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## Local agri-food systems: issues, design, successes and challenges. The example of the "Dijon, Alimentation Durable 2030" innovation territory project.

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In line with the emergence of territorial strategies designed to drive agro-ecological and food transitions, the "Innovation Territoryç" "Dijon, Alimentation Durable 2030" project developed by Dijon Métropole is part of its ProDij' territorial food strategy. Without seeking to achieve illusory food autonomy, this project aims to show that the food transition is virtuous for the environment, the local economy and citizens. Its design is centered around two themes: better producing and better eating, in a dynamic where improving the quality of supply and demand are mutually responsive. The fact that the project is led by the local authority helps to establish its legitimacy; moreover, the establishment of participative governance means that a wide network of local players are involved in various actions. The ambition to develop a supply chains (legumes and vegetables) illustrates the systemic dimension. This ambition is partly based on the strong involvement of academics, which has led to a number of research-action programmes, for example in the field of catering. This sector, particularly school meal catering, represents a real lever for action, opening up the possibility of involving local producers in the agroecological transition dynamic, and consumers in the food transition dynamic.

**Keywords:** Food transition; agroecological transition; territorial cooperation; school catering; sustainable food systems.

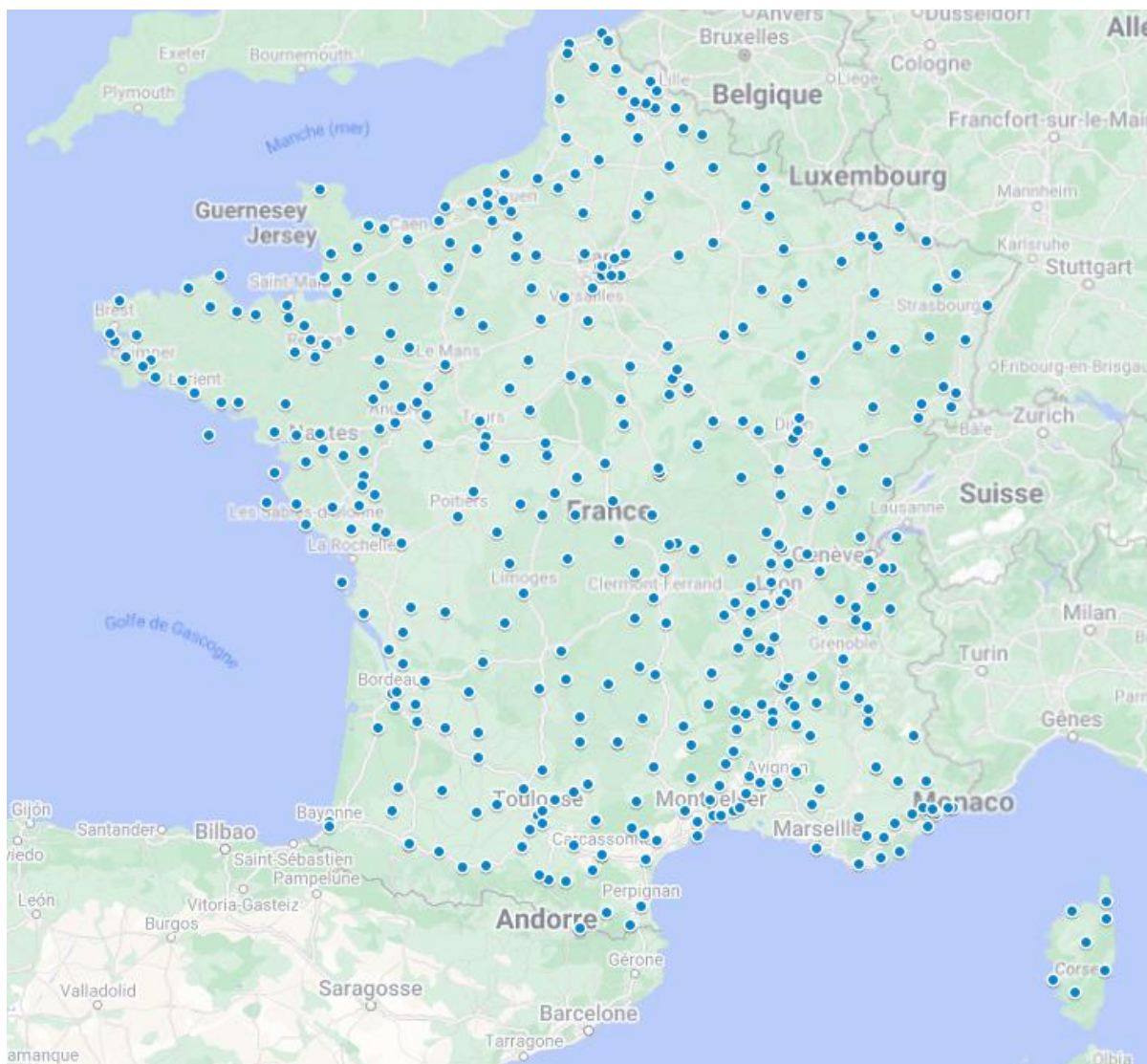
### 1. Introduction: the emergence of local food strategies

