisis, counter-hegemonic organizations are rising and developing actively in agriculture, in a global context of evolution of our societies and of the place of food systems within them.

The emergence of initiatives that operate differently in agriculture and related fields, is marked by the formation of networks of associations and farmers where a variety of actors come together to achieve common aims, share means of action and manage their Commons to further develop counter-hegemonic models.

In this paper, we are interested in peasant knowledge sharing within such counter-hegemonic networks which support the agroecological transition. Seeds and associated peasant knowledge are considered by these organizations as a part of Commons to be preserved, managed and shared. Those commons are also considered by these organizations as an essential pillar of the agroecological transition. However, these counter-hegemonic networks face challenges when it comes to defending their assets and practices against the hegemonic project of industrial agriculture.

A neo-Gramscian reading (Gramsci, 1971) allows us to characterize the agroecological movement as a counter-movement to the hegemony of the industrial agricultural model. Throughout the agricultural value chain, hegemons control considerable market shares (Ravenscroft et. al, 2013) particularly in terms of production (seeds, fruits and vegetables, fertilizers, tools) but also in terms of distribution and marketing. A globalized food system (Gaupp, 2020) allows agro-industrial multinationals to maintain and reinforce their positions (Clapp, 2018). Such hegemony allows dominant players to impose particular agricultural practices based on a vision of the human-nature relationship that is not necessarily shared by all (Rigolot, 2017). For example, industrial seeds are a commercial good owned, produced and

sold by market players, while peasant seeds are considered as a common resource by counter-hegemonic agroecological players. Counter-hegemonic agricultural organizations have a societal project that constitutes their driving force and opposes them to the hegemonic model on a number of fronts such as the production and appropriation of peasant seeds (Demeulenaere, 2014, 2018). Thus, these organizations are part of an ongoing struggle and a quest for emancipation that opposes them to the hegemony of industrial agriculture (Ravenscroft et. al, 2013; Goris, 2020).

Indeed, a counter-hegemonic movement has been developing and gaining influence in the form of local initiatives to support and develop counter-hegemonic forms of agriculture embodying distinct norms and values (Wezel et. Al, 2018). The concept of hegemony, central to Gramsci's writings, allows to capture the hegemony established by dominant players over a marginalized (or even reabsorbed) resistance (Carrol & Ratner, 1994, p. 7; Levy & Egan, 2003). The Gramscian conception of the hegemony is based on three pillars which are the State, the Firm and Civil society. This conception is relevant to study our case of counter-hegemonic movements in agriculture and particularly the case of peasant seeds.

In this paper we question the potential of the use of digital tools within counter-hegemonic organizations to share peasant knowledge in their commons management policy. Our research question therefore focuses on the potential of digital use to develop the agro-ecological model, particularly in terms of knowledge commons sharing within a counter-hegemonic organization, aimed at supporting small farmers and producers, with particular attention to the risks that might be associated with such use.

On the basis of a participative action-research, we explore such paradox of knowledge-sharing in counter-hegemonic organizations: on the one hand, peasant knowledge is destined to be disseminated, hence shared, while on the other hand, it also needs to be protected from hegemonic reappropriation. We investigate such dilemma in the particular case of a counter-hegemonic meta-organization's decision to develop a digital knowledge-sharing tool for its members.

We present in this paper a critical reading of common resources management and sharing in the case of peasant seeds and peasant knowledge in the context of the agricultural counter-hegemony. We present the results of our 18 months action-research project with a counter-hegemonic organization referred to as the « seeds' collective » in two phases:

1. Exploration of the potential to put in « common » peasant knowledge using a digital tool in the context of hegemonic struggle
2. Identification of the different risks associated with knowledge sharing via this digital tool

Theoretical framework

The literature provides insights on knowledge commons sharing, but does not address the specificities of the context of hegemonic struggle which characterizes counter-hegemonic organizations. Hence, we combine a Commons perspective with a neo-Gramscian approach so as to capture the particular conditions of counter-hegemonic organizations that are simultaneously engaged in developing and sharing Commons on the one hand, and protecting them from hegemonic reappropriation on the other hand.

Peasant seeds and peasant knowledge: common resources

The term 'commons' refers to a resource whose use is shared among members of a community. This resource generally meets needs that are not met by markets or institutions (Vivero-Pol et al, 2018). The meaning of the commons can, depending on the discipline, refer to different principles. For example, a commons may refer to the characteristics of a tangible and intangible public good that are needed by the public (Hampson and Hay, 2004). However, public good does not systematically mean free access (as for a resource like water or sunlight).

For Ostrom, a “commons” refers to a resource for which a system has been set up to define rules of use, so that all users can benefit from the resource, while preventing any process of exclusion of users from access to the resource. As with any rival good, the amount of resource available to other users decreases when a user uses it (Ostrom, 2009). These open access resources can fall victim to the tragedy of the commons (Hardin, 1968). While Ostrom has successfully challenged the foundations of Hardin's model, the profit motive of large corporations around the world is putting many resources under pressure, resources for which Hardin's model can predict the consequences of over-exploitation. This profit-seeking also translates into several practices that are criticized by a number of farmers, such as water privatization or land grabbing (Ferrando, 2017).

