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Identifying visions on agricultural diversification: A first step toward sustainable agrifood transformations in the Bauges

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Abstract

Scientific, political and civil society discourses agree that to foster the needed agroecological transition, agricultural diversification is a central element. In this study, we make use of qualitative analysis to examine the visions on agricultural diversification, held by a diversity of actors (farmers, elected officials, civil society, agricultural advisors). The Bauges, a territory located in the French Alps, specialises strongly in extensive dairy cattle breeding to produce Tome des Bauges PDO cheese. This dairy system is, however, increasingly vulnerable to climate change, particularly to droughts. In addition, there is a growing discourse on food autonomy and diversified production. We show that six visions on agricultural diversification, referring to different spatial levels, coexist among the interviewed actors. Two groups of actors can be distinguished based on their vision for, among others, the future of dairy cattle breeding in the Bauges, the possibility of developing other productions, the perimeter for food autonomy and the form of agriculture ecologisation. These two groups tend to oppose conventional breeders, i.e. natives of the Bauges, with civil society organisations including neo-residents and diversified farmers in organic farming including neo-rural and “left-returned” actors. Moreover, the analysis shows that some actors hold plural visions, and that those actors can play different intermediary roles. Thus, in order to initiate sustainable transformation dynamics at the territorial level, an important step seems to be to highlight these different visions to facilitate dialogue and increase mutual understanding.

Keywords agroecological transition, agricultural diversification, vision, intermediary actors, Bauges

Introduction

The dominant industrial agricultural model based on production intensification and territorial specialisation causes significant negative social and environmental effects (Tittonell et al. 2016). Specialisation, supported by policies, was one of the drivers of agricultural modernisation in the second half of the twentieth century (Abson 2019; Gasselin et al. 2020). Advocated to achieve economies of scale and low food prices, specialisation led to a significant loss of autonomy of farms and rural territories, as well as serious environmental problems (reduction of ecological processes, loss of biodiversity, greater use of chemical inputs and eutrophication, altered soil physical characteristics and microbial communities, etc.) (Antoine 2016; de Roest et al. 2018; Klasen et al. 2016). The industrial model requires a profound transformation towards sustainable agri-food systems that respect humans and their environment (Wezel et al. 2020). These changes relate to both the practices and the values of the actors involved (Hazard et al. 2022; Magrini et al. 2019; Plumecocq et al. 2018). In this context, the concept of agroecological transition receives increasing attention in the scientific literature (e.g. Bui et al. 2016; Darnhofer 2015; Lamine 2011; Magrini et al. 2019; Tittonell 2020) and from agri-food system actors (Hazard et al. 2020; Sellberg et al. 2018). Here, we consider the agroecological transition as a transformation of the agrifood system consisting in ecologising

agriculture and food towards diversified agriculture based on agroecological principles and reconnected with local consumption, with food that is healthy and culturally acceptable, and economically fair and affordable (Magrini et al., 2019).

Agricultural diversification emerges as a key element of agroecological transition (FAO 2018; Gasselin et al. 2020; Kremen et al. 2012; Wezel et al. 2020), promoted in the name of the associated benefits of complementarity, self-reliance and resilience (de Roest et al. 2018; Suryanata 2002). From an environmental point of view, diversification can enhance environmental benefits to farming, including soil quality, biodiversity, water and nitrogen cycling, control of weeds, diseases and pests, pollination and carbon sequestration, and it can increase the resilience of production in the face of climate change (Alletto et al. 2022; Kremen and Miles 2012; Tamburini et al. 2020). From a socioeconomical point of view, diversification allows to optimise production, provides complementary inputs and incomes and mitigates different risks (e.g. yield, price, climate hazards) (Bowman and Zilberman 2013). Moreover, diversification is frequently linked to alternative food networks and forms of distribution that offer a fairer price to the producers and increase connexion among consumers and producers, in addition to offering consumers better access to healthy, fresh and diverse foods (Kremen et al. 2012; Whatmore et al. 2003). Furthermore, some scholars consider agricultural diversification as an important strategy for achieving food security (e.g. Chavas et al. 2022; Waha et al. 2018). Addressing agricultural diversification requires integrating multiple spatial (plot, field, farm, landscape, territory, etc.) and temporal (crop rotation or sequence) effects (Hernández-Ochoa et al. 2022; Hufnagel et al. 2020; Kremen and Miles 2012; Kremen et al. 2012; Lamichhane 2023; Reckling et al. 2023). Many studies deal with diversification at the farm or plot level, and some propose sustainability indicators (Iocola et al. 2020; Morel et al. 2020; Viguier et al. 2021). A growing body of literature studies agricultural diversification at the landscape level, which includes spatial composition (diversity) and patterns (size, shape, arrangements) (Hernández-Ochoa et al. 2022; Lamine 2012; Spangler et al. 2022; Reckling et al. 2023; Redlich et al. 2018; Sellberg et al. 2018). Some works focus on the spatial patterns of the relocation of food specifically (Barataud et al. 2022; Frayssignes et al. 2021). Recent scholars also integrate value chains, governance (policies, collective actions, etc.) and territorial food systems (consumption, production, processing, institutions, etc.) in agricultural diversification strategies (Antier et al., 2022; Bui, 2015; Reckling et al. 2023; Weituschat et al. 2023).

Agroecological transition processes are complex and take place over the long term because they have to deal with a diversity of visions (Penvern et al. 2023). Such processes require to characterise and collectively acknowledge the variety of visions to improve mutual understandings, and to eventually lead to a shared vision (Bui et al. 2016; Dendoncker et al. 2018; Franzeskaki et al. 2011; Lamine et al. 2021; Loorbach 2010; Pachoud et al. 2023, Sellberg et al. 2018). Visions are considered as ways to understand an object or a situation that reflect a particular point of view, and they are also understood as the formulation of a desirable future, embodying values (Penvern et al. 2023). A growing body of

literature proposes to bring about dialogue on and the emergence of a common representation of agriculture within territories.¹ This is, for example, the case of the study by Sellberg et al. (2018), based on the perspectives of a diverse set of regional actors who developed a vision with regard to a positive food future for the Stockholm-Mälaren region in Sweden. In France, Young et al. (2023) characterised ideal visions of what agriculture may look like among diverse actors in different territories of Burgundy. Ouin et al. (2021) developed scenarios to build a shared vision on agricultural landscapes, with different stakeholders in southwestern France. In the literature, scholars usually understand visions as visioning processes to imagine the future. In this article, we propose to explore visions relative to the notion of agricultural diversification in a specific territory, with visions being understood as the different actors' conceptions of diversification. Following the same perspective of Penvern et al. (2023) who addressed the diversity of visions in different research projects supporting agroecological transitions, we believe that the characterisation of the different visions in a territory is a prerequisite for accompanying sustainable agrifood transformations², in that the characterisation of the visions enrich transformation pathways.

The objective of this article, which is part of a larger research project,³ is to identify and characterise how individual actors (breeders, farmers, inhabitants, elected officials and agricultural advisors) view agriculture diversification differently in the case of an extensive dairy cattle breeding territory in the French Alps. We chose to focus on diversification, as the first scoping interviews oriented the research towards agricultural diversification as an entry concept, linked to the territorial context of strong agricultural specialisation and an increase in diversified farm installations. Moreover, there is an increasing demand from inhabitants to consume a greater diversity of local products. Well aware that there are various practices and multiple spatial and temporal scales of agricultural diversification (Kremen et al. 2012), we choose not to limit ourselves to a specific aspect of diversification in order to understand the vision that the different actors hold. This analysis relies on qualitative methods, i.e. semi-structured interviews and participant observations, to characterise the actors' visions.

Materials and Methods

¹ We understand the concept of territory as it was conceived in postmodern French-speaking geography (Pachoud et al. 2022). Taken out of its political realm, territory is considered as space, socially constructed, culturally marked and institutionally regulated. It is an outcome of agency and the relations between actors.

² In this paper, we use the notion of agrifood transformation instead of agroecological transition, both to move away from an overly sectoral and technological approach that dominates the transition studies and political discourses, and to emphasise the idea of systemic changes within societies in all their dimensions (Pachoud et al. 2022).