For several years now, a number of initiatives led by local and regional authorities have been emerging with the aim of driving a movement towards more sustainable food systems, in all the components of sustainable food systems as defined by the FAO (2010), in addition to the public policies on agriculture and food that exist at national and European level. In this context, it is worth recalling the FAO definition: "Sustainable diets are diets with low environmental impact that contribute to food and nutrition security and a healthy lifestyle for present and future generations. They help to protect and respect biodiversity and ecosystems, are culturally acceptable, economically equitable and accessible, affordable, nutritionally safe and healthy, and optimise natural and human resources" (FAO, 2010).

The transition to more sustainable diets and food systems should make it possible to address a number of issues that characterise today's food systems: food security, nutritional security, metabolic diseases associated with food, loss of biodiversity, excessive use of resources (soil, green and blue water), pollution of ecosystems (Rastoin and Meynard, 2020), not to mention a distancing between producers and consumers, This distance is becoming increasingly conceptual as agricultural raw materials are cracked, formulated, packaged and marketed, until consumers are no longer able to identify the origin of products (Bricas, 2021). Food manufacturers sometimes even fail to trace the origin of their products (see the horsemeat lasagna scandal in 2013). These global and systemic challenges require the commitment of all players in the system, without restriction, to "unlock" food systems (High Council for the Climate, 2024). As a result, more and more local authorities are taking up the issue of agriculture and/or food in order to define a territorial policy in this area, even though this issue does not fall within their usual prerogatives in the case of metropolises. However, local authorities can play a key role in the success of food systems

initiatives, because of their proximity to the stakeholders concerned, whether producers or consumers (Barbour et al., 2022).

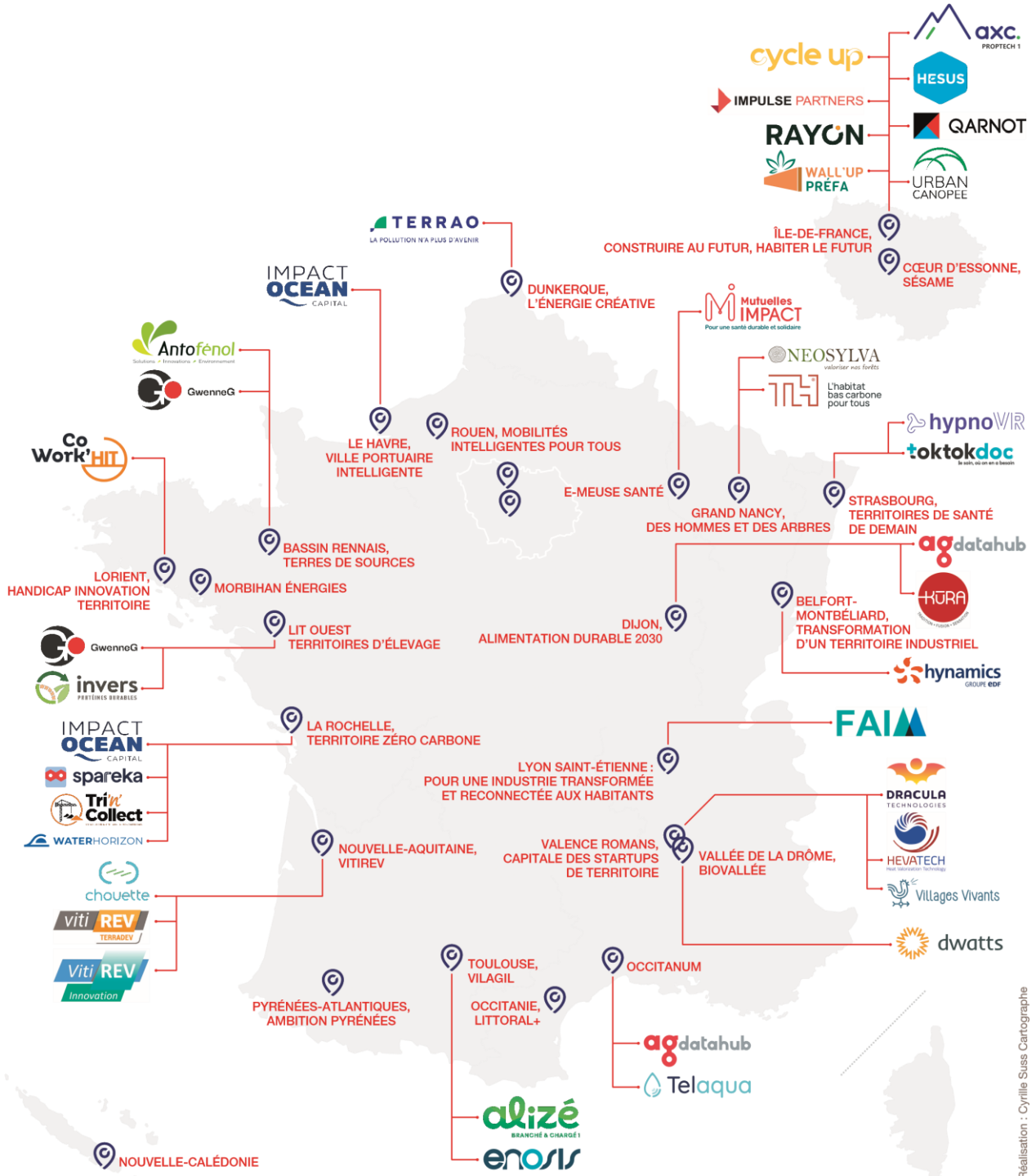
One of the best-known examples of this movement is the French system of *territorial food projects* (“PAT”), initiated by the Ministry of Agriculture and Food Sovereignty. PATs are voluntary, collective, grassroots initiatives. They bring together people with an interest in food issues, who work together to establish a diagnosis of the area and seek and implement practical solutions to local problems. They are supported by local authorities. PATs are very widely spread across France and the French overseas territories, as shown in **Figure 1**. A national network of PATs enables exchanges and sharing of experience, and the association 'Terres en Ville' is responsible for running the network.