A common good is seen as something that everyone is supposed to be able to enjoy without the possibility of appropriating it and excluding its use. This conception applies to forest resources, marine resources, irrigation systems or the oceans (Araral, 2014).

For Ostrom (2003), trust and reciprocity are central variables on which cooperation around a common resource depends. An actor is therefore highly dependent on his or her reputation as well as on the information available about his or her past actions.

This framework is useful for studying commons issues on a local but also global scale. This framework provides a framework where individuals are the main actors at the local scale while at a more global scale states are the main actors. In this configuration, the interests of the state are represented by a political apparatus whose individuals maximize their utility.

Knowledge can be considered as a “shared resource, a complex ecosystem that is a commons - a resource shared by a group of people that is subject to social dilemmas” (Hess 2012). The knowledge commons literature (Frischmann et al. 2014) is relevant to address the dynamics of co-managing such a common, and to grasp the dynamics of counter-hegemonic networks in agriculture (Mazé et al. 2021). Knowledge in this framework can be defined as “all useful ideas, information, and data in whatever form in which it is expressed or obtained” (Hess 2012). Sharing knowledge can be a serious dilemma whenever it involves risking a strategic advantage linked to the control of such knowledge (Mulder, 2020). Knowledge sharing and transmission can be facilitated through social networks (Ostrom & Cox 2010) and counter-hegemonic networks (Folke et al. 2005).

In their article, Hess and Ostrom (2003) address the issue of open knowledge being privatized. Privatized knowledge can be encrypted and monitored to control its dissemination. Intellectual property laws and rules are now increasingly impacting on the field of knowledge production as new technologies make it easier to share and disseminate knowledge, in the sense that it is increasingly difficult to control the dissemination of knowledge once it has been shared. Nevertheless, in some cases, new technologies can be a means of controlling or even monopolizing knowledge (Hess and Ostrom, 2003). The classic example of this is when a company extracts information that is in the public domain, or even commonly held knowledge, and then appropriates it by establishing intellectual property rights.

In agriculture, these issues are very much present, for example, in conflicts between large corporations and indigenous people (Hess and Ostrom, 2003). In these conflicts, large groups try to appropriate traditional knowledge related to local cultures. The appropriation of this type of knowledge can then lead to the appropriation of living varieties through the patenting of genetic resources.

Beyond genetic resources, and beyond the world of agriculture, patenting and the dynamics of appropriation of natural resources have been a trend for some decades now, affecting many natural resources, and therefore largely common resources, which are at the same time affected by radical changes linked to the development of new technologies (Hess and Ostrom, 2003).

The authors therefore consider knowledge and information in the public domain as common resources, which are subject to interaction between a large number of actors, thus giving rise to conflicts.

In the field of knowledge, the concept of the commons has been used in several disciplines, notably in law and management. A commons implies, by definition, that anyone can enjoy it without the permission of another person (Lessig, 1999). Similarly, the government should refrain from setting up institutions to decide on the use of common resources (Benkler, 1999).

The commons may also be in the public domain, in the sense that what is in the public domain is not eligible for appropriation through intellectual property rights so that anyone can use information that is in the public domain (Litman, 1990).

We are more particularly interested in agroecological peasant knowledge which continue to be disseminated through such networks (Mazé et al. 2021) in the context of their counter-hegemonic struggle (Demeulenaere 2014). Putting this agroecological peasant knowledge in the hands of the Firm and industrial players especially when it involves genetic resources like a peasant seed (which is also considered as a common resource), can lead to commodification, monopolization and patenting of this seed. That is why the excludability and rivalry matrix is a suitable tool to analyze questions related to peasant seeds and peasant knowledge, both considered as common resources by many peasants.

Considering the peasant seeds and associated knowledge as commons supposes that seeds can be subject to rivalry and not to excludability. However, the main dilemma concerning seeds is that if peasants choose not to exclude the Firm from the access to their unregistered peasant seeds, these seeds can be subject to privatization processes by the Firm, resulting in excluding the peasants themselves from using these seeds if they do not want to pay every year to acquire them. In other terms, we can consider that in this analysis, the “tragedy of commons” in the case of peasant seeds take other forms as a consequence of giving access to the common resources to hegemonic players.

The combination of a neo-gramscian approach and the commons literature allows us to explore the possibilities for counter-hegemonic actors to “protect” their commons in a hostile legal environment imposed by the State and which facilitates the Firm’s domination over the sector, while keeping on working on their mission spreading cultivated biodiversity and disseminating peasant knowledge. In the following part, we are going to characterize the structure of the hegemonic process in agriculture where the State will be considered as responsible for the legislation, the Firm represents industrial agriculture and is considered as a direct beneficiary of this legislation, and the peasants will be considered as part of the civil society which “undergo” the effects of this legislation.