³ This study is part of the transdisciplinary research project TransforMont and focuses on the analysis and support of sustainable agrifood transformations in the Bauges. From the perspective of the actors in the field, this research results from a request from a collective of inhabitants, and is carried out in collaboration with the regional nature park, with the research covering aspects like agricultural diversification and the localisation of food as set out the new charter of 2023. From the researchers' point of view, the Bauges appeared to be an interesting territory to observe the dynamics of agroecological transition, because this territory is a lived territory and does not correspond to an administrative territory, and its small size facilitates the systemic analysis of the transition dynamics and of the relationships between actors.

The territory of the Bauges

The mountainous territory of the Bauges (in French: *Coeur des Bauges*) is located in the French Pre-Alps in the department of Savoie and includes 14 municipalities and a little more than 5,000 inhabitants. The Bauges territory is located in the Regional Nature Park of the Bauges massif and in the community of municipalities of Grand Chambéry (Fig. 1). The vast majority (more than 99%) of the agricultural land in this territory is used for dairy herd grazing and forage production (RPG, 2021). In order to be competitive with the lowland areas, the breeders created dairy cooperatives since the 1970s and obtained the Protected Designation of Origin (PDO) certification in 2002. Today, 95% of the milk is certified as PDO Tome des Bauges.

However, the economic model of dairy cattle farms is largely based on aid per hectare from the first pillar of the common agricultural policy (CAP), which has led to an expansion of farms and a reduction in the number of workers per hectare. Nevertheless, it is important to emphasise that the PDO certification allowed maintaining a certain territorial anchoring of these extensive systems that use few inputs compared to conventional dairy farms in the plains (Dollé 2013). Some of the notable rules of the specifications are: the production per cow is limited to 5,500 kg/year, at least 50% of the herd is made up by two local breeds (Tarine and Abondance), at least 120 days of grazing and 70% of the fodder come from the designation area and silage and genetically modified organisms (GMO) are prohibited. The PDO milk price above national averages does not encourage diversification of production or organic milk production (today, only one farm is organic). However, climate change, and in particular summer droughts, makes the dairy cattle system increasingly vulnerable, as droughts reduce grasslands' productivity. Different strategies are therefore available to farmers: either lower the specifications' requirements to authorise the import of a larger share of fodder or reduce the herds' sizes or diversify production to diversify sources of income. Climate change adds to other issues that challenge cattle breeding in the Bauges, such as the difficulties of taking over farms, the increase in wolf predation and related protection measures and conflicts of use with tourism (Pachoud 2021).

The Bauges experienced a strong population decline until the 1980s. The latter decade marked the beginning of a new demographic growth, with the arrival of returned and neo-rural actors that persists to this day. Some of the new inhabitants have developed other types of agricultural production, mostly certified organic. These agricultural productions mainly concern small fruits, medicinal and aromatic plants and, goats and sheep for milk production. These productions are often combined with tourism activities on the farm. With a growing demand for local, organic and diversified products, some of the new inhabitants used diversified agriculture and agroecological principles to develop structures that protect the values related to food autonomy. The most visible citizen initiative is the cooperative known as the Croc'Bauges grocery store, created by a group of inhabitants in 2014, which offers a variety of local and organic products. A second initiative is the Et Maintenant association, created in

2019, which aims to be a place for reflection and action by residents to engage in an ecological transition in the Bauges. One of the strategic themes is entitled "feeding ourselves" and advocates for greater food autonomy in the territory.

However, diversification remains limited to productions that are marginal in terms of surface compared to dairy farming, includes crops like aromatic plants, small fruits, etc., and are most often established on land with lower agronomic qualities. Access to land is therefore a major issue for project leaders in a territory.

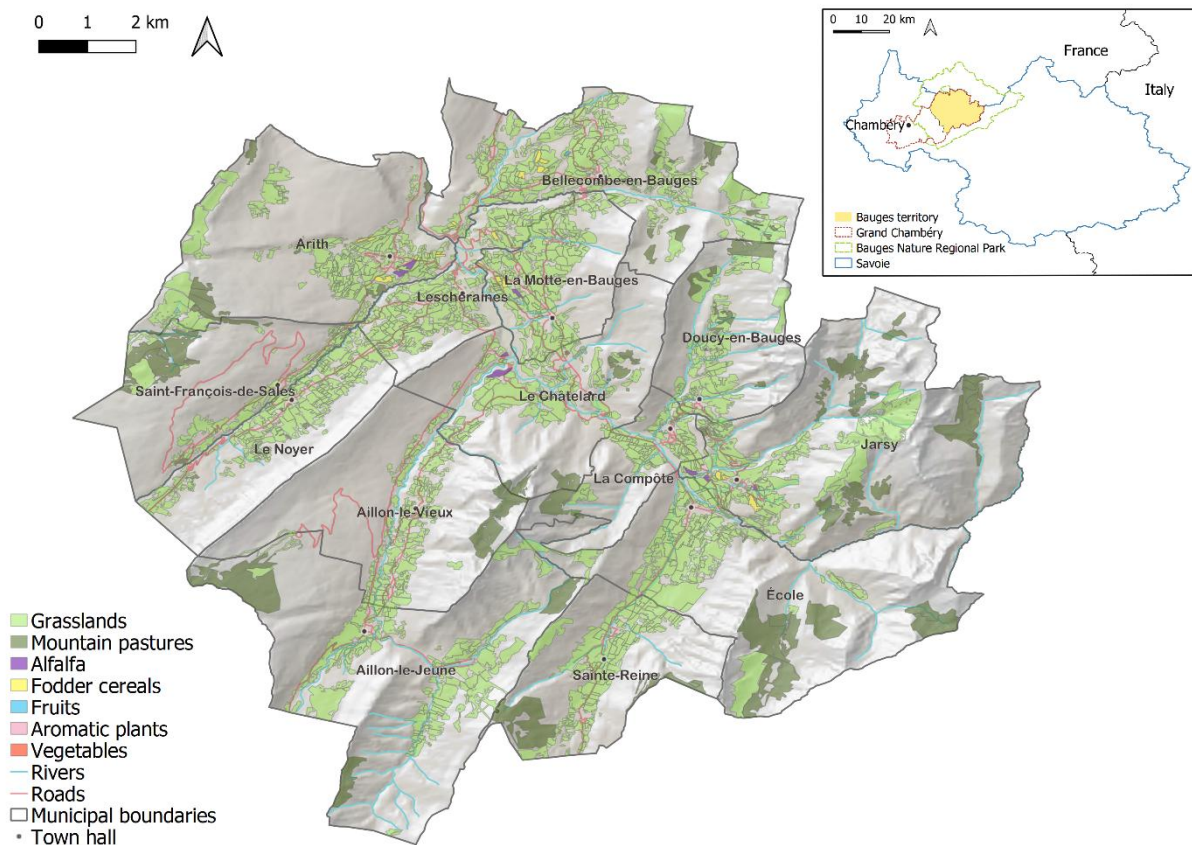


Fig. 1 The Bauges territory and the distribution of agricultural land (source: RPG, 2021)

Methods

Through semi-structured interviews, we qualitatively identified and analysed 28 people's visions on agricultural diversification in the Bauges. The interviews were conducted individually, except for one interview that was conducted with three actors simultaneously to meet their wishes. The selected persons represent different types of actors: dairy farmers, non-dairy farmers, agricultural employees, elected officials, citizens involved in initiatives related to agriculture and food (associations, cooperatives, non-governmental organisations (NGOs)) and agricultural advisors. Some actors have several roles (Table 1). Some of the actors were selected at the outset because they occupy central positions relating to agricultural diversification issues in the Bauges (agricultural advisors, citizens

involved in agricultural and food movements, elected farmers in agricultural institutions, an agricultural employee who wishes to set up a farm, elected officials invested in agri-food issues). Other actors were chosen because they were regularly mentioned in the discourse of other interviewees.