**Figure 1:** Map of the 435 territorial food plans (PAT) recognised by the Ministry of Agriculture and Food Sovereignty on 1 January 2024 (Source: Ministry of Agriculture and Food Sovereignty. Map created with Google My Maps).



Other schemes have been designed to encourage the transition to agro-ecology and food, such as the *Territoire d'Innovations* scheme, financed under the 3<sup>ème</sup> Plan d'Investissement d'Avenir. This plan has also financed other types of transition, such as the energy transition and soft mobility. **Figure 2** shows the 24 winners of this plan in the agri-food sector. The "Dijon, Alimentation Durable 2030" project, led by Dijon Métropole and winner of this call for projects in September 2019, is part of this scheme.



**Figure 2:** Map of the 24 "Innovation Territories" projects supported under the 3<sup>ème</sup> plan d'investissement d'Avenir (Source: Banque des Territoires).

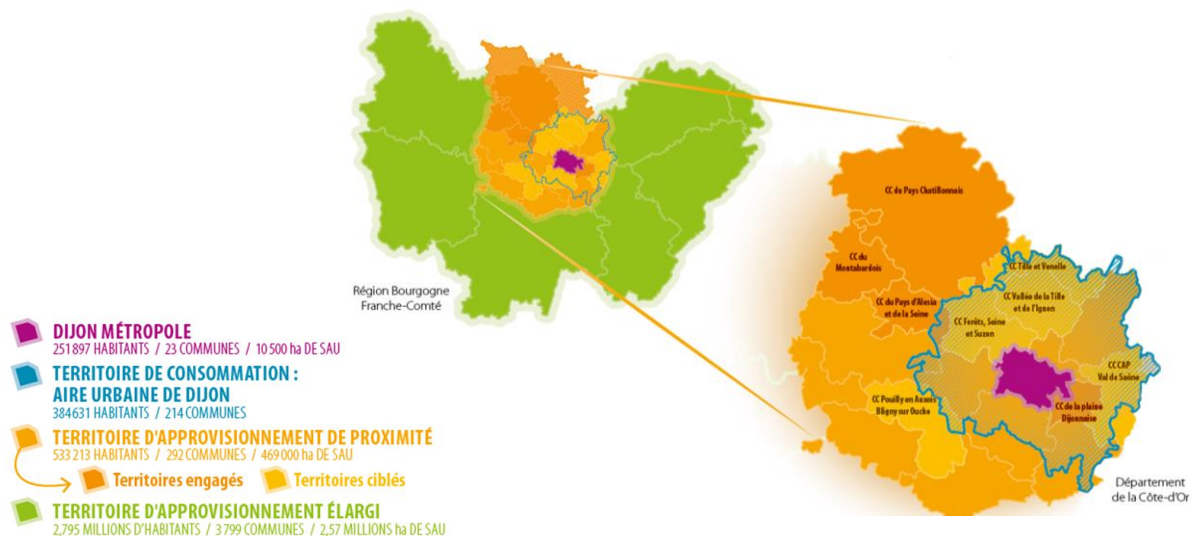
Réalisation : Cyrielle Susas Cartographie