Agricultural hegemony

Agriculture is characterized by a diversity of practices that emanate from a multitude of approaches based on different visions of the relationship between man and nature. A classic example is the choice of using the French term " exploiter" (by the State and the firm) versus " peasant " (used by counter-hegemonic movements) in the sense that the former refers to the exploitation of nature by humans, whereas the latter refers more to a way of life. While the term peasant was associated for a time with a pejorative connotation, it was rehabilitated in the 1980s

to distinguish peasantry from "modernized" agriculture (Morena, 2011; Demeulenaere 2014) thus becoming a sign of political commitment.

Today, all sectors and pillars of agriculture are dominated by actors and activities that are part of approaches considered to belong to "modern", "productivist" agriculture that adheres to the laws of the market and is subject to changes due to economic developments, especially in a state-adopted capitalist system propitious to the Firm.

A strong illustration of this hegemony is the large-scale production and use of chemicals, whose usefulness and assessment of the effects on the environment, but also on human health, are far from being the subject of a consensus. To understand this process, we go back to the end of the Second World War.

During these times of reconstruction and "modernism", agriculture was affected by the race for productivity. This productivity is encouraged by the use of new techniques, in particular mechanization and motorization, but also by new approaches based on standardization and "progress". At this time, the dynamics of mechanization, (and thus motorization) were necessary to "exploit" increasingly large surfaces - in a context of shortage of agricultural labor force - for which the use of large quantities of chemicals was also necessary.

The modernization of agriculture has rapidly spread to all its sectors, and in particular that of seeds, which became a "business" (Pistorius and van Wijk, 2000). This transformation is even more encouraged within the framework of the Common Agricultural Policy at European level (State), which advocates the "modernization" of agriculture.

On December 2, 1961, the Union for the Protection of New Varieties of Plants was created in Paris (State), marking the concretization and institutionalization of the enclosure around seeds. At this point, the regulations still allowed a "farmer's privilege" or “breeder’s exemption” which was to reproduce purchased seeds from the Firm for the following season. This privilege was abolished by a French law in 1970: the production of seeds is an "exclusive right" of the holder of the plant variety (Demeulenaere, 2013).

The vision behind this legal structure considers the farmer as an end user, who receives an improved product (the improved variety) thanks to an investment made by the Firm, who therefore considers the seed activity to be a separate activity (Demeulenaere, 2014). As a result of this investment by the Firm, it has therefore become legitimate with regard to the legal framework to consider that a farmer who reproduces his seeds is opportunistic and that, because he benefits from this "genetic progress" without paying for it, he becomes thus a free rider. In this increasingly constraining context, and an awareness of the technical, political, legal and scientific limits of these developments (Deléage, 2004; Bocci and Chable, 2009), counter-hegemonic social and agricultural movements are beginning to form.

These movements often take the form of networks and groups, as in the case of the seed sector, in which networks are being formed all over the world. These networks, which are interested in seeds and therefore in farmers' rights, are of great interest to researchers and scientists in different disciplines to show the importance of the agricultural and societal stakes. Moreover, these networks are sometimes subject to controversy or "misconceptions", as pointed out by a number of researchers. For example, four "misconceptions" are debated in a 2015 article (Coomes et. Al, 2015): these ideas concern the efficiency of these networks to disseminate farmers' seeds, the closed nature of these networks on themselves, their capacity to provide access to seeds and finally their fragility and lack of sustainability over time. The importance and the contribution of networks for farmers' seeds are therefore highlighted while clarifying the limits they suffer.

Another illustration of the agricultural hegemony is the discursive appropriation of the term “agroecology” which is now used by many hegemonic actors. The terms "weak" and "strong" agroecology originate from two different conceptions of the ecological transition in the agricultural sector. On the one hand, a weak agroecology is based on a "soft" transformation of agricultural practices, for example an optimization of the use of chemical inputs (Horlings and Marsden, 2011; Rains et al., 2011), whereas a strong agroecology corresponds more to the agroecological model desired by civil society actors and farmers engaged in alternative approaches that rely on the natural interactions of environmental components and biodiversity (Duru et al., 2015).

Nowadays, in addition to these issues, "modernization" of agriculture also includes digital transformation, which is often linked to an environmental but also a social impact (Beier et al, 2017). This transformation is justified by the State and the Firm by many arguments such as that of maintaining economic growth. The development of the use of digital tools on-farm raises important and potentially divisive questions about the design, adaptation and appropriation of these tools by the farmers, as well as the implications of their use (Hanappe, 2018; Klerkx et al, 2019). Digital technology strongly supports the industrial agricultural model. Moreover, many counter-hegemonic organizations hold digital tools and technologies responsible for the privatization of genetic resources which were once common resources. That’s why the digital tools in agriculture are, in the eyes of many counter-hegemonic organizations, part of the legacy of the hegemony, and therefore it becomes an object of struggle for these organizations. Therefore, some collectives and movements promote minimal recourse to “modern techniques” and new technologies (Demeulenaere, 2012, Goulet, 2010). On the other hand, the place of digital tools within an agroecological model remains an interesting research topic where several gaps could be explored (Klerkx et al, 2019). Digital tools could also be seen as a lever for the

development of the agroecological model (Bellon-Maurel and Huyghe, 2017) and are therefore at the crossroads of different agricultural models.

