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Reflecting on the Concept of Local Agroecological Food Systems

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Abstract: Despite the extensive literature on *Local Agro-food Systems* (LAFS), which involves research on local food identity and organisational proximity, the environmental sustainability of these systems has rarely been addressed. This paper develops a new concept called *Local Agroecological Food Systems* (LAEFS), which focuses the research not only on local food identity, but also on agroecological principles. We aim to conduct a reflexive review of the literature on the conceptual factors attempting to describe the particular characteristics of LAEFS (distinguishing these from LAFS). We explore five axes of analysis: (a) to establish a compromise at the local level between agro-food sectoral specialisation on the one hand and greater cultivated biodiversity and a more diversified economic structure on the other; (b) to geographically and commercially shorten food channels to the fullest extent; (c) to construct new institutional formulae in the fields of logistics, distribution and public procurement for the scaling up of sustainable food; (d) to develop a participatory, bottom-up, multi-stakeholder and multi-level territorial governance; and (e) to reduce the metabolic profile of food systems by reorganising rural-urban linkages. One of the principal objectives of LAEFS should involve redesigning agricultural and food systems at a scale greater than that of the farm (territory or landscape). This requires both a major public policy push and sustainable territorial governance that incorporate an approach based on territory, food systems and agroecology.

Keywords: specialisation vs. diversification; short food channels; food hubs; cooperative supermarkets; public procurement; territorial governance; urban–rural linkages; metabolism of food systems

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1. Introduction

When stakeholders of a food chain are situated close to each other in a territory, synergies can be obtained through collective action among agents provided there is cooperation between the stakeholders and institutions, as well as organisational proximity (shared values and common networks). Obtaining synergies from collective action among agents within a context of proximity and shared food-related values constitute a principal alternative with regard to overcoming territorial isolation and the entrepreneurial and social fragmentation that often occurs in innovative experiences. Few social innovation niches achieve the expected social benefits.

Such a synergetic social and territorial innovation is particularly challenging in the field of agroecology because the actors usually operate at a small scale, therefore facing huge constraints with regard to developing networks that are simultaneously efficient and democratic. To overcome these shortcomings, this paper develops and discusses the new concept, conceived by the authors, of *Local Agroecological Food Systems* (LAEFS), defined as a certain spatial concentration of farms, artisanal agro-industries, small distributors, input suppliers and local institutions, inspired by agroecology or by sustainable food approaches, in a network that shows a significant degree of collaborative relationships among all the agents and institutions. The above-mentioned LAEFS achieve synergies and positive externalities by means of cooperation among agents and institutions; this is enhanced by their geographical and organisational proximity. This approach entails not only cooperating

in the construction of local synergies, but also establishing a particular way of interacting with the local, ecological, social and economic environment (agroecological cultivation, circular economy, short food chains, social justice, etc.).

Such interactions within LAEFS (and between LAEFS and their territorial context) are driven by the support and promotion of a set of shared values and practices: fair prices as leverage for more equitable distribution of income and revenues (economic justice); the quest for a better life for every individual (social justice and equity); participatory and democratic procedures and decision-making processes (commitment to the community); delivery of healthy food (health); sustainable procedures at every stage of the food system (sustainability); and an unequivocal focus on local territorial development (localness). Consequently, LAEFS propose a set of values that are more comprehensive than *Local Agro-food Systems* (LAFS), which tend to associate territorial identity with foodstuffs as a tool for competing in differentiated markets, as is the case for geographical indications. Thus, LAEFS can be conceptualised as true chains/networks of values [1,2] whose members attempt to survive and thrive from within their specific standpoints—as producers, processors, wholesalers, retailers, consumers, or partners of the shared governance structures.

Nonetheless, the multiple values underlying these LAEFS do not involve neglecting the economic aspects of profitability and competitiveness. Accordingly, the discussion about LAEFS as a substantive evolution of the concept of LAFS starts with an assessment of the unstable compromise between biodiversity (and economies of scope) as a cornerstone of agroecology and the need for some degree of specialisation (and economies of scale) in order to supply consumer markets. According to the aforementioned values, such markets are mostly local or regional ones, in which food is intended to be channelled either directly or via the lowest number of intermediaries. This second stage of our discussion brings us straight to the third one because there is broad consensus in the empirical literature regarding the economic and environmental inefficiency of marketing schemes purely based on individual action and geographical closeness. New organisational arrangements in logistics (shared processing facilities, food hubs, and cooperative supermarkets) and new policies (responsible public procurement) emerge, thirdly, as collaborative solutions to upscale current atomistic practices. The subsequent need for tighter coordination among farmers, processors, and these new intermediary organisations points to a fourth topic in our discussion: the development of a model of territorial governance that must be bottom-up, participatory, inclusive, multi-stakeholder and multi-scalar; the aforementioned model is therefore aligned with beliefs of co-production and shared knowledge characterising agroecological and social innovations. For these implicit goals to be achieved, stakeholders, namely public administration, should be able to develop an integrated territorial approach in relation to the food supply process that is capable of overcoming the current urban–rural divide and the underlying metabolic rift.

In short, the present paper attempts to explain the particular characteristics of LAEFS, distinguishing them from LAFS. To this end, we conducted an 'integrative review', which critically assesses the literature, enabling new theoretical frameworks to emerge, particularly regarding novel approaches or preliminary conceptualisations. That is, our approach is based on a three-step process: an initial search for papers was conducted at the beginning of 2022 in WOS (425 results) and Scopus (369 results) and involved the following keywords: ('alternative food network*' or 'short food supply chain*' or 'local food system*') and ('governance' or 'social innovation' or 'proximity' or 'logistic*' or 'food hub*' or 'agroecolog*' or 'cooperat*' or 'upscale*' or 'delivery' or 'sdg'). A second step consisted of selecting papers by perusing keywords and abstracts pertinent to the topic of the present paper, in particular, the five principles of LAEFS mentioned at the end of Section 2. This resulted in a set of 110 papers.

In the third step, the authors included in the review other well-known papers that were deemed relevant to the topic of the review; this process made use of their previous research experience and their respective disciplinary backgrounds. This resulted in the final selection of 140 references that integrate the list of the present paper. Importantly,

no geographical filters were applied during the process. However, most of the empirical contributions focused on the Global North, while only four of them refer to countries such as Indonesia, Vietnam, Mexico, Colombia or Central America. Despite the embeddedness of agroecology as a practice and as a social movement in Latin America, our perusal of the literature appears to indicate that the building blocks of the concept of LAEFS have largely been developed in the more affluent countries.