Table 1. Types and number of actors interviewed, and code used to identify them

Type	Number	Code
Dairy farmers	3	D1 to D3
Dairy farmers and mayor	1	DM1
Dairy farmer and president of an agricultural institution	1	DP1
Non-dairy farmers	6	F1 to F6
Agricultural employee	1	E1
Elected municipal officials	5	O1 to O5
Inhabitants involved in citizens' organisations	3	I1 to I3
Agricultural advisors of agricultural and local development institutions	8	A1 to A8
Total	28	

The five dairy cow farmers interviewed produce milk for PDO Tome des Bauges production. Four of the farmers deliver their milk to the dairy cooperative, while the fifth is certified organic and makes the cheese on the farm. Four of these farmers were born in the Bauges, including the organic certified breeder. One breeder is a mayor, and another is president of an agricultural institution. The non-dairy cow farmers interviewed include three small fruit growers, two market gardeners and one dairy goat farmer. All are certified organic farmers. Five of these farmers are neo-rural. The agricultural employee is a native of the Bauges and wishes to set up a non-dairy farm in the territory. Three mayors (including the above-mentioned breeder) and three municipal councillors were interviewed. Only two mayors were natives of the Bauges. The representative actors of the citizens' organisations include two employees and one volunteer, with all three belonging to different local associations. The three actors are not natives of the Bauges. Lastly, eight agricultural advisors of the agricultural and local development institutions acting in the Bauges were interviewed. One of them is located in the territory, and the seven others are located in Chambéry (Fig. 1).

The objective of the interviews was to identify the interviewees' current and future vision on agriculture in the Bauges and the associated issues; their visions on agricultural diversification and the stakes associated with it, including the interplay of scales and related conflicts; and their networks of relationships (with whom they exchange on the subject of diversification, who are the parties that help each other and who are the parties that set up joint projects related to food and agriculture).

We derived the categories of visions from the discourse of the actors interviewed. More specifically, we identified the elements of the discourse that refers to the concept of diversification as understood by each respondent, integrating the spatial scale to which he/she refers, as well as the issues that this concept of diversification echoes (adaptation to climate change, securing income, local food, etc.). For this purpose, the interviews were recorded and then transcribed. The transcript for each interview was then systematically coded, i.e. the fragments of text were categorised according to the vision on diversification to which they refer. We coded all quotes corresponding to each vision for each actor. An actor's predominant vision is defined by the particular actor's greatest number of quotes on a vision (Table 2). We considered quotes as a sentence or several successive sentences, regardless of their length, developing an idea related to a specific vision. If the actor returned to the same idea later in the interview, this was counted as a new quote. If two different ideas following one another were developed by the interviewee, the quotes were counted as two different quotes according to the vision they refer to. The selection of quotes and their categorisation according to the different visions were carried out manually using Excel.

These analyses were completed by participant observations during formal meetings (general assembly and board of directors of the park's farmers' association, meetings and events organised by the citizens' collectives and by the municipalities), to confirm and refine the visions previously identified in the actors' discourses.

Results

Archetypal visions

The semi-structured interviews revealed that the actors have six archetypal visions of agricultural diversification (Table 2). These visions are not exclusive, i.e. each actor may hold several visions at the same time. However, the actors always present a predominant vision.

The first vision, "connect agriculture and food", links agricultural diversification to food and is held by nine actors. The main idea defended is to produce in order to feed local inhabitants, with an objective of food autonomy. This vision refers to the territorial food system level, as it includes production and consumption. According to this vision, livestock farming in the Bauges occupies too much space and does not leave room for other food production (market gardening, cereals, etc.). The perception of Tome des Bauges is that it is intended for tourists instead of for inhabitants, as the following quote shows: *"If we find ourselves without oil, shut in here, we won't feed ourselves for long. We're not going to feed on milk and Tome. We need to build a pyramid by going back to basic needs"* (O1). Moreover, there is a criticism of dairy farming's lack of resilience in the face of climate change, and of dairy farms' headlong rush to respond to this climate change (reservoirs, air conditioning of livestock buildings, etc.). According to this vision, the PDO certification is especially

in line with to an economic objective. The following quote explains this opinion: "*Livestock breeding and the PDO bring so much economically to the territory. They are known for that. It is always a question of money. Agriculture and food are central to our way of life. That's why it's so divisive*" (F4). Nevertheless, this vision also criticises that diversified products in the Bauges are still too expensive and that they are unaffordable for a part of the local population. As one actor explains: "*But then you have to have the means. A part of the population can buy them, the ones who have the means, but another part does not have the means*" (O1). According to this first vision, the thinking behind food autonomy is more towards food autonomy at the scale of the municipality or food autonomy within the territory of the Bauges. The idea is to produce as much as possible locally and to obtain what cannot be produced locally via exchanges with other territories. Last, according to this vision, agriculture must be ecological and offer healthy products to local consumers.

The second vision, "create diversified and short value chains", is based on the diversification of production and the development of autonomous value chains in the face of the territory's specialisation. This vision includes both the territorial and farm levels, as it refers to the development of diversified value chains and processing facilities in the territory, and also to the multiplication of activities on the farm. Eight actors defend this vision, which is critical of the intensification of dairy farms caused by the CAP based mainly on per-hectare premiums. This vision calls for degrowth and the development of human-sized diversified farms employing more people per hectare as illustrated by this quote: "*The farm was 40 ha and it went to a farmer who already had 250 ha. He may be a little richer but he lives alone on it. It's a shame because with 300 ha you can employ a certain number of people*" (D1). The development of processing and marketing tools is also central to this vision, to guarantee the autonomy of locally diversified value chains. For example, one of the interviewed actors said: "*If someone wants to set up a chicken farm, they would also have to produce cereals. So, we could set up someone to bake bread and produce cereals. The farmer says, 'Okay, we breed chickens, but we buy cereals from outside, so it's just an extra income, but we don't move forward'*" (D1). Another actor added: "*We could reintroduce meat production worthy of the name – there is everything here for that – and pork production, among other things, which used to exist, and fruit production as well, which has finally disappeared, and if you look at aerial photos, there used to be lots of orchards, but today there are only bare meadows*" (F5). The focus here is more on the production and transformation of products, rather than on the consumption and local food (first vision). There is also a criticism of dairy cattle farming, but more with regard to its intensification than the activity itself.

In the third vision called "introduce resilient productions", the idea is to develop agricultural productions that are adapted to global warming, and mainly to droughts. This vision, which is dominant for two actors, highlights the climate change vulnerability of cattle breeding linked to the production of Tome des Bauges PDO. According to this vision, it is necessary to develop animal, plant and forage productions adapted to global warming, and to diversify these productions as much as

possible within the farms to cope with climatic shocks, as illustrated by this quote: *"I'm not a scientist, but it doesn't smell good. We will have to adapt. I know that if I have to plant bananas or coconuts and stop farming goats tomorrow, I will do it. I'm not going to be stubborn. But after all, the goat comes from the Middle East, from the desert"* (F2). The following quote makes a similar point: *"Should we develop more sheep, more goats, bring back cereals in the Bauges, grow legumes again, I don't know. It is the tradition of breeding that can prevent us from seeing the future of agriculture in the Bauges correctly"* (F4). The focus of this vision is therefore less on the value chains (production and transformation) as proposed in the second vision, but more on the development of new productions adapted to climate change. This vision is in line with the first vision, which states that cattle breeding for the production of Tome des Bauges will be less and less adapted to climate change.

The central idea of the fourth vision, "diversify productions with dairy cattle breeding", is to diversify production *in addition to* dairy farming to increase dairy farming's resilience to climate change. According to this vision, supported by five actors, extensive cattle breeding remains the agricultural activity most adapted to the Bauges's pedoclimatic context (slope, fine soil, shorter summer season). This vision is at the farm and plot level, and it proposes not only to complement productions between farms, but also to promote the complementarities between productions on the plots. New practices linked to the complementarity between animal species, and the complementarity between plant and animal species, should make it possible to increase the resilience of dairy farming, as emphasized here: *"Diversification will be achieved through the multi-species use of agricultural space, which does not stop at the farm, but goes further. It is to mutualise the plots, to make cattle graze, and then goats and sheep"* (DM1). The new productions must therefore allow to maintain the breeding in the territory via the complementarity of the productions and an increase in the territory's resilience. Diversification can take place on farms or between farms. The development of other productions on the farms allows to secure the farmers' income in case of shocks. In the meetings between farmers, the practices envisaged include, for example, the integration of fruit trees in the meadows to cultivate fruits and make the meadows more resilient to drought, and improve animal welfare; rotations between meadows and market garden crops; or grazing small ruminants and cattle on the same grasslands. This vision is different from the previous one, in that dairy farming remains the central agricultural activity as illustrated by this quote: *"In fact, diversification in my opinion, is taking the dominant mode of exploitation and then linking the other farming activities in the area to it so that everything does not fall apart"* (A5).