The digital hegemony in the agroecological transition

The agroecological transition is characterized in the literature by foundations such as MacRae et al. (1990), which consist of a linear process marked by steps from increasing the optimization of the efficiency of the use of chemical inputs to their substitution by interactions between natural components of the environment, thus transforming the agricultural system (Gliessman, 2015). Knowledge, tools and technologies adapted to sustainability issues (Gkisakis & Damianakis, 2020) could support actors in this transition (Rains et al., 2011; Caron et al., 2014). While some technologies are now promoted as useful and suitable for the principles of agroecological transition, others are considered "disruptive" to the agroecosystem (Gkisakis et al., 2017).

Digital agriculture (or use of digital tools in agriculture) covers a multitude of digital tools applied in agriculture. The digital transition in agriculture consists of a process of socio-technical transformation where farmers are expected to adopt digital tools to integrate them into their operations, in terms of the production systems but also along the value chains (Klerkx et al., 2019).

Industrial agriculture is the breeding ground for the "technocentric" approach, which imposes heavy mechanization that is being implemented gradually, involving in most cases intense data harvesting via digital tools. Public policies, for example at the European Union level, encourage the development of digital solutions in agriculture (European Commission, 2019) in a more global desire to bring about the emergence of an economically powerful sector. This sector relies on synergies fostered by public authorities, aiming to create an ecosystem where institutions, private actors but also researchers - for example the creation of #digitag financed by public funds - establish partnerships that allow the development of this sector (Gkisakis & Damianakis, 2020).

On the other hand, a large number of associative actors, farmers and civil society organizations are multiplying their criticisms and warnings about the development of this vision of agriculture. A risk of "conventionalization" of the agroecological transition has been highlighted (Darnhofer et al., 2010; Caron et al., 2014; Duru et al., 2015). Distinguishing agroecology from other agricultural models is therefore necessary to avoid risking a political recuperation of the term leading to a transition that ultimately consists of a technological transformation of agriculture based on dominant agricultural trends (Pimbert, 2015; Altieri et al., 2017).

Thus, there is no consensus about the contribution and potential of digital tools in the agricultural sector, and in particular about the role that digital tools could play in the agroecological transition.

Furthermore, the costs associated with the "digitization" of agriculture are not necessarily offset by the savings from reduced input use after the introduction of digital tools (Van Meensel et al., 2012; Duru et al., 2015). The financial cost of using new technologies is also a barrier to their use by smaller farmers (Osipov and Bogoviz, 2017).

While peasant agroecology relies primarily on locally rooted knowledge whose transmission is fostered by human exchanges and the observations that the peasant makes in the field, weak agroecology models are based on the increased use of digital technology and rely instead on processes such as "machine learning" fostered by big data and the harvesting of peasant data (Carolan, 2017; Higgins et al., 2017; Gkisakis et al., 2017).

Moreover, the dissemination of digital tools in weak agroecology seems to be done through a top-down dynamic, in the sense that the farmer is an "end user" of the technology, in other words the farmer is just a customer (Kshetri, 2014; Seppala, 2014). Developers in this model therefore do not systematically use farmers to include them in the ideation and development phases of the tools, which would notably promote a better adaptation of the tools to the contexts in which they will be used (Bellon and Ollivier, 2018).

While farmer autonomy is an omnipresent criterion in the discourses of peasant (or strong) agroecology actors, this does not seem to be a criterion seriously considered by digital agriculture actors who propose tools that put farmers in asymmetrical power relations with tool providers and developers (Gkisakis et al., 2017; Higgins et al., 2017; Carolan, 2018).

Methodology

Our field exploration is based on an engaged participatory action-research or PAR (Whyte 1991), developed in 2020-2021 with an agroecological counter-hegemonic organization. Participatory action research is a dynamic, evolving process in which the researcher is constantly learning in order to solve a problem or engage in socio-political action (Gillis & Jackson, 2002; Koch & Kralik, 2006; Marshall & Rossman, 2006; McTaggart, 1989; Morris, 2002; Selenger, 1997).

Our partner for the action-research is a network of organizations engaged in the preservation and dissemination of farmers' seeds and agroecological peasant knowledge (hereafter named "seed collective"). Seed Collective (SC) brings together more than 80 national organizations (varying in size, wealth and area of influence) and multiple local collectives of farmers, agricultural technicians and activists involved in peasant, organic and biodynamic agriculture. For more than 15 years, SC has supported the development of local initiatives to promote and enhance cultivated biodiversity and the collective management and protection of peasant seeds. It participates in scientific programs fostering the recognition of farmers' know-how, and promotes the recognition of the rights of farmers to select, reproduce, use, protect, exchange and sell their seeds.