The remainder of the paper is organised as follows. Following the Introduction, Section 2 links the concept of LAEFS with the rich discussion on food studies, economic geography, and regional and environmental economics referring to proximity, its dimensions and the role it plays in enhancing economic performance and in the transition towards sustainability in the broad sense of the word. Section 3 develops the argument of LAEFS as a robust conceptual framework based on the five above-mentioned interconnected pillars: diversification/specialisation, short food channels, collaborative logistics and distribution, democratic governance, and territorial approach. The main contributions are highlighted in the Conclusions section.

2. Theoretical Framework

In the 1970s, Italian researchers, such as Becattini, Brusco or Sforzi, updated Alfred Marshall's concept of 'industrial districts' to investigate the socioeconomic factors promoting the achievement of agglomeration economies and external economies in Northern and Central Italy [3–6]). A basic premise involves the existence of a dense network of inter-entrepreneurial relations, as well as relationships among all enterprises and local institutions, which share a high level of technologies, techniques, and knowledge. A high degree of dissemination of innovations, know-how, and specific human and social capital is also distinctive of these economic environments.

These initial premises of Marshallian industrial districts, however, cannot be applied to all local production systems as a whole. Many areas specialised in the creation of an identity-based product do not necessarily present a high level of dissemination of innovation and know-how, in the same way, that the provision of social or human capital can present certain restrictions in many areas. In this context, in the 1990s, the School of Grenoble in France, with scholars such as Pecqueur, Benko and Courlet, introduced the concept of *Local Production Systems* (LPS). These systems extended the concept of the industrial district to a wide range of socioeconomic and productive contexts in areas presenting a high industrial specialisation and a predominance of small and medium-sized (SME) enterprises [7–10]. The particular features of LPS involve specialising in the production of a specific good and containing SME networks in which untraded relations play a relevant role.

Framed within the scientific heritage of the notion of LPS, LAFS has been developing for over two decades. They fall within the scope of research on agro-food territories in which stakeholders, resources, products and landscapes are associated through the sharing of common values, habits and experiences, giving rise to a collective identity. A LAFS was defined as 'a concentration of locally networked firms and institutions specialised in producing and marketing identity-based food products and which perform collective regulatory tasks, such as identification of the specific quality, adoption and dissemination of techniques, knowledge and know-how, among others' [11]. International literature is taking a fresh look at identity-based food production and consumption [12–18]. Moreover, there is an increasing amount of research on LAFS at the global level. This has given rise to a large number of research groups in America and Europe, as well as to the organisation of nine international conferences since 2002. The most well-known and institutionalised LAFS involve the territorial systems inherent to geographical indications.

The particular features characterising agro-food activities in comparison with other economic sectors, in turn, determine the specificities of LAFS when compared to LPS studies. This can be accounted for by the fact that agriculture occupies vast areas of many regions throughout the planet. Secondly, agricultural systems make intensive use of natural resources, conditioning the activity of LAFS. Furthermore, agro-food production systems

play a decisive role in rural development. Likewise, typical foods are intrinsically associated with the identity, culture and history of countries and regions.

Importantly, in the literature on LAFS, the degree of spatial concentration should be considered in relative terms because agro-food activities show a high degree of spatial diffusion. As in LPS theories, LAFS confer a central role to collective and cooperative action, usually seen as a necessary condition for achieving territorial competitiveness. The neo-institutional school, inspired by regional science research, also contributes investigation into LAFS to the argument that local networks of enterprises and institutions share a series of specific assets, such as knowledge, know-how or specific types of local organisational structures [19].

Research on LAFS pays particular attention to the role of territorial anchorage and of local proximity processes in their survival and sustainability [20]. The concept of origin of food products is based on a historical and bio-cultural analysis of food identity. Debates on territorial anchorage focus on the causal factors (natural, cultural, and socioeconomic ones) that a distinctive territory imprints on the specific attributes of identity-based foods. The socioeconomic and institutional networks are necessary for transmitting techniques and know-how over time because food typicity is always the result of social construction at the local level. Anchorage factors of identity-based foods are considered to constitute a specific territorial asset in the neo-institutional sense, which generates the differential quality attributes determining the typicity and specificity of these food products [21–23]. Research has analysed not only the identities ascribed to food but also the patrimonialisation initiatives developed by local communities, conceived as the processes of construction and transformation of the identities of the foodstuffs based on exchanges among different cultures.

Furthermore, the notion of geographical and organisational proximity aligns with a sociocultural and economical approach to collective action aimed at rural development. A given LAFS implies a certain spatial density of mutually cooperating farms, firms, and institutions that can, in turn, be used to valorise the food identity both on the markets and by contributing to the creation of common and public goods. One of the main aims of research on LAFS involves characterising the collective advantages obtained from the joint localisation of economic activities associated with a determined agro-food sector based on the concept of organisational proximity developed by the theories on LPS [24–27]. According to Benko and Desbiens [7] and Boschma [19], proximity does not exclusively incorporate notions of physical distance (referring to geographical proximity). This specific asset rather constitutes a social construction that determines greater proximity in the economic-organisational strategies of local stakeholders devoted to economic development strategies such as cooperative production and consumption networks. Organisational proximity between actors implies two major conditions: sharing a common system of values and belonging to networks of common relationships and arenas.

At this point, we move conceptually from researching the organisational and geographical proximity of spatial structures founded on identity-based food products (LAFS) to structures associated with agroecology-oriented food products (LAEFS) to building a new conceptual framework. Therefore, our paper attempts to reveal these differences conceptually and in a structured manner, as they have not been addressed in the extant literature.

Hence, the concept of LAEFS, still under construction, needs to combine features related to local food identity and organisational proximity with agroecological principles; the latter can involve closing biogeochemical cycles, promoting biodiversity, conserving biophysical capital, and marketing through short supply chains. There exist abundant empirical experiences in LAFS, as well as well-consolidated literature, all of which combine territorial analysis with value chain approaches. Most of these proposals, however, do not provide a clear definition of their performance in relation to sustainability and neither do they propose criteria for assessing the ecological impact. Such a focus has traditionally been linked to the agroecological approach to local food systems [28]. The literature is a true reflection of the reality, as the spatial concentration of farms, agro-industrial enterprises

and institutions that are mostly devoted to agroecology or to sustainable agriculture and food, is not very commonplace.