## 2. Issues

The Territoires d'Innovation "Dijon, Alimentation Durable 2030" project is one of the projects under Dijon Métropole's "ProDij" food transition policy (<https://www.dijon-metropole.fr/projets/transition-alimentaire-prodij/>), which includes other emblematic initiatives (vegetable processing unit for school catering, urban agriculture, etc.) financed locally (Métropole and Region) and nationally by other schemes (PAT, Quartiers Fertiles, etc.). It is part of the development policy of the Metropolis (Metropolitan Project) and its relationship with associated territories (**Figure 3**): territory of the metropolis; consumption territory (urban area); local supply territory; wider supply territory. The corresponding map clearly highlights the crucial importance of the alliance between urban and rural areas in setting up this type of project. In fact, a study carried out prior to the roll-out of the project showed that the metropolitan area's food coverage rate (all foods combined, home and away-from-home) was barely 5.4% in terms of tonnage (Triesse Gressard Consultants, 2019), in line with observations made in other metropolitan areas (Strasbourg, Marseille, etc.). While the aim of this type of project is obviously not to make the region self-sufficient in food, this figure does raise questions about the ability of regions to feed their populations, and about the importance of agricultural flows in today's food systems. These important strategic considerations came to the fore during the lock-down of the Covid-19 health crisis, which revealed the fragility of just-in-time food chains<sup>1</sup> (Alonso Ugaglia et al., 2021).

More broadly, for Dijon Métropole, the challenge of ProDij is to demonstrate that the food transition is virtuous not only for the environment but also for the local economy and for citizens (social cohesion, health), in other words a triple dimension of impact. It is also important to demonstrate that the territorial scale is a facilitating scale for this transition, as it enables the continuum from production to consumption to be integrated, through geographical, cultural and logistical proximity.



**Figure 3:** Representation of the areas involved in the Territoires d'Innovation "Dijon, Alimentation Durable 2030" project led by Dijon Métropole

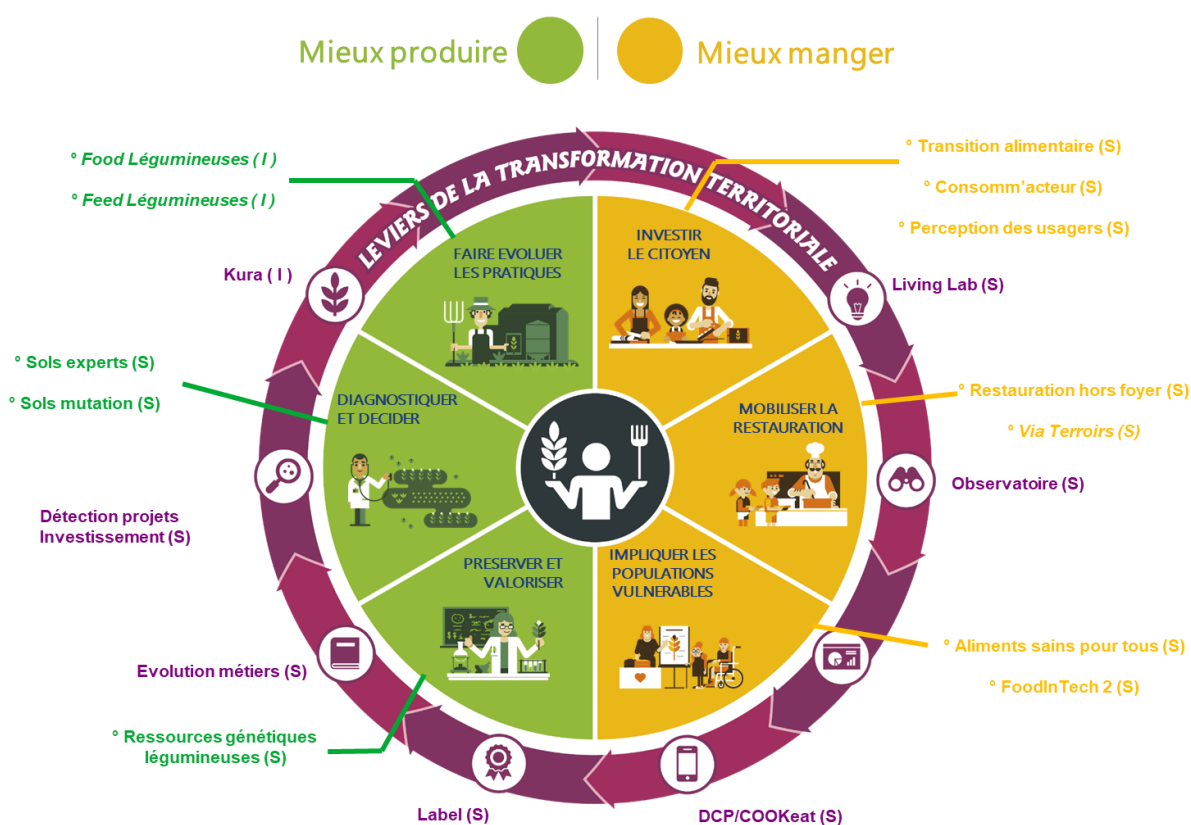
<sup>1</sup> The Ministry of Agriculture and Food was renamed the Ministry of Agriculture and Food Sovereignty in May 2022.