PAR provides participating partners with a tool for empowerment in their struggle for social change (McTaggart, 1997). The participant members from the seed collective were therefore actively participating in defining the research questions and the tackled topics throughout the collaboration and the research process (Whyte, 1991). The preliminary results were also presented and discussed with them. As their participation is central, the success of a PAR project depends directly on the knowledge and skills of the participants. In PAR, social and political issues have their place. The exchanges provide a moment of reflexivity and emancipation (Greenwood, Whyte and Harkavy, 1993; Greenwood and Levin, 1998; McTaggart, 1997).

A research proposal was sent in April 2020 to the Board of Directors of the organization, offering to explore together the potential that digital technology would offer for knowledge sharing in the network, before possibly co-constructing a digital tool fitting SC's needs.

The proposal was delegated for further discussion with SC's "research focus group" in charge of evaluating research proposals and conducting research projects in the network. Following this meeting, the first action-research phase began: in this phase, preliminary questions were tackled during five semi-structured interviews, more than ten email threads and one conference call. Those interviews focused on the members' general perception of digital uses in agriculture, and potentials in an agroecological model.

Data collected during this phase led us to develop our first results about threats of industrial appropriation of peasant knowledge, main difficulties in digital tools' implementations, and potential needs in terms of digital technologies.

Those results were then transmitted to the SC and shared with the members for further discussion, with an invitation for interested members to begin the second phase to work on the potential of digital tools for peasant knowledge sharing. This second phase involved a more homogenous group composed of a few people representing five associations, particularly interested in the discussion around the digital tool, who regularly participated in this process through ten semi-structured interviews, five conference calls, at least fifty email threads, four on-farm events, and several informal events. Those associations collect, maintain, preserve and disseminate farmers' seeds both in their local area and through the national network of SC. Tony, one of the participants, describes his association as follows:

"I am at the initiative of this association with a collective of about fifty members who work around the peasant seeds, mostly market gardeners, between 22 and 25 multipliers who have 1 or 2 varieties that we have recovered locally, ideally. We propagate in quantity for the common pool and put them on the table for free exchanges with the other seed producers. There is a college of professional "producers", those who live from this profession, and a more amateur part with gardeners who do backup multiplication, in a general way. We work mainly on the professional part, with the idea of also doing varietal improvement."

By the end of this phase, a clear image of the needs of these members was drawn. This phase was important to lay the ground for our theoretical analysis of stakes involved in managing and sharing commons in the context of hegemonic struggle: we defined the global specifications of what an adapted digital tool for peasant knowledge sharing would be.

Nevertheless, various limitations can sometimes complicate PAR processes. Participants may not be able to give much time to the research project, so commitment (or even disengagement) is variable at different times (Gillis & Jackson, 2002; MacDonald, 2012). A major challenge for the PAR project, however, remains the dissonance and differences of vision that exist within the partner community. These differences can be about the problems to be investigated in the project (MacDonald, 2012) or, as we observe in our case, about the action to be taken and the ways to solve the problem (Gillis & Jackson, 2002; McNiff & Whitehead, 2006). There are many issues that can trigger conflict and hindrance in PAR, such as power relations within the community or the interpretation of the subject of PAR (Gillis & Jackson; Maguire, 1987; Wadsworth, 1998). In our case, those challenges were naturally present because certain members of the collective are reluctant towards digital tools and also towards public research.

Those challenges can partially explain why even though we had access to a research funding for the ideation and development of the digital tool, yet the action-research process came to a standstill. Our data allows us to grasp the complexity of the participants' hard choice dilemma: a desire to pursue the project, in spite of the associated risks.

Main findings

Pooling knowledge: the desire to explore digital potential for knowledge sharing

If sharing knowledge via digital tools was not well received by many members, a group of small organizations has nonetheless shown interest in exploring and eventually co-developing a digital tool adapted to their needs in terms of knowledge management and sharing. Julia was one of the first members to express her interest: “I want to find tools that allow me to share my knowledge with them. Because my work must be disseminated in a wider way for the cause of peasant seeds, which is not just for my little territory but for the whole world.”

This group was composed of five member-organizations along with occasional participation of a few individual members interested in the project. Such organizations are typically small and manage their activities by using very accessible tools – such as pen and paper. Some of them already use a few digital tools such as excel sheets to list their varieties and associated peasant knowledge according to key characteristics (weight, germination rate, stock state etc.) like in Tony’s association:

“We use excel files where, as soon as someone takes a seed, we have to update the data, so that we update our catalog and that we know who has which strain, where was it last year and the year before that etc. You see: all this follow-up, this traceability of the seeds”

Some of them get a helping hand from bigger organizations with more means in the network that have developed a more advanced digital tool, and let the small associations borrow it like Bernard’s association:

“We exchanged with [bigger organization’s name], and they proposed us to use their tool which is much more, let's say, ergonomic. So, it's much easier, although it's still very complicated to use and we hardly use half of it. Because there's all the management side, there's all the online sales side that we don't have, and there's all the accounting side that we don't do. So, no sales, no accounting.”