From another point of view, agroecology has generally addressed sustainable food issues within the context of family farms [29]. First, agroecology has been proposed as an approach that helps to mitigate or adapt to climate change while supporting long-term productivity [30]. Nonetheless, farms become more resilient not only through enhanced biodiversity management or elimination of external synthetic inputs but also by promoting equality and addressing social, economic and political issues [31,32]. Agroecology has metamorphosed from a science, a social movement, and a set of farming practices for agricultural sustainability, mainly at the farming system scale, towards a wider focus on agency and power-related issues within food systems [33], along with the development of political agroecology [31]. As a result, agroecology has been conceptualised as 'the ecology of the (entire) food system' [29,34]. Additionally, the territory is a useful concept for investigating agroecological issues at the landscape scale. An agroecology territory is defined as 'a territory where a transition toward sustainable agriculture based on agroecological practices exists' [35].

Scaling agroecological transitions involves emerging challenges, which López-García and González de Molina [36] summarise as follows: (i) how to overcome the metabolic rift related to segregated activities along the rural-urban and productive-reproductive economy axes; (ii) how to feed cities sustainably, and how to shape and organise LAFS according to specific territorial conditions; and (iii) how to identify the social subjects who should drive such transitions, as well as the necessary governance arrangements. In order to address these challenges, the authors define 'agroecology-based local agro-food systems' (similar to LAEFS) as 'the assemblages of alternative food networks, new and emerging types of institutionalisation, public policies, and appropriate bottom-up institutional governance arrangements, together with the symbolic revival of place-based cultural and historical identities, which are embedded in specific territories with the aim of maximising social and ecological sustainability'.

Consequently, our discussion on LAEFS may benefit from the borrowing of specific contributions by cognate concepts such as biodistricts [37,38], agrobiodiversity-oriented food systems [39], agroecological territories [35], territorial agrifood systems [40], and values-based territorial food networks [2,41].

First, biodistricts are defined in Italy through a regulation on which public policies are based; they emphasise territorial governance as a way to improve the local population's quality of life in accordance with social and ecological sustainability, by connecting local food systems, sustainable gastronomy, tourism activities and organic productions.

Second, the concept of biodistricts resonates with that of agrobiodiversity-oriented food systems. Preservation of biodiversity in agriculture and husbandry, fuelled by public policies and economic actors, and rooted in local values and culture, is postulated to strengthen territorial capital via the supply of new genetic resources and traditional knowledge of food production. A broader portfolio of private and public goods and services can be expected from these food systems.

Third, agroecological territories and territorial agrifood systems are intended to involve all actors and organisations devoted to the production, transformation, distribution, and consumption of food in a given territory. These include farmers, wholesalers, merchants, processors, farmers' unions, local authorities, as well as all social organisations engaged in support of local and organic food production. Despite the fact that these actors have visions and goals of their own, they are all interconnected at the local and regional scale on the one hand, and they also interact with more geographically distant stakeholders on the other. Thus, at the territorial level, the agrifood system comprises both conventional and alternative actors who simultaneously cooperate and compete. This is a rather realistic approach to the current hybrid nature of the food economy, in which many conventional food actors are slowly associating alternative values and practices with their daily activities [42,43].

Finally, values-based territorial food networks (VTFN) have recently been launched as an 'umbrella concept' that is intended to replace the alleged ambiguity in the literature on alternative food networks. Thus, VTFN selects the terms 'local' from 'local food systems', 'short' from 'short food supply chains', and 'civic' from 'civic food networks', to discuss the alternative aspects of these three approaches in relation to the four strong values of sustainability: social wellbeing, economic resilience, environmental integrity, and ethical governance.

This range of concepts jointly points to the imperative of a holistic approach in any assessment of the nexus between food, nature, and society. Such a holistic approach is territorial by definition since the territory is conceptualised in geography as the dynamic outcome of long-term nature-society interaction. These concepts, therefore, share a territorial dimension or concern that is also informative of LAEFS. What differentiates LAEFS from LAFS is its focus on agroecology. As previously mentioned herein, agroecology is not at all new as a practice, a science, or a political standpoint. The main concerns of these related concepts (values, biodiversity, sustainability, governance, quality of life) are all integral to agroecology since its very inception. It, therefore, makes sense to reflect on the territorial dimension of agroecology embodied within the concept of LAEFS. In this sense, the idea of LAEFS connects with the agroecological territories of Wezel et al. [35], where a transition towards sustainable food supply is occurring. However, the latter concept is anchored by three pillars (i.e., an adaptation of agricultural practices, conservation of biodiversity and natural resources, and development of embedded food systems) and, thus, may benefit from a more comprehensive approach in which biodiversity and primary production interact with the broader socioeconomic milieu under a governance network that manages the territory as a whole.

In the following sections, we define and conduct a review of the five main principles of LAEFS. These constitute the specific characteristics of LAEFS, distinguishing them from LAFS (Figure 1):

1. To establish a compromise at the local level between specialisation in the agro-food sector, on the one hand, and greater cultivated biodiversity and a more diversified economic structure, on the other.
2. To shorten food channels, geographically and commercially, to the fullest extent.
3. To devise new institutional formulae in the field of logistics, distribution and public procurement for scaling up sustainable food systems.
4. To develop participatory, bottom-up, multi-stakeholder and multi-level territorial governance. This principle implies the co-creation of knowledge by producers, consumers and researchers based on bottom-up and participatory research methodologies.
5. To enhance urban–rural linkages in order to address the challenges of the metabolism of food systems and to develop an integrated territorial approach.

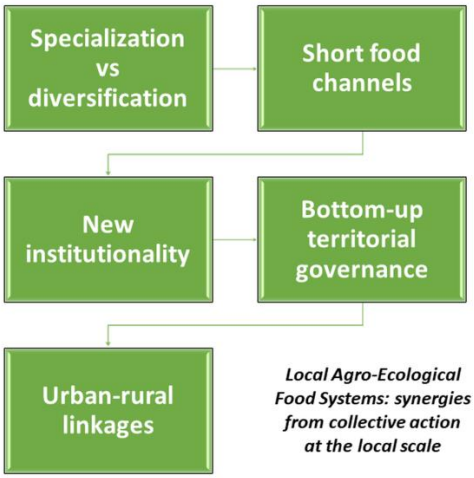

Figure 1. Five dimensions of the concept of Local Agroecological Food Systems.