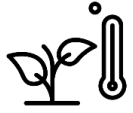
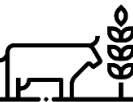

The fifth vision, "multiply activities on dairy farms", is held predominantly by one actor and focuses on dairy farms only. The idea is that diversification consists in the multiplication of production activities and the development of direct sales at the farm level. For example, it is a question of making cheese, yogurt or meat production and selling these products via direct sales, as shown by this quote: *"Until now, we didn't have the workforce to make cheese, and we didn't have the cheese-making fibre."*


Neither do the young people we are appointing, although it would be a good way to diversify" (D3). The multiplication of production activities at a dairy farm should make it possible to diversify the offers to the consumer and at the points of sale, and thus to secure the sources of income in case of shock, as mentioned here: "For example, for a dairy farmer, why not consider partially marketing meat? However, raising cows for meat is not the same as raising a herd of dairy cows. The question of diversification is very interesting, because it allows the farm to be based on different activities; thanks to the different activities, it is security in case of a hard blow or a shock" (A3). Unlike the preceding vision, this vision does not consider diversification as the development of other agricultural productions to secure income. Livestock farming remains central here.

Finally, the sixth vision, “diversify other productions at the margin”, dominant for three actors, is based on the idea that dairy cattle breeding is the most relevant activity in the Bauges because it is traditional and it is adapted to the territory. This idea is based on geographical and climatic arguments (e.g. slope, altitude), as well as historical arguments (heritage, know-how, collective structure of the value chain, etc.). The actors supporting this vision accept to develop new productions at the territorial level, but only at the margin, i.e. on lands not intended for breeding. This vision is closest to the current agricultural situation in the Bauges. According to this vision, there is scepticism about the viability of certain types of production in the Bauges, particularly market gardening, as illustrated by this quote: *"In the Bauges, dairy cattle are the majority: there are some goats, some dairy sheep, a few projects in the making, and otherwise vegetable production, but vegetable production is not really dominant, it is anecdotal. For market gardening, it is very complicated. The altitude does not allow everything, the slope factor also "* (DP1). The following quote makes a similar point: *"We must not forget that in agriculture, you cannot farm with everything everywhere. Agriculture is not a utopia, agriculture is the earth. It is not only a matter of imagining something – you cannot simply settle in everywhere as a market gardener; you must also know the environment and the functioning of the living being on which you wish to settle. It is like that, and in the Bauges it is typically the case"* (A3). This vision emphasises the numerous criticisms that livestock farming faces today from civil society, with the vision defending the environmentally friendly practices of extensive livestock farming. There is an awareness that climate change will affect livestock farming, but according to this vision, technical solutions to maintain cattle farming emerge instead, such as the creation of hillside reservoirs for irrigation, as this actor explains: *"When it comes things we must do in the future to diversify, we must also accept that we need to build hillside reservoirs"* (DM1).

Table 2 Characterisation of the six visions of agricultural diversification identified in the Bauges

Vision	Main objective	Motivations	Issues identified with the current situation	Scale	Number and typology of actors
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<p>1. Connect agriculture and food</p> 	<p>Contribution to food self-sufficiency</p>	<p>Produce to feed the inhabitants, with the objective of food autonomy and that products are accessible to everyone.</p>	<p>Extensive livestock farming does not leave enough room for other food productions. Moreover, this activity has a mainly economical purpose and is not resilient to climate change.</p>	<p>Municipality or Bauges</p>	<p>n=9 3 civil society actors 3 elected municipal officials 2 non-dairy farmers 1 agricultural advisor</p>
<p>2. Create diversified and short value chains</p> 	<p>Autonomy of local value chains and securing farmers' income</p>	<p>Diversify production based on organic farming, and develop food processing facilities and local markets.</p>	<p>Intensification of dairy farms and dependence on subsidies. Lack of autonomy of the dairy value chains in term of inputs. Lack of diversified productions and food processing facilities.</p>	<p>Bauges or regional nature park of the Bauges massif</p>	<p>n=8 3 non-dairy farmers 1 dairy farmer 1 agricultural employee 1 elected municipal official 2 agricultural advisors</p>
<p>3. Introduce resilient productions</p> 	<p>Adaptation to climate change</p>	<p>Develop agricultural productions adapted to global warming, and mainly to droughts.</p>	<p>Vulnerability of cattle breeding to climate change, accentuated by the territory's high degree of specialisation.</p>	<p>Bauges or regional nature park of the Bauges massif</p>	<p>n=2 1 non-dairy farmer 1 agricultural advisor</p>
<p>4. Diversify productions with dairy cattle breeding</p> 	<p>Adaptation to climate change and securing farmers' income</p>	<p>Maintain the dairy cattle breeding in the territory by the complementarity of the productions. Pedoclimatic and historical arguments justify the maintenance of dairy cattle breeding.</p>	<p>Difficulty in developing other types of production in the territory, better achieved through complementarity with livestock. New farms often do not last over time.</p>	<p>Intra-farm or between farms</p>	<p>n=5 3 agricultural advisors 1 dairy farmer/elected municipal official 1 elected municipal official</p>
<p>5. Multiply activities on dairy farms</p> 	<p>Securing the income of breeders</p>	<p>Diversify the production activities on the dairy farm (e.g. milk, meat, cheese) and make direct sales to face external shocks (climatic hazards, epidemics, etc.).</p>	<p>Livestock is adapted to the territorial context and diversification should take place first through livestock activities.</p>	<p>Farm</p>	<p>n=1 1 dairy farmer</p>

<p>6. Diversify other productions at the margin</p> 	<p>Maintaining the PDO Tome des Bauges value chain and securing the income of the breeders</p>	<p>Maintain dairy cattle breeding and PDO cheese production in cooperatives as the main value chain based on pedoclimatic and historical arguments. Diversify other productions on marginal lands not dedicated to dairy cattle breeding.</p>	<p>Crop production is poorly adapted to the territory and farms are generally not viable over the long term. Agricultural lands should remain primarily for livestock production.</p>	<p>Bauges</p>	<p>3 2 dairy farmers 1 agricultural advisor</p>
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These visions can be assessed according to their capacity to respond to the challenges of the agroecological transition. To do this assessment, we use Magrini et al.'s (2019) definition of agroecological transition, which includes diversified agriculture, agroecological principles and local food consumption (Table 3). First, diversified agriculture corresponds to the association of different agrifood activities at different space and time scales. Second, agroecological principles, based on diversification from a production point of view, refer to the intensification of interactions between the components of the biophysical system to replace synthetic inputs, and require locally adapted agricultural practices. Third, local consumption promotes a reconnection between agricultural production and local food, through alternative organisation of agrifood value chains and with food that is healthy and culturally acceptable, and economically fair and affordable. The first vision linking food and agriculture focuses on diversified agriculture and local consumption, and often highlights the need of agroecological practices. The second vision, which focuses on the diversification of value chains, introduces the idea of diversified agriculture based on organic farming and local marketing; it does so by suggesting the relocation of processing and marketing tools. This second point is similar to the fifth vision concerning the diversification of production activities and marketing channels, but for dairy farms instead. Nevertheless, neither the second vision nor the fifth vision specifies whether local sales should be aimed mainly at the local population, with a view to increase food autonomy. The third vision (adapting production to climate change) and the fourth vision (diversification with livestock) are based on diversified agriculture with agroecological practices. The difference between these two visions is the future place of livestock in Bauges agriculture. Finally, the sixth vision is characterised by the central place given to livestock farming in comparison with a proposed diversification to other productions at the margins. This vision is based on the idea that extensive livestock production for Tome des Bauges should meet certain agroecological principles (e.g. less use of inputs than in conventional livestock production, ecological role of grasslands).

Table 3. The three elements of agroecological transition according to the six visions of diversification in the Bauges, regardless of their scale of implementation

Elements of the agroecological transition	Vision 1	Vision 2	Vision 3	Vision 4	Vision 5	Vision 6
Diversified agrifood activities	+	+	+	+	+	-
Agroecological principles	+/-	+	+	+	-	+
Local consumption	+	+/-	-	-	+/-	-

Table 3 shows that none of the visions comprises all three elements of an agroecological transition that we defined based on Magrini et al.'s (2019) definition, although some visions seem to respond more to it (visions 1 and 2, and then visions 3 and 4). Moreover, local consumption is the element that appears the least in the visions.

Two ways of understanding the evolution of agriculture in the Bauges

The analysis of the interviews makes it possible to group the holders of these visions into two groups, mainly according to the way they conceive agriculture in the Bauges, and its future. Actors of these two groups seem to share some common social characteristics.