Even if those members are not dissatisfied from such borrowed tool, they admit that it does not perfectly fit to their needs and does not significantly facilitate knowledge sharing, which is understandable given the difference of scale and aims of the organizations. However, the main reason for Bernard to want to explore another tool is that the maintenance and durability of the tool are relying on a single person: “*Well, it's the fact that it's one person who knows how to make it evolve and update it. That's pretty dangerous.*”.

This led us to explore together what kind of digital tool would better meet their knowledge sharing needs. After several hours of meetings, in which we discussed the needs and the risks, a common vision of their needs began to take shape. Here is a summary of the main aspects that an adapted digital tool for peasant seeds and knowledge sharing should respect.

Data protection and storage

A main general concern was shared by all about data protection, like in the case of Julia's association: *"The actual need for our associations, is to have digital management tools, which help us to manage and share our commons, while protecting ourselves and respecting the rules of use of these commons, and that it does not spread to just anyone. So how can we do it?"*

More technically, how the data is stored presents an issue. Tony stressed on the question of data storage and the choice of servers:

"We have an association, we have no money. So where am I going to put all this data online? Well, there is Google Drive offering me 15 GB. All these millions of information, it only takes 3,4 GB, you know? That's nothing in terms of volume. But we work on peasant seeds, on the commons, on the non-appropriation of living organisms, etc. This is all the knowledge that is essential for peasant seeds and for the common, but we are not stupid, we put all this on Google and we know that Google is free but it is not free. "When it's free, you're the merchandise". And so, this raises questions: "yeah, so we put it all online, and then tomorrow, Google decides to shut down a whole part of its operation, of its drive, and all the information that is centralized is privatized. All of a sudden, they decide to change their mind... We depend on a large group, you have no idea for how long this information will be available. How do you do open source stuff, how do you do things on a much more ethical level about storage, server stuff, I don't know..."

Bernard also shares Tony's views on storage, even in the case of collaboration with researchers: *"The data are stored on a [research institute's name] server. These data were generated by the group in collaboration with [researcher's name], [research institute's name], and the SC. So, all it takes is a change in management in the [research institute's name] and we find ourselves with data blocked at [research institute's name], and at the whim of the people who manage it."*

Durability of the tool

Most of the participants mentioned the importance of the flexibility regarding the tool's transmission and use by different persons at different times, in Tony's words:

"In order for it to be sustainable over time, for an association like ours, if I have to leave tomorrow, it must be possible for someone else to come in and take over the tool and make it live. You see, it's these issues that raise questions for us. There, the Google Drive for example, if I'm leaving tomorrow, I'm giving the read and write access to someone else, and anyone can use a Google Drive, to add things, to update it, it's still a question of the durability of this knowledge and know-how so that if Mr/Mrs "everyone" arrives tomorrow, they can continue to

make the tool live... If the tool, all of a sudden, requires a fingerprint of a person and then I lose my finger, that's it! It's over, and all these accesses are forbidden to everyone."

After discussing all these issues with the interested members, we produced a document that formalized the details and specifications of the main functionalities to be performed by a knowledge sharing digital tool that takes into consideration all the expressed concerns. Although we proposed to fund the ideation phase and develop a demonstrator for our group of associations, the group with which this work has been accomplished did not follow up and the action-research came to a standstill.

Hiding knowledge: the risks prevail

Overall if at the level of the five associations, members were open for exploration and discussion around digital tools, sharing knowledge via a digital platform met a strong reluctance and distrust from key players in the SC as described by Tony:

"The need is there. It exists. In your place, I understand that it's really not easy, because, I find, (it's a personal judgment), that the SC, (well, it's a little better now), but in the last years, there was really a big problem of reactionism, you know, it's like the grandfather who doesn't want to hear about a new thing. And so, it's not easy, it comes to touch on subjects that are a little bit sensitive like digital, on the commons and everything. Each time, I feel a global chill, where these stories of, eh, in the past, egos, when there was... [old member's name], and all the mess, which still left historical traces, today. There is a historical load which is rather strong within the national network. On the other hand, our associations, we are a few years old, we are new, and individualities mean that things can change. And then when you finally go and talk to [another association's name] directly, well, they don't have the same mentality as the SC either, you know."