3. The Foundations of Local Agroecological Food Systems

3.1. Specialisation versus Diversification

The debate around specialisation versus diversification in the context of local agriculture, food systems and rural areas has pervaded research into agro-food systems and territorial development since the late 1970s. At that time, the focus was on the increasing specialisation of farms and rural spaces, which was causing farmers to lose their autonomy. Indeed, specialisation has been one of the key elements of the paradigm of modernisation of agriculture in the second half of the 20th century [44]. The debate continues, although scholars have recently been addressing this controversy through the lens of a sustainable development approach in an attempt to reconcile agricultural production with natural spaces and land use within a context of resource scarcity.

The objective involves deciding whether farms and territory should evolve towards one single or a small number of agricultural activities or to greater diversity thereof. Many scholars currently consider it necessary to reach a compromise at the local level between two conflicting principles: on the one hand, a certain threshold of diversification of the local economic structure and cultivated biodiversity to ensure a certain level of economic and environmental resilience; on the other, a certain degree of specialisation aimed at achieving economies of scale and generating economies of agglomeration, which result from a degree of geographical concentration of related activities [44–46].

First, from the standpoint of diversification of agricultural production inherent to agroecology, there is growing evidence that biodiverse ecosystems are able to provide additional ecosystem services without compromising crop yields, thus promoting ecological resilience [47–49]. In addition, the diversity of crops favours seasonal complementarity of employment, sources of income and the resulting economic resilience. The literature has often investigated the effects of crop diversification at the farm level, but the literature on diversification at the level of agricultural landscapes is far scarcer [50]. The territorial diversity of crops and agro-industrial activities needs to be complemented by diversification throughout the rest of the food chain, particularly in local ones, within the realm of consumption. Diversification of foodscapes improves the multifunctionality and the environmental services provided by the farms that constitute them.

In addition, co-location in the territory of activities specialising in the same agri-food subsector, which also presents organisational proximity, generates synergies and positive externalities derived from collective action inherent to the networks of farms and companies. Above and beyond geographical proximity, which refers to physical distance, organisational proximity is the quality whereby interactions between local stakeholders are favoured by shared norms and routines of behaviour, by a common system of values and representations, and by belonging to similar networks of relationships [25,26].

Consequently, one could propose a trade-off between two competing processes: specialisation and the achievement of economies of scale versus diversification and economies of scope [51]. Agglomeration externalities and economies of scale, considered at the level of a territory, are amongst the main advantages provided by geographical and organisational proximity in LAFS that are highly specialised in a particular agro-food sector; nonetheless, there tend to arise issues relating to economic resilience, as well as negative environmental externalities associated with monoculture. López-García and González de Molina [36] state that networks of stakeholders and small companies cooperating and employing common resources, such as local landscapes and ecosystems, can generate economies of scope via cross-cooperation in LAEFS which enhance the added value of the territory and reduce the metabolic profile.

The 'land sparing' versus 'land sharing' debate to be encountered in the Ecology literature [52,53] finds a parallel in agricultural territories. Gasselin et al. [44], citing the Agrimonde report [54], discuss the existence of two ideal types of management of a territory and its resources: the segregationist and the integrationist models. The former consists of spatially segregating cultivable areas, where production needs to be intensified to obtain a certain level of production, from areas that need to be environmentally protected. The

integrationist model, inherent to agroecology, promotes the creation of a diversity and complementarity of forms of agriculture and natural spaces arranged in a mosaic, which produces diverse ecosystem services and enhances biodiversity.

In order to reach a compromise between the two principles, smart specialisation policies [46] could provide a suitable alternative for the development of LAEFS. These policies consist of promoting a limited number of food sectors presenting a certain degree of territorial specialisation at the local level but which also possess strong connections at the regional level in terms of incoming and outgoing flows of raw materials and products, employment and knowledge. However, due to the fact that specialisation and diversification can be considered differently at the farm level than at the scales of landscape, LAEFS or territory, and because they are not always at loggerheads, then the articulation of scales seems crucial. In this sense, Gasselin et al. [44] wonder whether production in territories could be diversified through a certain degree of specialisation at the farm level.

This kind of compromise is explored by Van der Ploeg [55] in a case study of a producers' cooperative in the Netherlands: the author suggests that the ability of the cooperative to follow agroecological rules over time and to rely on its own tangible and intangible resources constitutes a best-practice case that could be extrapolated from the farm to the territorial scale. In such a process, local actors and resources (cooperatives' members, farmers' traditional knowledge, local seeds and breeds, self-produced inputs, on-farm sales, local consumers) come to play a central role at the expense of non-local ones (banks, insurance, extension agencies, research facilities, middlemen, input suppliers, factories, regulatory bodies for water management or animal welfare). Van der Ploeg postulates that this agroecology-centred evolution from farm to territory prevents the risk of conventionalisation, which is always implicit in upscaling processes. Or, more precisely, the consistent standardisation of agroecological practices could push this food-led transition towards new frontiers in the economic, social, and political arenas.

3.2. Shortening Food Channels

Shortening food channels to the greatest possible extent, both geographically and commercially, becomes an essential requirement for all alternative food networks, including LAEFS. Short food supply chains respond to the growing demand of urban consumers for direct access to safe, sustainable and high-quality food, as well as to the need for producers to capture greater shares of the added value in food chains [1]. Food channels need to be shortened for the following reasons.

First, the geographical shortening of food channels implies a clear reduction of food miles, which is likely to reduce the carbon footprint and other greenhouse gas emissions in food transportation from producers to retailers and consumers [56]. From the environmental perspective, short food supply chains tend to employ more sustainable production methods (including agroecology) and optimise energy use and reduce food waste, in comparison with conventional food chains [57].

Second, geographical shortening also involves lower logistics costs, which is vital with regard to reducing final prices and, consequently, selling quality food at prices most consumers can afford. It attempts to counter the current commonplace tendency to associate 'good food' (local, organic, agroecological) with ideas of 'elitism' and 'awareness' [58]. Narrow commercial margins in the food chain, even for differentiated food products, resulting from the prevalence at the global scale of the big retailers' model in the food chain [59–61].