### 3. Design

#### 3.1 Overall diagram

The project is represented in the form of a wheel of change, organised around two major themes: better producing and better eating, as shown in **Figure 4**. Various levers are used to activate this wheel, so that "producing better" can facilitate "eating better", and the demand for "eating better" can create the conditions for "producing better"; for "eating better": involving citizens in the transition process, mobilising the catering industry, involving vulnerable populations; and for "producing better": preserving and making decisions based in particular on soil quality and expected services, and developing agricultural production practices towards a better environmental performance, while meeting consumer expectations. The various elements shown on the outside of the wheel correspond to the project's 'actions', or work packages, which make it possible to target different transition levers in terms of both consumption and production for each of the themes mentioned above.



**Figure 4:** Design of the "Dijon, Alimentation Durable 2030" IT project

#### 3.2 Governance

The organisation of governance systems is generally a particular feature and a strength of territorialised systems, opening up to governance that is as broadly participatory as possible (Rabialahy and Guillaumie, 2022). Local authorities have the legitimacy required to develop structuring cross-sectoral activities and bring together local stakeholders. For example, the Dijon metropolitan area, on the initiative of the elected official in charge of the local food strategy, has brought together a vast network of stakeholders to help drive the strategy forward. Various committees have been set up to organise dialogue between



stakeholders: a strategy committee, a steering committee, working groups for the various actions, a users' committee, etc. A referral was recently made to the Metropoles Development Council through a 'Better Eating, Better Producing' Commission, so that citizens can get to grips with the subject and make proposals. Citizen participation is also taking place through the construction of the Metropole's Territorial Climate-Air-Energy Plan, which has chosen to include food, given that food from upstream to downstream represents 25% of the carbon footprint (Barbier et al., 2019). From this point of view, a major challenge for the Metropole is to be able to measure the impact of the ProDij policy, implemented through the Territoires d'Innovation project 'Dijon, Alimentation Durable 2030' but also other projects launched, on the environment (carbon and energy footprint, biodiversity, soil quality, etc.), the local economy (development of new activities, etc.) and the social sector (cohesion, health, etc.).

### **3.3. Systemic dimension**

In addition to being organised into 'actions', this project also aims to develop systemic visions, for example with a view to developing a 'legume' industry, which is structured around various actions: action 1 (which aims to collect the genetic resources of legumes to better innovate), action 2 (by characterising soil quality and identifying for a type of soil the practices that are most favourable to biodiversity and the expected services), action 16 (which aims to co-construct with citizens and pioneering farmers a label that can certify the local origin of products and their intrinsic and environmental quality), action 11 (aimed at stimulating and supporting demand in out-of-home catering, particularly in schools), action 13 (aimed at improving the physical, cultural and financial accessibility of healthy, sustainable food for people on social assistance), actions 7 and 22 (aimed at understanding how consumers perceive the concepts of agroecology and sustainable food ; and to define the means of communicating on these subjects), action 21 (which aims to involve citizens in the transition towards sustainable food), all supported by action 23 (which proposes to develop skills to meet the new challenges of agro-ecological and food transitions).