This cautious approach when it comes to knowledge sharing via digital tools is a reality that had been described to us by most interviewees, including Camille: "I wanted to see what else could be done that could be interesting, and I would find it a shame that people who are not interested block out those who are"

Sharing tacit knowledge: challenges, and risk of standardizing formalization

Nevertheless, even the most open members like Tony admit that it's generally not very easy to share knowledge: *"There are millions of pieces of information, of reading my personal interests, that even within my own association, I find it very difficult to share. Not simply by the will, but by simply the, time necessary for sharing, the tools necessary for sharing. There is the knowledge like stories of a granny who tells me a recipe; it's stuff that I have in my head, and how to formalize it? How do we find, devote the energy, you know, how to write it? To write it, to formalize it, to put the photos that go with it, I have a lot of trouble doing it, but the main obstacle is the time to do it. Let's say, in an even more horribly capitalistic way, the money to do it. Because I would have to spend thousands of hours putting all this knowledge about peasant seeds that I have in my head and that are written down nowhere, or that are sometimes written down but in a scattered way... And so, there is no centralization of the information"*

Sharing such tacit knowledge and information about seeds is traditionally done through personal conversations and contacts, facilitated by the numerous events that SC and its members organize throughout the year. Members share their knowledge during these events and they may (or not) also keep in touch afterwards and develop collaborations and friendships over the years,

according to Bernard: “There are people with whom it works and people with whom it doesn't work. And the transmission of knowledge is more or less the same thing. And as a result, this knowledge is passed on or not, depending on how you feel about these people.”

In this context where they may share knowledge through digital tools on a one-to-one, private and interpersonal basis, we observe a selective process about the shared information like explained by Bernard: *“you don't necessarily share everything: there are things that the peasant keeps for himself like the resistance to certain diseases for example... But these are things that we tell each other verbally. In fact, it's the affinity that we don't share. The affinity with a plant: Why we like this plant. And that is shared verbally. But it's difficult to do it by... by computer, you know. Afterwards, there are things that can be shared within the multiplier’s community, but that people outside won't get to see. There is data that will be shared in a closed circle and other data that will be shared with the general public: everything that is descriptive for the Internet, that's disseminated... But there are varieties that I don't share. Because there is a variety that I want to preserve for the moment. Because I like it, because I like to have my little seed to give for gifts.”*

The risk of reappropriation by market players

While sharing within the organization is common, sharing knowledge more openly outside the network is very delicate and widely discouraged in SC like in Julia’s case: *“Julia: I wouldn't share that "the strain of pink sweet onion from Menton you can find it specifically at Jane's farm, how it grew, that we observed an explosion of yields following the use of a 3% manure"... It's this data where I think there is more risk.*

Interviewer: And you wouldn't have any problem sharing them within the collective?

Julia: On the contrary, I want to find tools that allow me to share them with them.”

Such unwillingness to digitally share information about seeds outside the network stems from two reasons. First, as mentioned by Bernard and Tony, the formalization process imposed by digital tools does not ensure – and might even hamper – the preservation of the human and subjective aspects of farmers’ knowledge, which is better achieved through interpersonal conversations on the subject.

Second, the reluctance to openly share knowledge in the network stems more importantly from the risk of reappropriation by dominant market players. Indeed, agro-industrial firms may have an interest in capturing and appropriating unregistered seeds’ varieties in order to feed their research, development and commercial activities. Obtaining a sample of such seed may allow for preliminary testing and the launch of a subsequent intellectual property and patenting process by which the industrial firm could privatize the seed’s variety and its genetic resources. If knowledge about cultivation conditions for the seed is also shared, then the firm’s work to

adapt and exploit the seed may be all the more facilitated, as explained by Tony: *"I have a fear about living organisms, about farmers' seeds. For example, we are developing a rare variety of onion that we have saved, forgotten by the farmers, and so we have a crazy peasant work of recovery. If tomorrow, we use a digital tool, we will store for 10 years all the information about this onion, lot of peasant knowledge, which leads to a result of a living peasant seed, and that at the end of all this work, a trainee of [hegemonic firm], who goes on the internet with who is paid for that, to do prospection all over the world, he types there, Hop! He has a database, he has all the results... All he has to do is go to a field, get two onions of this type, he puts them in the official catalog of varieties, he distributes them, and they will have the production capacity to invade the market with a seed that is 10 times less expensive than what we will ever be able to produce with our value chains, and so tomorrow, we will find ourselves deprived of our seed"*

Moreover, mutualizing the data of several members via a common digital tool could thus greatly enhance the scale of potential knowledge leaks outside the network, by allowing industrial rivals to access a centralized knowledge base. Hence, digital knowledge sharing could make the meta-organization much more vulnerable to data grabbing, exposing the members to the risk of loss of their strategic advantage granted by the control of the knowledge which allows them to fulfill their mission: preserve and disseminate local peasant unregistered varieties.

We can consider that those risks (shared by the majority of SC's members) outweigh the desire to develop a common adapted digital tool for knowledge sharing (shared by a minority of members).

"Hi George,

Thank you for letting me know how you're doing, I must admit I'm disappointed that we didn't get anywhere, but I guess the timing wasn't in favor, not to mention some people's brakes!

This work still resonates with some people though, we'll see!

In all cases, thank you for your commitment.

I wish you a good continuation and do not hesitate to visit us if you pass by [village's name]!