Third, commercial shortening implies marketing food with fewer intermediaries between production and consumption. The definition of short food supply chains permits one intermediary at the most. Fewer intermediaries also mean higher profits and broader margins for producers, which results in lower final prices, thus making these quality foods more affordable for final consumers [56,62].

Fourth, LAEFS not only implies geographical proximity but also organisational proximity by developing mutual trust and mutual knowledge among producers, consumers

and other stakeholders. Short food chains generate trust between producers and consumers. The literature emphasises trust as the true cornerstone of alternative food networks [1,57]. Trust improves relations with other individuals and social systems, serves to reduce risk and uncertainty, and simplifies social interactions [63].

Finally, the literature also suggests that the dichotomy between the conventional and the alternative systems is relatively unclear for some short food marketing channels. Stakeholders in agro-food chains acquire a certain hybrid role in food networks [43,64], which involve connections, rivalries and complementarities between alternative networks and conventional systems. In urban agglomerations, in particular, alternative networks are often unable to meet the demand they generate or to gain appropriate access to certain outlets and retailing points. To address this situation, the literature proposes the concept of progressive hybrid networks [65]. These networks rely on pre-existing conventional circuits but deploy particular relationships, tools and distribution actions, which make them an increasingly interesting alternative due to their embeddedness in specific territories and within food movements.

In their comprehensive literature reviews addressing shortening/alternativeness and sustainability, Forsell and Lankoski [66], Michel-Villareal et al. [67], and Chiffoleau and Dorian [1] find that social advantages (a higher level of trust and localised interaction in relation to food) represent the most prominent outcome of short food circuits. Economic returns for producers are also noteworthy (higher revenues, more jobs per hectare, less uncertainty that enables investment), mostly when food delivery is diversified through alternative and organic outlets. As for issues relating to health and nutrition, short food supply chains provide a higher nutrient content per weight unit and are therefore beneficial for consumers' health while simultaneously preserving biodiversity. Empirical evidence provided by Mundler and Laughrea [68] in a well-informed study in Quebec broadly confirmed such findings.

According to these reviews, the environmental implications of short food supply chains are far more controversial: geographical dispersion and the small size of nodes in alternative and agroecological food networks imply high levels of inefficiency in logistics, and the carbon footprint, therefore, often remains higher than expected [69]. Accordingly, the literature on the carbon footprint resulting from the transport of products in short food supply networks highlights logistics as a major flaw (Section 3.3) and, consequently, underlines the need to develop innovative solutions in this contested field as a prerequisite for upscaling LAEFS.

3.3. New Institutionality: Logistics, Distribution and Public Procurement

Alternative networks, frequently linked to social movements, have often shown insufficient growth. Reaching a certain degree of territorial concentration of agro-ecological activities, and therefore scaling up and generating synergies, requires the involvement of a new institutional framework for logistics and distribution, alternative to the conventional model dominated by the big retailers. Cooperation among producers, among consumers and between both, appears to constitute a collective undertaking, with a need to control decision-making in alternative food chains. The construction of new institutional formulae in the field of logistics and distribution is intended to relieve the bottlenecks hindering the scaling up of agroecology and sustainable food systems, and to broaden the range of sustainable consumption. These new institutional arrangements incorporate social innovations, generally in the form of producer cooperatives (logistics food hubs) or consumer cooperatives (cooperative supermarkets). Both kinds of cooperatives share a communitarian purpose of social transformation and ecological transition. Closely interrelated to the problems of logistics and distribution, and from the point of view of public policies, a third type of institutionality refers to responsible food procurement in publicly owned canteens (schools, health centres, retirement homes, government offices, etc.), which seeks to incorporate sustainability criteria into the meals provided therein.

The logistics and physical distribution of food currently respond to a fragmented model of storage, picking or transport, involving high costs and generating a significant carbon footprint. In order to overcome these obstacles, the biggest challenge involves the creation of *food hubs*, or logistics centres of small local food producers and processors, devoted to local and regional consumption and which avail of permanent facilities for conducting logistics functions [69–72]. In particular, agroecology-oriented food hubs are cooperatives of producers who deal jointly with logistics and sometimes incorporate wholesale marketing tasks.

Food hubs are centres for optimal storage and exchange of products. Producers cooperate in a whole range of functions aimed at reducing costs and the carbon footprint, but also at improving accessibility in order for food retailers, local food processors and consumers to purchase sustainable and local food products. The functions of food hubs include providing a facility for the exchange of goods, picking services, storage (including refrigeration), transport sharing, joint planning of production in the case of fruit and vegetable farmers, or even the inverse logistics of bio-waste. Food hubs, however, can also incorporate common wholesale activities, such as joint promotion and joint marketing. The organisational model of logistics and distribution must be flexible and scalable in order to adapt to demands, e.g., public procurement of hospitals, schools or universities.

Cooperative supermarkets are associative formulae of the retail sector, whose consumers are the members of the cooperative. Membership is required for the purchase of products. These supermarkets operate on the basis that members contribute small amounts of money to the share capital, and they also work several hours a month or pay a periodical fee. Although these supermarkets also hire professional full-time employees, salary costs are considerably lower as a result of the hours of work performed by the members in tasks such as stocking, inventory, manning cash desks, weighing fruit and vegetables or cleaning, among others. Very few references can be found in this sense in the international scientific literature [73–75]. The function of cooperative supermarkets involves purchasing quality food products (many of these organic and/or local) at a fair and affordable price. An additional objective calls for the creation of a community of consumers around sustainable food.

This model dates back to the 1970s, originating in the pioneering Park Slope Food Co-op supermarket in New York. However, it has only recently expanded in Europe, building on the experience of La Louve supermarket in Paris in 2016. The wide range of organic and local food and drugstore products, together with a huge interest in making sustainable food affordable for many people, justify the role of cooperative supermarkets as key players in the upscaling of sustainable food. The governance model of the supermarkets is a participatory one. Strategic decisions are taken in assemblies, and members can volunteer to organise thematic working committees performing functions such as purchasing, information technologies and management, communication or finance.

Responsible public food procurement is the policy with the biggest quantitative impact on the upscaling of agroecology and sustainable food, even in the short term [76,77]. This policy also has beneficial effects at the educational level, especially in the case of school canteens; it also serves to instill healthy eating habits in the population. The first phase in the implementation of a public procurement programme involves defining the technical specifications for contracting canteen services. This is where sustainability criteria are incorporated into the food supply, which is based on two systems: by contractual obligation or as criteria for evaluating the bids tendered.