The first group of actors sharing visions 1, 2 and 3 question dairy farming in the Bauges through a discourse that has to do with food autonomy and the diversification of productions, often based on organic farming, direct selling and adaptation to climate change. These actors defend the diversification of productions in the territory, with more or less strong criticism of dairy cattle breeding. In this group, we find mainly diversified farmers or dairy farmers, certified in organic agriculture, as well as inhabitants involved in citizen initiatives related to agriculture and food. This group also includes three municipal councillors, one mayor and three agricultural advisors. Although there are four actors originally from the Bauges, the majority of actors (N=15/19) holding these visions are neo-rural inhabitants who arrived after the year 2000.

The second group of actors share visions 4, 5 and 6. They defend the maintenance of dairy cattle farming in the Bauges because it is considered traditional and adapted to the pedoclimatic context of the Bauges. The objectives targeted by this group correspond more to securing the income of the breeders, especially in the face of climate change. This group expresses many doubts about the viability of other agricultural productions and the relevance of food autonomy in the Bauges. This group of actors includes the conventional dairy farmers interviewed, who are mostly natives of the Bauges (N=3/4). As observed during interviews and meetings, farmers often report social pressure from civil society, with regard to the way in which they conduct their business and the pollution their activity would cause. This group also includes four agricultural advisors and two mayors, of which one is also a dairy farmer.

In the same way as livestock farming, crop productions and especially market gardening are a source of controversy between these two groups of actors. On the one hand, those with visions 1, 2 and 3 argue that it would be possible to do market gardening, although it would be necessary to adapt to different conditions than in the plains (shorter seasons, late frosts, farmers' pluriactivity, etc.). They then use the example of two market gardeners in the territory. Some actors explain that the land that would be more suitable for market gardening (flat, deep soils, etc.) is mostly occupied by hay fields. Some of the actors also denounce the lack of subsidies for these activities in comparison to the subsidies given to livestock farming, and the difficulty of accessing land with good agronomic conditions. On the other hand, the other group of actors believes that it would be difficult, if not impossible, to do market gardening in the Bauges, because of the climate, the altitude and the unsuitable soils. These actors make their case based on the experiences of market gardening in the territory, which show low profitability and market gardeners who have left the activity.

In addition, the analysis revealed that the two groups of actors had opposing views with regard to agriculture ecologisation, particularly represented by the opposition between the organic farming label and the PDO certification. The farmers with the visions 1, 2 and 3 are organic, while the conventional farmers with the other visions produce milk delivered to the dairy cooperatives for the production of PDO Tome des Bauges. The breeders defend the PDO certification as an approach that allows the production to be anchored in the territory, with the breeders themselves defining the rules. The breeders consider the organic farming label not adapted to the local context, and something over which the farmers have little control. The breeders do not understand the interest in developing organic farming. Only one breeder produces PDO Tomes des Bauges in organic production, and is more in line with vision 2. The breeder defends the view that the two labels are complementary. Like the other farmers, this breeder believes that the PDO certification defends agroecological practices in the territory, but also believes that the supplementary feed for the cows bought outside the territory must be certified organic so as not to pollute other territories.

Lastly, although there was general agreement on the importance of food autonomy, the two groups differ with regard to the perimeters for achieving it. On the one hand, actors with visions 1, 2 and 3 often consider it desirable to produce as much as possible at the municipal, Coeur des Bauges or Massif des Bauges level, and to import anything that cannot be produced locally. In contrast, actors with visions 4, 5 and 6 often believe that the perimeter of food autonomy is at the departmental, regional or national level instead. For these actors, territories first need to exploit their comparative advantages in terms of soil and climate.

In the Bauges, the relations between the two groups of actors generally result in tensions, without necessarily turning into conflicts, which arise with a visible engagement in one of or both actors taking an opposing stance (Torre 2006). However, two conflicts have recently broken out in the territory. The first conflict occurred between a collective of mainly neo-rural inhabitants and dairy farmers. The inhabitants' collective, which brings together several citizen initiatives, organised an event in 2022 with pupils from the territory. The idea was to imagine sustainable solutions for the future with the pupils through artistic works. One of the themes addressed was to eat less meat. Some farmers felt that this was an attack on their profession and complained to the town hall and the park about this theme. A second conflict broke out between a farmer wishing to set up a free-range pig farm supported by the town hall, and some neighbours complained about the bad smells that this activity could generate. This resulted in a verbal confrontation among different groups of actors, and some inhabitants then led a petition in the village against the setting up of the pig farm.

Some actors standing at the interface of the visions

The analysis shows that some of the interviewed actors have plural visions, as these actors' quotes represent a significant share of quotes for the different visions. In this instance, it is interesting to identify the actors whose views are spread among visions 1, 2, 3 and visions 4, 5, 6, respectively, which represent the visions held by the two above-mentioned opposing groups of actors. From the number of quotes calculated in each vision and for each actor, we have identified 13 actors out of 28 with less clear-cut visions. The share of quotes for these actors varies between 50% and 80%, either in visions 1, 2 and 3 or in visions 4, 5 and 6. For example, one of the actors has 17% of the quotes in vision 1, 33% in vision 2, 17% in vision 3, 13% in vision 4, 0% in vision 5 and 21% in vision 6; i.e. 67% in visions 1, 2 and 3, and 33% in visions 4, 5 and 6.

The 13 actors include six agricultural advisors, three non-dairy farmers, two dairy farmers and two actors who belong to citizen organisations. The only three actors native to the Bauges are the two dairy farmers and the one non-dairy farmer. All of these actors have professional or private interactions, with different groups carrying divergent visions. The agricultural advisors generally work with all the farmers in a given territory, or have the necessary hindsight to understand the challenges and

difficulties of each sector. The non-dairy farmers are professionally in contact with livestock farmers, notably in the context of land sharing (e.g. a goat farmer grazes his animals on a livestock farmer's land after his cows have grazed) or because they sell their products jointly (e.g. selling diversified products to dairy cooperatives). A non-dairy farmer also has personal relationships with the breeders, as he is a native and comes from a breeder's family. The two breeders, both natives, then set up on the family farm. However, they also interact with the other group of actors, as the first is in organic farming and shares the same marketing channels as the non-dairy farmers (Croc'Bauges, the organic farmers market), while the second is active in the shared garden initiative. Finally, the two actors from citizen organisations meet with the two groups of actors in the course of their activities (e.g. sale of diversified products, dialogue with the various actors).

Discussion

Visions and agroecological transition

In this article, we identified six visions that relate to agricultural diversification in the Bauges. These six visions seem to bring together two groups of actors who have opposing visions concerning the place and future of livestock farming in the territory; the possibility of making other productions notably with the objective of feeding the local population; the labels for agricultural ecologisation; and the perimeters for food autonomy. The two groups of actors' divergent visions echo different worldviews (Naugle 2002), which are based on value systems that actors of the same group share to build their arguments (Buclet and Lazarevic 2015; Young et al. 2023). These differences often lead to tensions and even conflicts. Similar observations on the characterisation of the different groups were made in the Arac valley, in the French Pyrenees (Izard, 2021). This work explored the functioning of the diversity of production systems. In the Arac valley, extensive cattle farming occupies the majority of the valley's agricultural land as a result of a dynamic of specialisation and expansion, supported by public policies. Since the 1970s, there has been a high concentration of neo-rural populations in the valley, who have developed other productions (small ruminant breeding, market gardening, aromatic and medicinal plants, small fruits), often combined with direct sales and processing. Alternative productions are mainly found on small and not mechanisable areas. Results showed that small production systems, having few subsidies, do not appear viable without social aid or a complementary professional activity. Similarly, the existence of a local discourse around food autonomy calls into question the place of livestock farming in the territory.