Have a nice day, Bernard"

Discussion

Peasant seeds and peasant knowledge are both connected common resources, however they involve different stakes when it comes to sharing. Peasant seeds as a common resource are naturally vulnerable to the risk of reappropriation by hegemonic players through the privatization of the genetic resource that results in an exclusion through commodification which represents the loss of strategical advantage of the counter-hegemonic players. On the other hand, peasant knowledge faces other issues within the counter-hegemonic movement: this knowledge is considered a knowledge common, but its sharing may present a different risk than

that of seeds, which in this case is related to the loss of distinctive skills among the actors of the counter-hegemonic movement who make of the dissemination of this knowledge, through paid training, their livelihood.

The contribution of this article is therefore to advance in the discussion around the seed as a common resource and the issues related to the dissemination of peasant knowledge.

The role of technology and digital tools in the process of reappropriating genetic common resources makes it interesting to look at how these tools can on the other hand support the counter-hegemonic project through knowledge sharing. However, this can be more of a challenge when the reasons for the refusal of digital tools are combined with a mistrust of scientific research, also held responsible for the reappropriation of genetic resources through science using technology. This was our challenge during this work with this the SC, because of the research funding which comes from the Digital Agriculture Convergence Lab (#DigitAg). This institute is also funding several mainstream research projects in agriculture, and is, in the eyes of some members, a hegemonic tool of the dominant model. That's why an action-research collaboration was a relevant approach to build relationships and trust with field actors, who made it clear they don't like to be a research "object". In this configuration, field actors, members of the SC were the central partner in the action-research collaboration in which they are directly contributing. But as we mentioned in the methodology section, there are some challenges within a participatory action research framework that helped hinder the process, like differences in points of view concerning the action to take, and also power relations between member (Gillis & Jackson; Maguire, 1987; Wadsworth, 1998; MacDonald, 2012). Those power relations can lead to a hegemony inside the counter-hegemonic organization (Ouahab, 2019): to ensure an effective counter-hegemony, the organization develops an internal hegemony embodied by certain influential members who impose their views in a relatively consensual atmosphere.

The framework of the commons and our own experience allow us to imagine two possible evolutions for the issues of peasant seeds. On the one hand, the natural hegemonic process would mean that through a legal framework set up by the State, the Firm can continue to reappropriate genetic resources considered as a common good, in order to transform them into a private good. The counter-hegemonic response would be a transformation of the commons into a club good: in order to better protect the common resource. The idea is therefore to preserve and share peasant seeds and knowledge within a controlled closed circle where a selective process can be ensured. We observe logics of selective exclusion in the sense that counter-hegemonic organizations will continue to enclose themselves while sharing within the

organizations. In this context, members are selective about people with whom they share, and also about the knowledge they share.

This seems to be the status quo we observe today in the seed sector, but we can imagine an evolution of the situation in the case of legal and legislative progress on these issues.

Finally, on the one hand, digital technology is generally perceived as a tool that serves hegemony by facilitating the process of reappropriation of non-catalogued seeds through technological advances in the field of genetics. On the other hand, we observe that questions about property rights are very similar for digital and for seeds.

We can't help but notice the similarity between an open-source code and a peasant seed. This encourages further questioning of the potential of the use of such digital tools within the counter-hegemonic movement. Within the counter-hegemonic organization, we could imagine the use of digital tools for knowledge sharing in a restricted circle. At first glance, we might think that this use should be okay because it's just inside the organization. But there can be potentially other elements that are to be considered in the equation, such as the question of distinctive skills that allow members of counter-hegemonic organizations to finance themselves by organizing trainings. This appears to be a factor that can affect the implementation of such a tool within the organization.

Conclusion

In this work we explored the stakes of knowledge commons sharing via digital tools in the context of a counter-hegemonic movement. Even if there is potential for counter-hegemonic organizations of the agroecological transition to benefit from digital tools to facilitate knowledge commons management and sharing, further exploration is needed to implement suitable use of digital tools according to the vision of counter-hegemonic organizations for an alternative agriculture. That explains partly why our action-research came to a standstill: when it comes to agroecological peasant knowledge, sharing presents a dilemma. If disseminating and preserving knowledge commons is a strong goal of the counter-hegemonic agricultural movement, it seems that the risks of common resources appropriation lead many organizations to be overly protective of their own resources, even if this involves to limit sharing among network members. Those risks outweigh the desire to develop a common adapted digital tool for knowledge sharing. Such protective tendency could be reinforced by the role that proprietary knowledge may play in sustaining the economic model of these counter-hegemonic organizations, for instance via the offering of fee-based training sessions. Furthermore, the counter-hegemonic culture of the meta-organization raised continuous suspicion over the risk of instrumentalization involved by the action-research, stemming from the lack of previous collaboration with the research team as well as the origins of the funding of the research. One

highlights the necessity to develop a reliable and mutually beneficial relationship over time with actors in the field so as to tackle sensitive topics such as strategic information sharing.
Such combination of factors may raise important challenges to use a digital tool for knowledge sharing within an agroecological meta-organization.
However, knowledge continues to be shared via other channels in the network: to protect their commons, members keep sharing knowledge *by capillarity*, via informal interpersonal channels which are perceived as more secure and where it is easier for them to be selective about whom they share knowledge with.

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