## **4. The Innovation Territories project: what role for Research?**

From the outset, this project has made provision for research work to inform the project sponsor's public policies. As a result, a number of actions are supported by academics (**Table 1**). In a number of places, academic work can inform and support public decision-making, thanks to the availability of objective data concerning the local situation (for example, on the question of the quality of urban and agricultural soils, and the link with water quality).

**Table 1:** list of actions involving or led by academics.

Action	Name	Supporting institution
1	Legume genetic resources	INRAE UMR Agroecology
2	Expert floors	INRAE UMR Agroecology
3	Soil Change	Muséum National d'Histoire Naturelle; Université Lyon 3
7	Food transition	University of Burgundy CIMEOS lab
11	Sustainable out-of-home catering	INRAE UMR Centre for Taste and Food Science
13	Healthy food for everyone	CCAS City of Dijon; INRAE UMR CESAER
15	FoodInTech 2	Dijon University Hospital
16	"Label	Citoyens & Compagnie; INRAE UMR Agroecology
22	User perception	University of Burgundy Psy-DREPI laboratory
23	Career development	University of Burgundy Campus des métiers et des Qualification - Créativ21

### **Success stories: catering as a microsystem for observing the food transition**

As shown in **Figure 4**, one of the levers for action to drive the food transition is the mobilisation of catering. This is also a lever that is particularly used by public policies at national level in this area, since the organisation of catering, and school catering in particular, has long been the subject of an elaborate regulatory framework (Avallone et al., 2023). For example, the nutritional composition of menus has been regulated since 2011 (Decree no. 2011-1227). More recently, the Egalim (Law no. 2018-938) and Climate & Resilience (Law no. 2021-1104) laws have supplemented this framework, introducing new obligations covering various aspects, such as reducing the use of plastic, diversifying protein sources, combating food waste and using sustainable, high-quality products.

**Table 2** shows how some of these indicators have evolved over the last few years in Dijon's school catering service, and is a perfect illustration of the approach in place, which aims to act simultaneously on several levers. The fight against food waste has long been one of the areas of focus for school catering. A study carried out in 2017 showed that the equivalent of 161g of food was wasted per meal and per child. Thanks to the implementation of a wide range of actions (regular monitoring of waste and regular use of the results, introduction of dematerialised link sheets, redistribution of bread and fruit, donation of foodstuffs to the Food Bank, reduction in sauces, introduction of 4-component menus, authorisation of table service by the children, encouragement of the introduction of grassroots initiatives, etc.), this volume has been halved by 2022, as shown in Table 2.





**Table 2:** Trends in quality products and food waste in Dijon's school canteens between 2019 and 2022 (Source: City of Dijon; adapted from Dahmani, 2023)

	2019	2021	2022
Sustainable products with a sign of quality	40 % <sup>1</sup>	50 %	57 %
Organic products	34 %	33 %	33 %
Local products	4 %	15 %	17 %
Food waste (per meal and per child, including bread)	99 g	88 g	81 g

<sup>1</sup> Calculated at purchase value

More specifically, as part of the Territoires d'Innovation project, the collective catering lever has been implemented as part of two research-action doctoral theses: one on school catering in collaboration with the City of Dijon's school catering and sustainable food service (led by J. Dahmani), the other on university catering in collaboration with the Crous Bourgogne-Franche-Comté (led by L. Arrazat), both supervised by S. Nicklaus and L. Marty (INRAE, UMR Centre des Sciences du Goût et de l'Alimentation).

Working closely with the school catering and sustainable food service, the researchers helped Dijon to roll out vegetarian menus in school catering (increasing the frequency), which became compulsory under the Egalim (2018) and Climate & Resilience (2021) laws, and which had already been widely implemented by Dijon even before these regulatory obligations.

We report here the main results of this thesis (Dahmani, 2023). The aim of the work was to study the nutritional quality, carbon footprint and children's appreciation of vegetarian menus, by comparing them with meat- or fish-based menus. We also wanted to quantify and characterise the parents who wanted to register their children for a second weekly vegetarian meal. The final objective was to increase children's appreciation of vegetarian dishes, which had previously been identified as not very popular, by means of a taste education programme called Chouette Cantine, co-constructed by involving the various school catering teams in drawing up the programme and with the methodological support of an association specialising in sensory education, Eveil'ô'Goût. The Chouette Cantine food education programme was organised around the lunch break, with the support of the extra-curricular activities teams, catering staff and central kitchen staff ([INRAE dossier "De Chouettes Cantines portées par un Territoire d'Innovation"](#)).