Some recent studies assess the role of visions to better understand the levers of agroecological transition. Young et al. (2023) identified five visions on agriculture in the Bourgogne Franche-Comté region, through a visioning exercise with the actors. Some of these visions can be compared to those identified in the Bauges, even if the contexts are different. This is notably the case for the vision of

“small-scale diversified agriculture”, which is more respectful of the environment, and for the vision of “anchored agriculture” that relies on local consumption, with this vision being mainly spread by the civil society, organic farmers and agricultural technicians. Two other studies analyse worldviews in agriculture. Firstly, Rigolot (2017) studied four worldviews (traditional, postmodern, modern and integral). From this perspective, the group holding visions 1, 2 and 3 would rather refer to a postmodern worldview, and the group with visions 4, 5 and 6 would rather refer to traditional or modern visions. Moreover, Rigolot shows, as our study, that each individual does not simply have a single vision, but rather a predominant one, with an immense diversity of possible variations. In the same vein, Cayre et al. (2018) studied the different worldviews of dairy breeders in three PDO cheese areas in the French mountains, and identified four ideal-typical worldviews (modern, traditional, ecological intensive, holist) among dairy farmers. These three works aim at characterizing broader worldviews of agriculture, whereas our approach seeks to identify visions based on a local and contextualized controversy, which is diversification. Moreover, for these authors, the coexistence of multiple worldviews is a key driver of the sustainable agrifood transformations, which can be enhanced by initiating dialogue, and also underlined the differences and commonalities of the different visions in order to identify areas of consensus and divergence. Focusing on agricultural diversification enables us to obtain more detailed results on the different types of visions coexisting in the territory, and to identify the consensus and dissensus to trigger participatory approaches with local actors. Further investigations should be conducted in the Bauges to deepen the differences in the vision among a same-actor typology, which can be achieved by extending the number of interviews.

Spatiality of agricultural diversification

We would like to return to the question of the spatiality of agricultural diversification. To our knowledge, this question is still largely understudied in the literature (see for example Hernández-Ochoa et al. 2022; Reckling et al. 2023). In our analysis, some visions focus more on the farm or inter-farm levels, while other visions refer more to the territorial food system level. We believe that the transition of agri-food systems lies precisely at the intersection of different spatial scales. Nonetheless, the diversification process involves different actors and processes and present different limits depending on the scale. The diversification at the farm level depends mainly on the farmers and on their choice and capacity to develop new productions or activities on the farm. Many farms are involved in on-farm processing and sales in the Bauges. However, many farmers say they are not yet ready to diversify into other products. Inter-farm diversification, particularly through land sharing, can be an initiative of the farmers themselves, as found marginally in the Bauges, but generally requires information exchange that can be facilitated via institutional arrangements. At the territorial level, diversification involves a wider range of actors. At the production level, local authorities can help farmers set up farms on public land, as implemented by three municipalities in the Bauges. Processing

facilities are also essential to agricultural diversification, as they can attract certain types of production, depending on the tools available. The chamber of agriculture for example reflects on the development and distribution of processing facilities in the territory. Marketing tools are also essential for diversification, and beyond on-farm sales, citizens and farmers can take over the issue of collective sales. The farmers' market and shops of dairy cooperatives are therefore farmers' initiatives while Croc'Bauges is a citizen initiative.

Moreover, we would like to return to the controversy of food autonomy that emerged during the interviews. The interviewed actors generally agree on the principle of food autonomy, but the divergence of views concerns the scale at which to achieve it. In this perspective, we discussed with the actors participating in the workshop the scale issues related to agricultural diversification in the Bauges. The PARCEL⁴ tool, which aims to inform actors about the food potential of territories, was used to support the discussion. Additional work appeared necessary to collectively define what food autonomy means and what is desirable in the relocation of food according to diets, eating habits and the territorial context.

Intermediary actors

We identified actors holding plural visions of agricultural diversification in the Bauges. Among these, agricultural advisors, who often work at the interface between several types of farmers and institutional actors, generally have a greater understanding of different views. The other territorial actors including farmers and inhabitants may interact personally or professionally with the different groups of actors. These actors can be characterised as intermediary, i.e. actors who connect different groups of actors. Intermediaries can fulfil different functions at different scales (Howells 2006; Kivimaa 2014; Sovacool et al. 2020), which have different effects on transformation dynamics (Kivimaa et al. 2018). Institutional actors, in particular agricultural advisors, can, beyond their traditional role of advising on, facilitating learning about and coordinating innovation processes (Van Lente et al. 2003), promote cooperation among a diversity of actors (Mignon and Kanda 2018) and reinforce trust and address conflicts (Howell, 2006; Moss 2009). For example, in the Bauges, the park's farmers' association was created to facilitate exchanges between the diversity of farmers and develop innovations. Then, farmers can play a crucial role in circulating visions and practices among different groups of farmers. Some identified farmers holding plural visions exchange, for example, with farmers having divergent practices and visions to increase mutual understanding. Moreover, they may also guide visions and practices (Martiskainen and Kivimaa 2018), as well as develop innovations and create networks. For example, the early diversified farmers, who arrived in the 1980s, inspired other farmers. Moreover, farmers developed networks to create collective commercialisation and

⁴ <https://parcel-app.org/>

processing tools. Some farmers also recently created a market for organic producers in the territory. Lastly, farmers can act as intermediaries for institutions (Kanda et al. 2020), as some of the identified farmers are elected in the municipal council. When it comes to civil society actors, they can facilitate exchanges among a variety of actors, and support learning. For example, it is the role of a local radio station to give a voice to different actors. Civil society actors can also develop initiatives and encourage new practices in the territory, such as the citizen grocery shop or associations engaged in sustainability transition. Finally, none of the elected officials was identified as having plural visions. This can be a weakness for the territory, as local authorities may provide different types of resources (Howells 2006). In the Bauges, only three municipalities rent communal land to set up new farmers. Municipalities may also facilitate learning, as one of the municipalities, for example, organise workshops on food and agriculture issues for the inhabitants.

To deepen the discussion on intermediary actors, an interpersonal network analysis was conducted as part of this project to identify the key actors and to clarify how they exchange with the different actors and act at different scales (Pachoud, 2024).

Participatory research

We believe that achieving sustainability transformations of agriculture and food should be addressed collectively. The dialogue between the actors with different visions should allow a mutual understanding of the visions, and then an identification of collectively shared issues and values to bring out a sustainable territorial trajectory for agriculture and food. Penvern et al. (2023) showed that it is necessary to characterise the diversity of visions in order to share this diversity among the actors concerned so as to accompany them in an inclusive way and enrich transition pathways. The present results enabled to identify the different visions with regard to agriculture and food in the Bauges, and allowed to develop a participatory approach within the territory, allowing to share the visions among actors. This research was developed through regular meetings with the park advisors, with the farmers of the park association and with inhabitants involved in citizen initiatives related to food, to present them intermediate results and to question the relevance of the methods chosen. Co-construction of the participatory research needs to include the different types of actors to ensure that the research is not perceived to favour some groups and lead to certain groups refusing to participate. This is all the more important, given that attractive rural areas, particularly in the mountains, experience an increase in neo-rural population. Also showed earlier by McGreevy (2012), this new population tends to have greater communication skills and visibility, and acumen with research because they often have a greater cultural capital due to their studies and experiences outside the territory. Moreover, neo-rural population involved in agricultural issues tend to bring alternative visions of agriculture and develop new practices in relation to what is conventionally done in the territory. This often leads to tensions and conflicts with historical residents, as shown in this article. After having identified the different

visions among the variety of actors, we organised a workshop to promote greater understanding of different actors' visions and to reduce tensions, by engaging in dialogue through accounts of their experiences. This workshop provided the basis for future research to co-construct shared pathways of agriculture and food in the Bauges.

Last, to facilitate participatory research, it seems helpful to identify and mobilise intermediary actors who can bridge and integrate different groups at different scales and create common ground for discussion (Young et al. 2012). Moreover, intermediary actors can facilitate the entry of researchers in a territory by disseminating information and by increasing trust levels and participation among local actors.

Conclusion

To meet the requirements of an agroecological transition, agricultural diversification is a central element in the discourse of science, politics and civil society. However, in the case of the Bauges, we have shown that the actors hold a diversity of visions on the concept of agricultural diversification. These visions refer to worldviews that are sometimes antagonistic and may lead to tensions or even conflicts between groups of actors. We identified six individual archetypal visions on agricultural diversification in the Bauges, referring to different spatial levels. From the interviews conducted, two groups of actors seem to have opposed visions concerning the place and future of livestock farming in the territory, the possibility of other productions notably for local food, the reference to labels for agricultural ecologisation and the perimeter for food autonomy. The first group includes more neo-returned and left-returned residents, gathering diversified farmers in organic agriculture and actors of the civil society. The second group includes more cattle breeders, born in the Bauges and producing milk to make PDO Tome des Bauges. We believe that the identification of different visions is a necessary prerequisite for initiating a participatory approach to increase mutual understanding and reduce tensions and conflicts, allowing the integration of the diversity of visions. Finally, we have shown that some actors, standing at the interface between the two groups of actors, hold plural visions. These actors seem to fulfil different functions of intermediaries according to their typology and position in the network. In a participatory research perspective, it appears useful to further characterise these actors to facilitate cooperation and explore their role in the agrifood transformation dynamics.

