

## POSITION PAPER

# Agroecological terroir: an approach for scaling-out local food systems

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## 1 Pathways to sustainable agriculture of tomorrow

At the beginning of the 21st century, agriculture copes with multiple challenges concerning global food security, while increasing population and consumption are placing unprecedented demands on agriculture and natural resources (Foley et al., 2011; Poore and Nemecek, 2018). Accordingly, food production remains a key pillar of food security (Porter et al., 2014) and a crucial point of intervention for food availability. The establishment of a global world market allows for increased availability of all types of food throughout the year, regardless of production season and region (Kearney, 2010). As a result, modern agriculture has the potential to provide more than enough food for a population reaching up to  $10 \times 10^9$  people by 2050 (Searchinger et al., 2019). This contradicts the view that food security is dramatically compromised by the effects of global climate change (Lobell et al., 2011), the use of agricultural products for industrial purposes (von Braun, 2007), and animal feed (Salami et al., 2019). In addition to this, 70% less arable land area was needed in 2014 to produce the same quantity of crops as in 1961; at the same time, the yield of major staple crop increased (Ritchie and Roser, 2020). Lappé et al. (1998) presented evidence that intensification in agriculture and a gradual increase in agricultural production could lead to further deterioration of the environment and depletion of non-renewable resources. Smith (2015) argues that instead of

expanding the limits of food production, we need to manage demand, particularly that for livestock products if we want to meet food security in 2050. In addition, the developments of global food systems impose some consequences anticipated before but not properly managed, such as the concentration of power into multinational companies and the internationalisation of the market. Projections of the future of agriculture are based on our current knowledge, which in the global context often gives an insufficiently clear picture of what we can expect. Conditions that have not been considered so far will shape the future and considerably affect food security. Among them, the following challenges can be anticipated:

1. A new generation of consumers with specific requirements will emerge;
2. information communication technologies (ICT) will boost the global food market and allow for buying virtually anything from anywhere;
3. improved crops and livestock with specific traits adapted to the altered environment will be developed;
4. increased interest in palatable, ultra-processed foods (made from processed substances extracted or refined from whole foods), and new food sources, lab meat, algae, and insects;
5. continuous soil degradation will affect the capacity of our food system to meet the requirement of the global population;

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6. fewer farmers will be involved in food production, and agriculture will rely more on automatisations, robotics, and ICT.

Because of all this, the quest for solutions that would be globally acceptable and sustainable from an ecological and socio-economic point of view is the major task of contemporary agriculture (Odegard and van der Voet, 2014). According to Griggs et al. (2013), the future development of food systems largely relies on how successfully 17 sustainable development goals (SDGs) will be achieved (United Nations, 2015). The beginning of the 21st century has brought much greater interest in food production, consumption, as well as its nutritional properties. This has led to the popularisation of a different alternative concept of a local food system that symbolises a paradigm shift from the globalised and industrialised mainstream production. Recently, a large number of socio-economic and environmental movements converged around local food systems that refer to voluntarily established food systems characterised by a close producer-consumer relationship within a designated place or local area (Hall and Gössling, 2016). Accordingly, the combination of research-based innovations and traditional knowledge yields multiple options for transforming food systems at the local level (Caron et al., 2018). DuPuis and Goodman (2005) advocate that there is an increasingly important connection between the localisation of food systems and the promotion of environmental sustainability and social justice. The local modification of alternative food systems has resulted in short food chains (kilometre zero, box delivery schemes, urban agriculture) and the establishment of 'slow food' consumption. Such systems are characterised by a closer relation between local producers and consumers, better interaction between organisations and farmers, fair production conditions, and distinctive flavour and aroma of the produced food (Feldmann and Hamm, 2015). El Bilali (2019) stressed in a comprehensive review that the way forward for research on agro-food sustainability transitions implies a deeper understanding of different socio-technical system levels and landscape-niche-regime interactions. Garnett (2013) elaborated that the priority for the future is a nutrition-driven food system that remains within environmental limits. Adams and Salois (2010) argue that the demand for local food will largely arise in response to corporate co-optation of the organic food market and the introduction of the concept of "organic lite". Guthman (2014) presented a scenario involving this concept for California, in which big agribusinesses impose a model of farming practice adaptation (specialisation in high-value crops), thus leading to the conventionalisation of organic production. Some studies show that consumers tend to value the local origin of the product more than the organic nature of production (de-Magistris and Gracia, 2014; Campbell, 2014). As a result, a shift away from organic and toward local food in consumer preferences will bring new implications for the environment and society (Meas et al., 2014). Globally, the interest in locally produced foods is increasing, but it becomes very difficult for consumers to find it in mainstream shops (Hardesty, 2008). Wholesale and retail food