In an initial study, we showed that the menus served by Dijon's school canteens were of good nutritional quality (Dahmani et al., 2022). On average, a menu provided 659 kcal (SD 125), corresponding to 33% of daily energy requirements. Coverage of recommended daily requirements for 23 nutrients was on average 48% for vegetarian menus and 51% for meat- or fish-based menus, indicating a good nutritional density of school catering menus. Vegetarian menus emitted on average half as much greenhouse gas as meat- or fish-based menus. Consequently, increasing the frequency of vegetarian meals based on eggs, dairy products, cereals, vegetables and legumes beyond the current regulations seems to be a good strategy for meeting the challenge of maintaining good nutritional quality and reducing greenhouse gas emissions from school catering.

Thanks to the implementation of connected scoring devices accessible to all primary school children, with more than 200,000 assessment data collected during the 2021-2022 school year for 125 meals served in Dijon's 38 primary schools, we showed that the average assessment score for a main dish was 3.8 out of 5, indicating that children were on average satisfied with the main dish served in school restaurants. No overall difference in satisfaction was observed between vegetarian dishes and meat or fish dishes (Marty et al., submitted). However, among the vegetarian dishes, egg- and/or cheese-based dishes were more popular than plant-based dishes, but we also showed that they were of poorer nutritional quality. In



schools with a lower socio-economic background, vegetarian dishes were slightly but significantly more popular than meat- or fish-based dishes. Our results show that, as well as being good for the planet and for health, vegetarian meals are enjoyed by children without penalising those from less advantaged socio-economic backgrounds, who are more likely to be at risk of lower coverage of nutritional requirements.

In October 2022, we conducted a survey of parents whose children are registered with the school catering service, to find out whether they would like to opt for a second vegetarian menu, or a daily vegetarian menu. The results showed that half of the parents who responded (i.e. 13% of the population contacted) wanted to have two vegetarian meals a week for their children, and 26% wanted a daily vegetarian option (Dahmani et al., 2024a). This was particularly true for parents who already excluded pork from their children's diet, those with a high level of education, and those whose children attended school meals less regularly. Parents who declared themselves to be vegetarian or flexitarian were more likely to opt for more vegetarian menus for their children. The study also revealed the motivations behind these parental choices. Motivations linked to the environment, fair trade, health and animal welfare played an important role in the desire to increase the number of vegetarian meals in school catering. However, motivations linked to familiarity and the 'good to eat' criterion were obstacles that could hinder the desire to increase the frequency of vegetarian meals in school catering.

Evaluation of the effects of the "Chouette Cantine" food and taste education scheme based on two foods not much appreciated by children (cabbage and red beans) showed effects on children's eating behaviour (Dahmani et al, 2024b). Following the first focus period, children's knowledge of cabbage increased, but we did not observe any increase in their appreciation of the cabbage-based dish served in the school canteen, nor in their desire to taste or ability to identify cabbage. Following the focus on legumes, the children's knowledge increased, as did their desire to taste and their ability to identify red beans. However, we did not observe any increase in their appreciation of the red bean dish. These encouraging results indicate the relevance of implementing food education initiatives alongside extracurricular activities. The proof of concept provided by this study means that this programme could be extended to other target foods whose consumption is currently below the recommended levels (e.g. wholegrain cereals). The conditions for its implementation in the various districts still need to be defined.

This research-action project, during which the objectives were defined jointly by the operators of the school catering and sustainable food services and the research team, helped to inform the City of Dijon's political decision regarding the frequency of vegetarian menus. Indeed, following the introduction of a second optional vegetarian menu during the first half of 2023, and on the strength of the results presented above, the City of Dijon has decided to opt for a second vegetarian menu for all children from July 2023. The research-action work made it possible to base the municipality's decisions to introduce a vegetarian menu on scientific results, in order to justify them on a scientific basis, if necessary.

The trend towards 'better eating' in school catering is accompanied by a growing demand for quality local vegetables and pulses (with organic labels). In order to ensure this supply, and more generally that of Dijon Métropole's collective catering in the long term, a metropolitan vegetable processing unit, managed for the time being on a contract basis, was inaugurated in May 2023 and has been operational since April 2023. It is a cornerstone of the ProDij policy, linking school catering with local producers. School catering, and more generally public and private collective catering in the longer term, represents a major lever for transition in terms of both consumption and production.