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Declaration

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References

- Abson DJ (2019) Chapter 19—the economic drivers and consequences of agricultural specialization. In: Lemaire G, Carvalho PCDF, Kronberg S, Recous S (eds) *Agroecosystem Diversity*. Academic Press, pp 301–315
- Alletto L, Celette F, Drexler D et al (2022) Editorial: crop diversification, a key pillar for the agroecological transition. *Front Agron* 4. <https://doi.org/10.3389/fagro.2022.950822>
- Antier C, Baret PV, Rossing W, Villa A, Fares M, Viguiier L, Messéan A (2022) How to support the development of crop diversification? The importance of an approach at the value chain level. Zenodo. <https://doi.org/10.5281/zenodo.6382721>
- Antoine A (2016) *Agricultural specialisation and rural patterns of development*. Brepols Publishers, Turnhout
- Barataud F, Petit C, Garnier J et al (2022) Pour penser la territorialisation alimentaire, intégrer les inter-territorialités. *Géocarrefour*. <https://doi.org/10.4000/geocarrefour.21053>
- Bowman M, Zilberman D (2013) Economic factors affecting diversified farming systems. *Ecol Soc* 18. <https://doi.org/10.5751/ES-05574-180133>
- Buclet N, Lazarevic D (2015) Principles for sustainability: the need to shift to a sustainable conventional regime. *Environ Dev Sustain* 17:83–100. <https://doi.org/10.1007/s10668-014-9539-4>
- Bui S (2015) *Pour une approche territoriale des transitions écologiques. Analyse de la transition vers l'agroécologie dans la Biovallée (1970–2015)*. These de doctorat, AgroParisTech, Paris
- Bui S, Cardona A, Lamine C, Cerf M (2016) Sustainability transitions: Insights on processes of niche-regime interaction and regime reconfiguration in agri-food systems. *J Rural Stud* 48:92–103. <https://doi.org/10.1016/j.jrurstud.2016.10.003>
- Cayre P, Michaud A, Theau J-P, Rigolot C (2018) The coexistence of multiple worldviews in livestock farming drives agroecological transition. A case study in French Protected Designation of Origin (PDO) cheese mountain areas. *Sustainability* 10:1097. <https://doi.org/10.3390/su10041097>
- Chavas J-P, Riviuccio G, Di Falco S et al (2022) Agricultural diversification, productivity, and food security across time and space. *Agric Econ* 53:41–58. <https://doi.org/10.1111/agec.12742>

Darnhofer I (2015) Socio-technical transitions in farming: key concepts. In: Sutherland L, Darnhofer I, Wilson GA, Zagata L (eds) *Transition pathways towards sustainability in agriculture: case studies from Europe*. CABI Books. CABI International, pp 17–31. <https://doi.org/10.1079/9781780642192.0017>

de Roest K, Ferrari P, Knickel K (2018) Specialisation and economies of scale or diversification and economies of scope? Assessing different agricultural development pathways. *J Rural Stud* 59:222–231. <https://doi.org/10.1016/j.jrurstud.2017.04.013>

Dendoncker N, Boeraeve F, Crouzat E et al (2018) How can integrated valuation of ecosystem services help understanding and steering agroecological transitions? *Ecol Soc*. <https://doi.org/10.5751/ES-09843-230112>

Dollé J-B, Faverdin P, Agabriel J et al (2013) Contribution de l'élevage bovin aux émissions de GES et au stockage de carbone selon les systèmes de production. *Fourrages* 215:181–191

FAO (2018) *The 10 elements of agroecology: guiding the transition to sustainable food and agricultural systems*. <http://www.fao.org/3/i9037en/i9037en.pdf>

Frantzeskaki N, Loorbach D, Meadowcroft J (2012) Governing societal transitions to sustainability. *Int J Sustain Develop* 15:19–36. <https://doi.org/10.1504/IJSD.2012.044032>

Frayssignes J, Pouzenc M, Olivier-Salvagnac V (2021) La relocalisation de l'agriculture: entre dimension spatiale et représentations des acteurs. Le cas des circuits courts collectifs. *Développement Durable Et Territoires*. <https://doi.org/10.4000/developpemendurable.18584>

Gasselin P, Lardon S, Cerdan C et al (2020) The coexistence of agricultural and food models at the territorial scale: an analytical framework for a research agenda. *Rev Agric Food Environ Stud* 101:339–361. <https://doi.org/10.1007/s41130-020-00119-7>

Hazard L, Cerf M, Lamine C et al (2020) A tool for reflecting on research stances to support sustainability transitions. *Nat Sustain* 3:89–95. <https://doi.org/10.1038/s41893-019-0440-x>

Hazard L, Locqueville J, Rey F (2022) A facilitation method to foster collective action in transitions toward sustainable agriculture—a case study. *Agron Sustain Dev* 42:106. <https://doi.org/10.1007/s13593-022-00838-9>

Hernández-Ochoa IM, Gaiser T, Kersebaum K-C et al (2022) Modelbased design of crop diversification through new field arrangements in spatially heterogeneous landscapes. A review. *Agron Sustain Dev* 42:74. <https://doi.org/10.1007/s13593-022-00805-4>

Howells J (2006) Intermediation and the role of intermediaries in innovation. *Res Policy* 35:715–728. <https://doi.org/10.1016/j.respol.2006.03.005>

Hufnagel J, Reckling M, Ewert F (2020) Diverse approaches to crop diversification in agricultural research. A review. *Agron Sustain Dev* 40:14. <https://doi.org/10.1007/s13593-020-00617-4>

Iocola I, Angevin F, Bockstaller C et al (2020) An actor-oriented multi-criteria assessment framework to support a transition towards sustainable agricultural systems based on crop diversification. *Sustainability* 12:5434. <https://doi.org/10.3390/su12135434>

Izard M (2021) Analyse-diagnostic de la dynamique agraire et de la diversité des systèmes agricoles dans la Vallée de l'Arac. Master thesis. L'Institut Agro, Montpellier

Kanda W, Kuisma M, Kivimaa P, Hjelm O (2020) Conceptualising the systemic activities of intermediaries in sustainability transitions. *Environ Innov Soc Trans* 36:449–465. <https://doi.org/10.1016/j.eist.2020.01.002>

Kivimaa P (2014) Government-affiliated intermediary organisations as actors in system-level transitions. *Res Policy* 43:1370–1380. <https://doi.org/10.1016/j.respol.2014.02.007>

Kivimaa P, Boon W, Hyysalo S, Klerkx L (2019) Towards a typology of intermediaries in sustainability transitions: a systematic review and a research agenda. *Res Policy* 48:1062–1075. <https://doi.org/10.1016/j.respol.2018.10.006>

Klasen S, Meyer KM, Dislich C et al (2016) Economic and ecological trade-offs of agricultural specialization at different spatial scales. *Ecol Econ* 122:111–120. <https://doi.org/10.1016/j.ecolecon.2016.01.001>

Kremen C, Miles A (2012) Ecosystem services in biologically diversified versus conventional farming systems: benefits, externalities, and trade-offs. *Ecol Soc* 17. <https://doi.org/10.5751/ES-05035-170440>

Kremen C, Iles A, Bacon C (2012) Diversified farming systems: an agroecological, systems-based alternative to modern industrial agriculture. *Ecol Soc* 17. <https://doi.org/10.5751/ES-05103-170444>

Lamichhane JR (2023) Knowledge gaps on agricultural diversification. *Nat Food* 4:742–743. <https://doi.org/10.1038/s43016-023-00837-3>

Lamine C (2011) Transition pathways towards a robust ecologization of agriculture and the need for system redesign. Cases from organic farming and IPM. *J Rural Stud* 27:209–219. <https://doi.org/10.1016/j.jrurstud.2011.02.001>

Lamine C (2012) Changer de système: une analyse des transitions vers l'agriculture biologique à l'échelle des systèmes agri-alimentaires territoriaux. *Terrains Travaux* 20:139–156