buyers show increasing interest in purchasing locally produced foods; however, the consistency of supply, lower product volume, labelling and information about product origin are common barriers for their greater penetration into the conventional markets. Therefore, local and global food systems must be developed simultaneously and overlap in the pursuit of food security. This will require efforts to increase the environmental efficiency of food production, but this approach is not sufficient to achieve the sustainability of food systems (Capone et al., 2014). This paper seeks to contribute to the discussion about food system development with the encouragement of synergies between the terroir and agroecology.

## 2 Defining the position

The term 'terroir' has for a long time gained much attention in the context of viticulture (wine production) and has been extensively used in describing the "sense of place" derived from a complex interaction of climate, soil, tradition, geomorphology, and variety. The concept of terroir is frequently used to explain the sensory attributes of high-quality wines by the environmental conditions in which the grapes are grown (Seguin, 1988). Commonly, terroir is associated with adjusted methods of resource management that enhances the quality hierarchy of the final product and differs from similar products. Vaudour et al. (2015) elucidate that studies based on metabolomics or strontium isotopic ratio strengthen the assumption that geographical origin does leave an imprint on wines through soil substrate and climate and the interaction of viticulture choices. The same author noted that microbial terroir is identified as a key factor in variation among grapes growing in different locations. In addition, terroir is associated with specific management practices, not exclusively ecological (practices with a beneficial impact on the environment), that create a physical environment and connect production methods with sensory attributes and character of the end product.

Initially, terroir was recognised in the production of wine, olives, and cheese. Jacobsen (2010) was among the first to point out the wider potential of terroir as a local food quality concept. He wrote the first guide to the "flavour landscapes" of different foods, including apples, honey, maple syrup, coffee, oysters, salmon, wild mushrooms, wine, cheese, and chocolate. In France, using sourdough bread ecosystems as a model, Michel et al. (2017) documented that the microbial diversity associated with bread-making practices related with human and socio-cultural practices could give the bread a "sense of place". According to Turbes et al. (2016), the geographical location of the milk source has an effect on the flavour of Cheddar cheese, but the practices of milk comingling and heat treatment are likely to reduce the effect of geographical location, particularly as the cheese ages. In tea production, terroir is linked with the production ecosystem and the process of manual collection that workers themselves knowingly reproduce in the taste of the final product (Besky, 2014). On the contrary, critics argue that terroir comes into the fore with luxury consumption and the

obtained products are intended only for wealthy customers; because of this, the concept has a restricted contribution to food security (Dagne, 2015).

To overcome the world’s greatest challenges in food production/supply, agroecology has been proposed as a set of practices and people-centred knowledge, intensively and deeply rooted in sustainability (FAO, 2018a). Agroecological approaches are increasingly considered as possible alternatives to the industrial model of agricultural improvement, representing concrete transition pathways towards sustainable food systems that enhance food security and nutrition (HLPE, 2019). Many researchers support the idea that agroecology is a key tool in the transition to sustainable food systems (Gliessman, 2016; Hatt et al., 2016). Such systems involve agroecology, which in turn incorporates science, a set of practices, and a social dimension. Their co-evolution and supplementation develop a holistic approach to agriculture as a crucial driver in creating the foundation for environmentally sound food systems (Wezel et al., 2009; Gliessman, 2015). A crucial aspect of agroecological approaches is an increased reliance on knowledge and ecological management, complementing and reducing the use of external inputs. Today, agroecology is referred as a transdisciplinary concept that includes ecological, sociocultural, technological, economic, and political dimensions of food systems, from production to consumption (HLPE, 2019). Wezel et al. (2014) identified a wide range of agricultural practices and solutions that are agroecological in nature (organic fertilisation, reduced tillage, biological pest control, cultivar choice, crop rotation, direct seeding into living cover crops and mulch etc.). The combination of agroecological concepts with respectful utilisation of physical environment has the potential to ensure better valorisation of local food systems.