The types of criteria applied by public food procurement programmes can be environmental, sociolabour, ethical or nutritional [77–79]. Environmental criteria emerged as a pioneering type in the 1980s but are still the most widespread and important internationally: the most frequent clauses establish minimum percentages of organic and/or local food to be incorporated into menus. They may also include clauses aimed at phasing out single-use packaging and containers, the compulsory use of electric vehicles for supplying food to canteens, or the mandatory submission of a waste management plan. Among the

sociolabour and ethical criteria, tendering procedures could require companies to belong to the social economy or to present a training plan for their kitchen staff, or fair-trade labelled food could even be introduced in menus for some products (e.g., chocolate). Nutritional clauses might involve the number of times per week that fresh fruit and vegetables must be included on menus or the obligation to cook with a healthy oil (e.g., olive oil).

To implement a public procurement policy, there is a need to ensure that a local supply and logistics system is capable of consistently and unfailingly handling a large, regular and diversified supply on a daily basis. Moreover, managing the daily food supply with numerous suppliers entails significant transaction costs for canteen managers. Cooperative food hubs constitute an essential tool for synchronising public procurement policies with the supply logistics of small-scale agroecological producers.

Finally, digitisation is an essential strategy with regard to optimising the different phases of logistics and distribution. Multiple digital tools have been adapted to short food chains [80]: programmes for optimising transport routes, calculating the carbon footprint of transport, online sales platforms, as well as the linkage of order and stock management systems with the accounting, transport and sales, systems, among others. Information technologies generate key information and financial flows for disseminating value and for coordinating exchanges between stakeholders in short food supply chains [81,82]. In addition, digitisation represents a crucial tool for matching supply and demand in terms of physical, economic and temporal flows, as well as for minimising the carbon footprint produced by transport. The greater the diversity of delivery or sales points and the greater the hybridisation of commercial channels, the more important digitisation becomes. Moreover, the consumer of agroecological food is very demanding, not only in relation to the traceability of product characteristics but also in relation to the identity of the producer; in this sense, there is a vital need to deploy digital technology [83].

3.4. Participatory and Bottom-Up Territorial Governance

Territorial governance is conceived as a non-hierarchical form of government, defined by a territorial and dynamic articulation of collective organisational decision-making processes; these are grounded on cooperation and coordination among stakeholders and institutions, who present multiple interactions and mutual agreements among both private and public actors. Territorial governance entails implementing networked, multi-actor and multi-level coordination processes, as well as the cooperative organisation of local farms, firms and institutions, all favoured by geographical and organisational proximity, in a context of information asymmetries involving multiple decision centres [84,85].

At the global level, a broad range of LAFS territorial governance schemes exists; these, in turn, are linked to the multiple patrimonialisation and valorisation processes involving identity-based foods [86–90]. Geographical indications, as well as other modalities of LAFS, constitute a vital territorial alternative for the collective organisation of quality for identity-based foods. The institutional activity of the Regulatory Boards of the different geographical indications involves cooperation among economic agents who have vested interests in the different stages of the food chain; this is intended to define quality standards, develop quality control tasks, and legally protect the label.

The partnership processes required for the organisation of Regulatory Boards imply networks of vertical and horizontal relationships for coordination and cooperation among agents. As a consequence, Regulatory Boards tend to collectively adopt a series of non-mandatory tasks, transcending the regulatory ones, such as dissemination and adoption of techniques, knowledge and know-how, training programs, joint-marketing activities or promotional initiatives, among others. Geographical indications can therefore generate economic synergies resulting from the inter-professional organisation of LAFS at the local scale, which promotes processes of territorial governance [91]. Positive territorial externalities result from the implementation of these territorial governance mechanisms. The specialised literature states that some effects of the establishment and development of LAFS in the territory include human capital formation, development of commercial

networks, promotion of the territory as a whole, and value-added initiatives in tourism and heritage, among others [16,92–94].

The literature on social sciences includes the following interconnected components within the concept of LAFS territorial governance [25,26,85,95,96]: (i) multi-level coordination (horizontal and vertical) among the actors; (ii) cooperation among agents and institutions in a multi-stakeholder context; (iii) a central role taken by local networks for disseminating knowledge, information and innovation; (iv) decentralisation and participation of all the actors in the decision-making processes; and (v) existence of geographical and organisational proximity. Additionally, openness, transparency and accountability constitute other basic conditions inherent to the concept of governance.

Nonetheless, the social and ecological dimensions referring to the sustainability of agroecology [33,36] have not been fully addressed in previous conceptualisations of LAFS. Moreover, LAEFS deploys a wider approach to the governance of food systems, combining the clear sustainability dimension presented by agroecology and the operationalisation of territorialised dynamics inherent to LAFS. Thus, with regard to the main components of the concept described in the previous paragraph, the territorial governance systems of LAFS and LAEFS coincide in that they both require multi-level and multi-stakeholder governance processes and because the processes of dissemination of knowledge and innovations are particularly relevant in both cases. Notwithstanding, big differences exist: for instance, LAFS territorial governance processes are usually top-down, presenting a greater or lesser degree of empowerment and acceptance by grassroots food initiatives and movements. In contrast, LAEFS territorial governance is necessarily participatory and bottom-up. Another relevant difference is that the territorial governance of LAEFS presents greater involvement of civil society [97] in comparison to LAFS, which respond largely to sectorally specialised agents and institutions. This greater participation of civil society enhances territorialised alliances and phenomena of hybridisation [42].

Lamine et al. [40] stated that their 'territorial agro-food systems' approach (similar to that of LAEFS) attempts to encompass the diverse actors involved in the production, processing, distribution and consumption of food products at the territorial scale and who strive to promote local and ecological products. The complexity encountered in a territorial approach to the sustainability of food systems (and the varying and often contradictory interests of the social actors) calls for complex, constructivist and inductive research approaches [98,99]. López-García and González de Molina [36] argue that the discourse around agroecology and food sovereignty is usually rejected by conservative sectors within rural communities, a fact that hinders the scaling up of sustainable food systems. Thus, upscaling processes require the establishment of partnerships and hybridisation at the territorial level, with the participation of small and medium-sized conventional actors. Additionally, the bottom-up and multi-level approach inherent to political agroecology requires an understanding of the interrelations between state and non-state actors at different territorial scales and administrative levels [100,101].