A new relationship has thus been established with local producers of vegetables and pulses, with a commitment to price and volume through a market set up with the 'Manger Bio BFC' platform (<https://www.mangerbiobfc.fr/>). The organic producers who have made this commitment receive a fair reward for their work, but also express their pride in contributing to children's diets and, more generally, to Dijon Métropole's food transition policy. The new relationship between production and consumption is based on a major paradigm shift in which it is no longer the menus that identify the products required (vegetables and pulses), but rather the products available that define the menus. For the time being, the



vegetable processing unit is supplied exclusively by organic producers, and the vast majority of its customers are the central kitchen of the school canteen, as part of the Egalim law.

However, the vegetable processing unit is also intended to process vegetables from conventional agriculture, in order to broaden the range of catering customers. Ultimately, the aim is to supply all of Dijon Métropole's public and private catering services, representing 15 million meals a year and 2,000 tonnes of vegetables. However, the corresponding public contract was unsuccessful due to the lack of organisation among local conventional producers. As a result, the Côte d'Or Chamber of Agriculture is in the process of building a platform that will not only respond to the corresponding market, but also to that of supermarkets and hypermarkets looking for local produce. This positive dynamic represents a rebound effect from the structuring of the vegetable sector through the metropolitan vegetable factory. With the Côte d'Or Chamber of Agriculture and INRAE, as part of action 16 (Table 1), Dijon Métropole is now working, thanks to the contribution of C&C (<https://citoyensetcompagnie.collaborons.fr/?universe=all>), on a label ("Mon Produit Local Engagé") to promote the agroecological transition. The aim of this label will be to guarantee the local origin of products, their low environmental footprint, their intrinsic quality, fair remuneration for producers, etc. The project is being steered by C&C, with the close involvement of the Chamber of Agriculture, with the help of a producers' committee and a citizens' committee based on the principle of the Participatory Guarantee System (SPG, <https://certification-participative.org/les-spg/>).

## 5. Conclusion

The information provided in this article is intended to illustrate how a local authority can develop a food transition policy (ProDij) with the support of local academic, economic and social players, with something for everyone. Researchers have a unique field of application in which to test hypotheses in real life and gather data that is useful for their research, of course, but also useful for the local authority. The economic players interested in the local dynamic co-construct innovations with researchers and citizens, and assess the relevance of their deployment as well as the acceptance of the price to be paid for these innovations by eaters through a living lab run by the Vitagora competitiveness cluster as part of the Territoires d'Innovation project. These players are investing in our region.

The Territoires d'Innovation project, which is the focus of this article, is part of a wider policy aimed at showing that the food transition is possible, that the territorial scale is relevant, and that it is good for the environment, the local economy and social cohesion. France, and several other European countries, are going through a major crisis in their agricultural and food systems. Local initiatives are showing that another path is possible, one based on fair remuneration for farmers and recognition of their contribution to society, which in turn depends on a fair price for food. This fair price of food should necessarily take into account the avoided costs of good food in terms of health and the environment, and in this respect it is a matter for policy at national level. The FAO has recently shown that these "hidden costs of food" are high, up to 8% of GDP for high-income countries, and that in these countries they are mainly associated with a diet of poor nutritional quality, leading to disease and lower labour productivity (FAO, 2023). This clearly highlights the importance of the issue and the major investment that a fair price for food represents, which with strong political support will bear fruit for both health and the environment.

The food transition policy is a long-standing one, starting in 2004 with the decision to set up a central kitchen, then continuing in 2013 with the sanctification of agricultural land that had previously been earmarked for urbanisation, and the introduction of a PLUI (urban development plan) that prioritises the redevelopment of the city within itself to avoid nibbling away at agricultural land. The Territoires d'Innovation project, accredited in 2019, then helped to create an innovative conceptual framework. Much remains to be done, but Dijon Métropole's exemplary dynamic is underway to the benefit of us all.

## Ethics



The authors declare that the experiments were carried out in compliance with the applicable national regulations.

#### **Declaration on the availability of data and models**

The data supporting the results presented in this article are available on request from the author of the article.

#### **Declaration on Generative Artificial Intelligence and Artificial Intelligence Assisted Technologies in the Drafting Process.**

The authors have used artificial intelligence-assisted technologies to translate from French to English.

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#### **Authors' contributions**

SN is responsible for action 11; she drafted an initial version of the article. PL is VP in charge of Dijon Métropole's territorial food strategy; he contributed to the drafting and revised the text.

#### **Declaration of interest**

The authors declare that they do not work for, advise, own shares in, or receive funds from any organisation that could benefit from this article, and declare no affiliation other than those listed at the beginning of the article.

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