### 3 A conceptual encounter of agroecology and terroir

So far, ‘terroir’ has not been combined with ‘agroecology’, but bringing them together could empower local food systems by expanding synergies within the framework of agroecology and supporting advanced food quality. Although both approaches have existed simultaneously, there has been no overlap because the two concepts have contrasting ideas about food production and different groups of specialists have been interested in each of them. On the one hand, terroir is focused on the quality of the final product, while agroecology is focused on food production that conserves resources. The growing interest in local food production and sensibilised consumers represent the common ground for both of these concepts. Vast evidence suggests that the certification schemes of protected geographical origin under sustainable management have many complementary advantages across the globe compared to mainstream agriculture (Charters et al., 2017; FAO, 2018b). Gyimóthy (2017) reported that the potential of food place promotion has been extensively studied in the context of tourism and place branding as a strategic asset to raise awareness and create an image of local food in the consumer’s mind.

Therefore, it is important to investigate what contribution to local food production systems would produce a combination of agroecology and terroir. The idea of combining terroir with agroecology has been proposed within the framework of promoting local food consumption and sustainable development (Šeremešić, 2019). Wezel et al. (2016) recognised the importance of territorial scale in agroecology and presented a similar approach for food systems and biodiversity conservation. The authors argued that the development of sustainable systems at a territorial scale was strongly neglected and are almost exclusively proposed either at the scale of specific agricultural systems or for selected supply chains. Surprisingly, when combined at the same production area, not many of the basic concepts of agroecology and terroir are overlapping (Figure 1). The terroir is a result of a complex interaction of climate, soil type, geomorphology, microbiota, water regime, variety history and cultural tradition (Meinert, 2018). This concept covers a wide range of activities but only a few address the social and ecological dimensions of resource management. On the other hand, agroecology is rooted in biodiversity, co-creation of knowledge, synergies, resilience, environmental protection, food sovereignty, social inclusiveness, adaptable management practices, and co-innovation (Wezel et al., 2014). The ten elements of agroecology, proposed by FAO (2019), and complemented with the recognition of geographical origin (van Leeuwen and Seguin, 2006), would possibly result in improved food quality from the development of agroecological terroir.

Agroecology is oriented towards maintaining the production resources and the application of practices that improve agroecosystem as a whole as well as the neighbouring natural systems. The implementation of a management system that is grounded in agroecology and combined with terroir physical environment could result in the development of a new food system with multiple benefits. The proposed system could be easily adapted to different