A comprehensive approach to the governance of food systems (which includes diverse stakeholders and dialectics of state and non-state actors) requires dynamic transition theories in order to explain the mechanisms of the systemic 'rejection effect' by the corporate food regime in relation to agroecological initiatives of production, distribution and consumption [31,102]. A political agroecology-based approach to food systems calls for operational frameworks in order to account for and promote bottom-up, multi-actor and multi-level co-production processes of knowledge, cooperation and policies favourable to agroecology. López-García et al. [103] have identified and characterised six domains of governance in urban food policies, all of which cut across actor profiles and territorial scales: governance among local socioeconomic operators in local food systems and alternative food networks, multi-stakeholder (between socioeconomic actors and local administration), intra-local (between different departments of the local administrations), multi-level (between administrations at different levels), specifically territorial (including rural-urban

linkages), and trans-local governance (networks of local actors and administrations that do not share a specific geographical territory).

Nonetheless, complex approaches to the territorialisation of agroecological transitions need specific methodologies in order both to comprehend and activate non-deterministic processes [99,104]. The construction of plural subjects aimed at promoting and leading such transitions calls for complex and integrative devices that will enable the management of the diverging interests, symbolic environments, and timelines to accelerate the transition [105,106]. This is particularly the case of a scheme in which small farmers are to be the drivers of a broader space that includes urban and non-agricultural actors, niche and regime stakeholders, and state and non-state actors.

In line with the bottom-up decision-making process, LAEFS require the use of bottom-up and participatory research methodologies, widely employed in agroecology and based on the co-creation of knowledge by producers, consumers and researchers, such as participatory action research (PAR) techniques [107,108]. Furthermore, participatory and territorialised approaches to transition processes can generate wider-ranging alliances between actors committed to agroecology and other conventional actors; this approach is known as 'hybrid forums' [109]. Such alliances and plural agencies are suitable for scaling up agroecological transition processes and for involving diverse local actors in the dissemination of agroecological innovations. However, empirical research on PAR applied to agroecological transitions is still seriously underdeveloped at large territorial scales [110], as is the case of LAEFS.

Different types of institutions are also developing new modalities of multi-level governance arrangements for transitions towards sustainability in food systems. One initiative that is increasingly attracting attention involves biodistricts, discussed above in Section 2. Another interesting administrative model for protecting and re-activating agricultural land are agricultural parks, as legal entities capable of demarcating a specific agricultural territory, usually in peri-urban settings under high urbanisation pressure and usually managed by public-private consortia [111,112]. Agricultural parks are understood to constitute a planning tool for enhancing sustainable urban food systems; they operate through cooperation among different local actors and short food supply chains [113].

Finally, Territorial Food Projects (Projets Alimentaires Territoriaux, PAT, in French) are voluntary and collective agreements at the local level between the stakeholders involved in sustainable food in a given geographical area in France: among other stakeholders, they involve farmers, agro-industries, logistics operators and distributors, cooperatives, collective canteens, public and private institutions and civil society organisations (consumer associations, environmentalists, etc.). The PAT have a specific legal framework and a particular territorial labelling system and are promoted by public policies [114–116]. Their objective is to employ bottom-up governance approaches in order to provide solutions to local problems of sustainable local agro-food systems.

3.5. Urban-Rural Linkages and the Metabolism of Food Systems

The main challenge of the agroecological transition at the food system level refers to closing the metabolic rift generated by the segregation between production and consumption in relation to different processes, stakeholders, timelines and spaces. Agroecosystems must become capable of maintaining long-term biomass production without increasing external energy inputs; this can only be achieved through a change in the management of land and food systems designed to close the main biogeochemical cycles at different (and nested) spatial scales [31]. Agroecology-oriented food systems, alternative food networks, and short food supply chains imply improved metabolic performance, but this is seldom demonstrated in quantitative or empirical terms [56,117].

There is broad scientific consensus regarding the fact that the most effective way to reduce the metabolic profile of food systems, particularly in relation to energy flows and GHG emissions, is to shift towards plant-based diets and to prevent food loss and waste [118,119]. However, no single measure will be completely effective. Joint measures

are needed to address the additional risks associated with planetary boundaries, which are increasingly moving beyond the 'safe operating space'. These threats include changes in land use, biodiversity loss, depletion of freshwater resources, or pollution of aquatic and terrestrial ecosystems through excessive nitrogen and phosphorus inputs [118,120,121]. Consequently, agroecological approaches to farming systems and LAFS are increasingly being considered as suitable implements for addressing such environmental challenges [119] and other societal issues such as food insecurity [122], rural poverty and depletion of family farmers' income [62]. Indeed, a close relationship has been shown to exist between agriculture-related biophysical degradation and a decline in family farming [123].

Moreover, apart from sustainable management of farms, optimum provision of ecosystem services will require agricultural landscapes and agroecosystems to be redesigned, and most farmers will therefore need to become involved in such a transition. Closing the biophysical cycles of food systems, however, also calls for a restructuring of the relations between urban and rural settings [31]. In this sense, the concept of 'city region food systems' (CRFS) [124] has emerged as a concept both for understanding and planning sustainable relations between urban and rural settlements and for acknowledging the current centrality of urban settings in economic, political and sociocultural terms. Blay-Palmer et al. [125] defined CRFS as a theoretical framework and operational approach that 'integrates flows across sectors and resources, [. . .] offers an integrative method with which to consider and develop policies and programs across scales, including the urban, peri-urban, and rural scopes'. Some authors propose CRFS as a suitable approach for scaling up agroecological experiences to larger territorial scales [126], whilst others highlight the need to reconstruct more localised (rural) food systems, which would be intertwined and articulated within a nested and multi-level structure of sustainable food systems [28].

Indeed, although reinforcing rural territories is seen to constitute the central idea in the discourse on sustainable food systems and in relation to projections of global disruptive episodes resulting from global climate change, many alternative experiences analysed in sustainable food systems research are related to urban systems, such as public food procurement or farmers' markets [117]. Special mention should be given to urban agriculture in all its forms, as it is increasingly garnering attention both in the policy and the research arenas, and it has been broadly associated with agroecology [127,128]. Urban agriculture has shown great potential for providing ecosystem services in urban settings [129] whilst simultaneously strengthening local communities [130] and combating food insecurity [131]. Additionally, urban and peri-urban agriculture have shown a high degree of resilience in the face of global disturbances such as COVID-19, thus enabling urban dwellers to access fresh fruits and vegetables [132,133].