Lamine C, Magda D, Rivera-Ferre M, Marsden T (eds) (2021) *Agroecological transitions, between determinist and open-ended visions*. Peter Lang International Academic Publishers

Loorbach D, Rotmans J (2010) The practice of transition management: examples and lessons from four distinct cases. *Futures* 42:237–246. <https://doi.org/10.1016/j.futures.2009.11.009>

Magrini MB, Martin G, Magne MA, Duru M, Couix N, Hazard L, Plumecocq G (2019) Agroecological transition from farms to territorialised agri-food systems: issues and drivers. In: Bergez JE, Audouin E, Therond O (eds) *Agroecological transitions: from theory to practice in local participatory design*. Springer. https://doi.org/10.1007/978-3-030-01953-2_5

Martiskainen M, Kivimaa P (2018) Creating innovative zero carbon homes in the United Kingdom—Intermediaries and champions in building projects. *Environ Innov Soc Trans*

McGreevy SR (2012) Lost in translation: incomer organic farmers, local knowledge, and the revitalization of upland Japanese hamlets. *Agric Hum Values* 29:393–412. <https://doi.org/10.1007/s10460-011-9347-5>

Mignon I, Kanda W (2018) A typology of intermediary organizations and their impact on sustainability transition policies. *Environ Innov Soc Transit* 29:100–113. <https://doi.org/10.1016/j.eist.2018.07.001>

Morel K, Revoyron E, San Cristobal M, Baret PV (2020) Innovating within or outside dominant food systems? Different challenges for contrasting crop diversification strategies in Europe. *PLoS ONE* 15:e0229910. <https://doi.org/10.1371/journal.pone.0229910>

Moss T (2009) Intermediaries and the governance of sociotechnical networks in transition. *Environ Plan A* 41:1480–1495. <https://doi.org/10.1068/a4116>

Naugle DK (2002) *Worldview: the history of a concept*. W.B. Eerdmans Publishing, Grand Rapids

Ouin A, Andrieu E, Vialatte A et al (2021) Chapter Two—Building a shared vision of the future for multifunctional agricultural landscapes. Lessons from a long-term socio-ecological research site in

south-western France. In: Bohan DA, Dumbrell AJ, Vanbergen AJ (eds) *Advances in ecological research*. Academic Press, Cambridge, pp 57–106

Pachoud C (2021) Territorialization of public action and mountain pastoral areas—case study of the territorial pastoral plans of the Rhône-Alpes Region France. *Sustainability* 13:8014. <https://doi.org/10.3390/su13148014>

Pachoud C (2024) Conciliation or a confrontation of agricultural visions? A characterisation of the networks and key actors for sustainable agrifood transformations in the Bauges. *Agric Syst* 218:103980. <https://doi.org/10.1016/j.agry.2024.103980>

Pachoud C, Koop K, George E (2022) Societal transformation through the prism of the concept of territoire: a French contribution. *Environ Innov Soc Transit* 45:101–113. <https://doi.org/10.1016/j.eist.2022.10.001>

Pachoud C, Bruley E, Grosinger J et al (2023) Joint problem framing: a transdisciplinary methodology for a sustainable future in mountain areas. *Sustain Sci*. <https://doi.org/10.1007/s11625-022-01285-x>

Penvern S, Lamine C, Derbez F et al (2023) Addressing the diversity of visions of ecologization in research and in support to agroecological transitions. *Agroecol Sustain Food Syst* 47:1403–1427. <https://doi.org/10.1080/21683565.2023.2246395>

Plumecocq G, Debril T, Duru M et al (2018) The plurality of values in sustainable agriculture models: diverse lock-in and coevolution patterns. *Ecol Soc* 23(1):21. <https://doi.org/10.5751/ES-09881-230121>

Reckling M, Watson CA, Whitbread A, Helming K (2023) Diversification for sustainable and resilient agricultural landscape systems. *Agron Sustain Dev* 43:44. <https://doi.org/10.1007/s13593-023-00898-5>

Redlich S, Martin EA, Steffan-Dewenter I (2018) Landscape-level crop diversity benefits biological pest control. *J Appl Ecol* 55:2419–2428. <https://doi.org/10.1111/1365-2664.13126>

Registre parcellaire graphique (RPG) (2021) <https://www.data.gouv.fr/fr/datasets/registre-parcellaire-graphique-rpg-contours-des-parcelles-et-ilots-cultureaux-et-leur-groupe-de-cultures-majoritaire/>

Rigolot C (2017) Une approche évolutive des visions du monde pour penser les transformations de l'agriculture. *Cah Agric* 26:36001. <https://doi.org/10.1051/cagri/2017015>

Sellberg MM, Norström AV, Peterson GD, Gordon LJ (2020) Using local initiatives to envision sustainable and resilient food systems in the Stockholm city-region. *Glob Food Sec* 24:100334. <https://doi.org/10.1016/j.gfs.2019.100334>

Sovacool BK, Turnheim B, Martiskainen M et al (2020) Guides or gatekeepers? Incumbent-oriented transition intermediaries in a low-carbon era. *Energy Res Soc Sci* 66:101490. <https://doi.org/10.1016/j.erss.2020.101490>

Spangler K, Burchfield EK, Radel C et al (2022) Crop diversification in Idaho's Magic Valley: the present and the imaginary. *Agron Sustain Dev* 42:99. <https://doi.org/10.1007/s13593-022-00833-0>

Suryanata K (2002) Diversified agriculture, land use, and agrifood networks in Hawaii. *Econ Geogr* 78:71–86. <https://doi.org/10.1111/j.1944-8287.2002.tb00176.x>

Tamburini G, Bommarco R, Wanger TC et al (2020) Agricultural diversification promotes multiple ecosystem services without compromising yield. *Sci Adv* 6:eaba1715. <https://doi.org/10.1126/sciadv.aba1715>

Tittonell P (2020) Assessing resilience and adaptability in agroecological transitions. *Agric Syst* 184:102862. <https://doi.org/10.1016/j.agsy.2020.102862>

Tittonell P, Klerkx L, Baudron F et al (2016) Ecological intensification: local innovation to address global challenges. In: Lichtfouse E (ed) *Sustainable agriculture reviews*. Springer International Publishing, Cham, pp 1–34

Torre A, Aznar O, Bonin M, Caron A, Chia E, Galman M, Kirat T (2006) Conflits et tensions autour des usages de l'espace dans les territoires ruraux et périurbains. Le cas de six zones géographiques françaises. *RERU* 3:415–453. <https://doi.org/10.3917/reru.063.0415>

van Lente H, Hekkert M, Smits R, van Waveren B (2003) Roles of systemic intermediaries in transition processes. *Int J Innov Mgt* 07:247–279. <https://doi.org/10.1142/S1363919603000817>

Viguié L, Cavan N, Bockstaller C et al (2021) Combining diversification practices to enhance the sustainability of conventional cropping systems. *Eur J Agron* 127:126279. <https://doi.org/10.1016/j.eja.2021.126279>

Waha K, van Wijk MT, Fritz S et al (2018) Agricultural diversification as an important strategy for achieving food security in Africa. *Global Change Biol* 24:3390–3400. <https://doi.org/10.1111/gcb.14158>

Weituschat CS, Pascucci S, Materia VC, Blasi E (2023) Understanding the role of value chain formation in the scaling of crop diversification. *Agron Sustain Dev* 43:25. <https://doi.org/10.1007/s13593-023-00866-z>

Wezel A, Herren BG, Kerr RB et al (2020) Agroecological principles and elements and their implications for transitioning to sustainable food systems. A Review. *Agron Sustain Dev* 40:40. <https://doi.org/10.1007/s13593-020-00646-z>

Whatmore S, Stassart P, Renting H (2003) What's Alternative about Alternative Food Networks? *Environ Plan A* 35:389–391. <https://doi.org/10.1068/a3621>

Young JC, Butler JRA, Jordan A et al (2012) Less government intervention in biodiversity management: risks and opportunities. *Biodivers Conserv* 21:1095–1100. <https://doi.org/10.1007/s10531-012-0243-0>

Young JC, Calla S, Lécuyer L (2023) Just and sustainable transformed agricultural landscapes: an analysis based on local food actors' ideal visions of agriculture. *Agric Ecosyst Environ* 342:108236. <https://doi.org/10.1016/j.agee.2022.108236>