The metabolic rift between the urban and rural settings is often expressed in policy arenas in parallel with a growing cultural distance between the city (represented by the government and the environmentalist movements in some discourses) and the (conventional) farming sector (representing the rural communities). Such a symbolic opposition between rural and urban communities is being constructed and used by some actors to justify resistance to a shift towards sustainability policies in the food system [134]. Conventional farmers are adhering to powerful actors on the food chain (profoundly conservative) as the farming crisis deepens with time. Addressing this issue poses a serious challenge to sustainability transitions in the food systems [135]. Radical transitions in the agricultural sector intended to include rural communities will need to deploy narratives that connect with symbolic rural worlds, which have sometimes been called 'silent food sovereignty' [136,137].

In general terms, this attempt to bridge the urban/rural divide in food systems theory and practice emphasises the need for a true territorial approach to food production, delivery and consumption. Although the methodological procedure is very complex in this sense, noteworthy contributions, which draw on concepts such as foodsheds or bioregions [138–140], have very recently opened up the path to a far more realistic assessment of the potential food supply for specific crops or breeds raised around cities. Such insights

demonstrate the advantages of assessing food issues at the territorial level or scale whilst considering both rural settings and urban spots simultaneously. LAEFS emphasise a balance between specialisation and diversification, short food chains, more efficient logistics, co-production of knowledge, and they also express concern for the closure of metabolic processes.

4. Concluding Reflections and Further Research Questions

The concept of Local Agroecological Food Systems is still under construction, as was previously indicated herein. The present paper contributes to its theoretical development in three main aspects.

First, the concept of LAEFS did not just appear from nowhere. It is embedded in the more wide-ranging field of literature that explores the contribution of geographical and organisational proximity to local and regional development. Food production constitutes one of the most interesting scenarios for testing such relationships. This inescapable fact provides an opportunity to develop economic linkages, social bonds, and political arrangements around food as a way to create self-centred development paths. Linked to industrial districts, local production systems and LAFS (the latter mostly based on adding value to food with identity-based attributes associated with the territory), the concept of LAEFS includes local food within its broader ecological context. Thus, from the perspective of LAEFS, agroecology is actively involved in the whole food supply chain, from agriculture to consumption. By considering the broad set of issues arising from agroecology, food production becomes the carrier of an important set of values: economic justice, social justice, health care, a sense of community, localness, and environmental sustainability, among others. The commonplace notion of the food value chain as the cornerstone of the food system is thus replaced by the reconceptualisation of alternative food supply systems as chains of values endorsed by a complex range of actors, whether individual or collective. In this manner, agroecology (as a basis for LAEFS) increases the range of sustainable food beyond the current (and increasingly conventionalised) limits imposed by organic labels and geographical indications.

Second, LAEFS must possess five dimensions to ensure such values: a dynamic equilibrium between agroecological diversification and economic specialisation, a localised scale for socioeconomic relations between producers and consumers, a cooperative model for addressing the challenge of logistics and retailing, a truly democratic governance framework, and a territorial approach that closes the metabolic rift by reconnecting rural territories with urban centres. These five dimensions are rooted in the core of the diversification-specialisation divide that affects the economy as a whole, but LAEFS connects the food economy to its local context by means of alternative solutions to daily challenges: new institutional formulae for logistics and retailing devoted to short food chains and enabled by digitisation, coordination of actors to ensure the protection of values throughout the network in a democratic and inclusive manner, and the blurring of urban/rural boundaries to provide an alternative and metabolic territorial perspective.

Thirdly, LAEFS can inspire public policies at the local and regional scales, such as responsible public procurement. LAEFS is not only an academic device; it is also a powerful tool for informing any authorities who may be aware of the food-water-energy nexus and thus committed to pushing their territories to the forefront of the ecological transition in the broader sense of the term. A LAEFS-based policy is fully compatible with city-region food policies and also with visions of a bioregional future. LAEFS provides a roadmap for authorities to address their concerns, because the five dimensions can be developed to produce multiple programs and projects, which will necessarily be based on cooperation and democratic governance procedures.

Territory therefore emerges as the very foundation of the LAEFS concept. First, LAEFS scales agroecology up from the farm to a larger territorial scope. Second, LAEFS resorts to agroecology in order to embrace a wider range of (territorial) values for food and of practices and goals for (territorial) stakeholders. It could be said that agroecology, on the

one hand, and LAFS, on the other, converge around the territory, which serves as a meeting point, to maximise their respective potentials and to enhance their performance in terms of territorial development.

Territorial governance, therefore, becomes the key order for LAEFS to make advances in food transition. From a LAEFS standpoint, the territory (city-region, bioregion) constitutes a reflexive and proactive actor whose governance framework protects the above-mentioned values at the expense of vested interests. Such new governance scales must cope with tensions between the more progressive and the more conservative actors. Hybridisation is the most likely outcome of this territorial governance.

Accordingly, this potential contribution of LAEFS to the upscaling of sustainable agriculture and food, to public policies, and to territorial development raises several questions to be discussed in future empirical research.

First, how are agroecological initiatives seeding the basis for LAEFS? Are agroecological producers and other stakeholders really benefiting from geographical and organisational proximity? What governance arrangements do they have in place? Are these arrangements useful for upscaling agroecology-based food?

Second, are these agroecological spatial concentrations promoting sustainable territorial development? Are they actually reconnecting rural communities with urban dwellers? Are these agroecological territories more resilient against ongoing environmental and political disturbances?

Third, are currently existing territorial food policies (food policy councils, biodistricts, public procurement) aligned with LAEFS foundations? How can LAEFS and public policies be aligned?

All these questions merit further exploration of the development of the LAEFS approach through empirical research. One of the main aims of the LAEFS approach should involve redesigning agricultural and food systems at a scale larger than that of the farm: territory or landscape. This can only be achieved through both a major public policy drive and by means of sustainable territorial governance that incorporates a threefold approach based on territory, the food system and agroecology.

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Abbreviations

LAEFS	Local agroecological food systems
LAFS	Local agro-food systems
LPS	Local production systems
SME	Small and medium-sized enterprises
VTFN	Values-based territorial food networks
PAR	Participatory action research
PAT	Projets Alimentaires Territoriaux

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