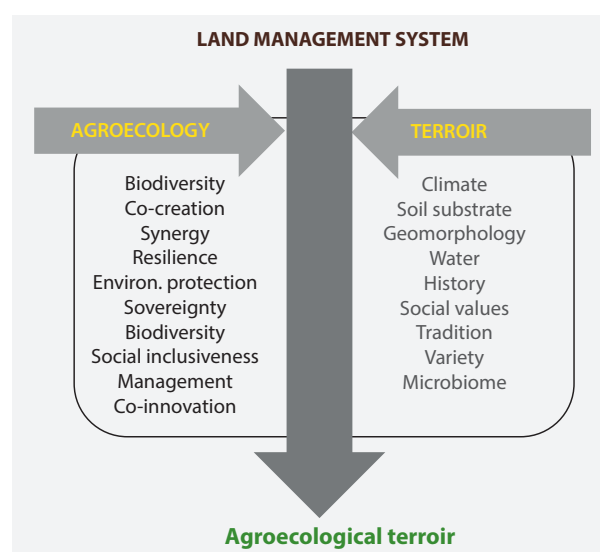


FIGURE 1 Transformation of land management systems with agroecological terroir

environments and socio-economic conditions shown in Figure 2. Accordingly, the benefit from terroir recognition under the schemes of agroecological practices would be more appealing for consumers compared to conventional production and could present a strategic option in the promotion of the local food systems. Starting from the point that each place on the Earth is physically unique and often coincides with a society marked by a common, indigenous outlook and way of life found nowhere else, Charters et al. (2017) elucidate that a place offers an advantage which others cannot reproduce and, in return, people must steward the integrity of that place to sustain its ability to create value. In California, agroecological partnerships are becoming the chief vehicle for extending sustainable agricultural practices, while “quality turn” has received attention from researchers for its potential to organise linkages among various forces in agro-food systems (Warner, 2007).

There is evidence to suggest the hypothesis that the food system transformation can be successful only when local organisations are able to develop and spread (i.e. scale-up and -out), without compromising the guiding principles of sustainability. Scaling-out implies that an innovation crosses the boundaries reaching more people, which in the context of the food systems means more consumers and producers (Pitt and Jones, 2016). Successful scaling-up relies heavily on enhancing human capital and empowering local communities through training and participatory methods that take into account farmers' requirements, aspirations, and traditions (Altieri and Nicholls, 2012). This is important because scaling-up bears the danger of co-optation and assimilation into the dominant food system (Laforge et al., 2017). Agroecological terroir could benefit from horizontal scaling-out with geographical spread through replication and adaptation and vertical scaling-up that implicates the institutional strengthening and involves different stakeholders from grassroots organisations to academia, NGO, policy-makers, and donors (Parmentier, 2014). Millar and Connell (2009) conclude that scaling-out positive impacts from systems change requires

field-tested and proven technologies, evidence of significant livelihood impacts, fostering of local innovation, competent field staff, effective peer learning, and ongoing institutional support. Consequently, agroecological terroir can gain recognition by using practices and methods that increase sustainability and reach more consumers. What is also important is that the presented concept can make a significant contribution to environmental protection (Belletti et al., 2015). It is particularly relevant that the concept of agroecological terroir could place a special value on the taste of food and can contribute to the “farm to fork strategy” of the EU (EC, 2019). In another context, it could help to strengthen local food systems and make them more identifiable and recognisable. Gliessman (2015) has proposed a framework for classifying “levels” of food system change. He advocates the scaling-up of agroecology and progressive development of sustainable food systems where local food schemes play an important role. Guzman et al. (2013) stressed that changes of individual technological procedure in the food system are not sufficient because it is necessary to change the agri-food system as a whole.

Although many advantages can be anticipated from the proposed concept of agroecological terroir, there will be some obstacles to its implementation. I believe that the preparation is crucial before we can establish a functional relationship between agroecology and terroir within a practical framework. The introduction of agroecological terroir will require tangible access to different agroecosystems due to complex interaction with the surrounding ecosystems. In the process of co-creation and scaling, there must be a clear goal for which agroecological terroir indicators should be set. Since agroecology is a broader concept than terroir, it would be necessary first to harmonise the dimension of science, rural movement, and practice and then co-create local food systems with terroir encompassing ecological, social, and economic dimensions. Some important trade-offs should be taken into consideration for appropriate decision making regarding agroecological terroir performance. This includes distinguishing who is “in” and who is “out” regarding the “standard” achievement, the balance between private and public coordination, economic vs environmental impact and assessment (FAO, 2018b). Therefore, the implementation of the agroecological terroir in improving the local food systems will need time and must be introduced with legislative support. Procedures can help to identify key elements and minimum requirements for the establishment of agroecological terroir as well as potential support for its introduction.

### 4 Conclusion

Agroecological terroir represents a new approach in valorisation of local food systems and the development of food quality recognition while preserving the production resources. This work suggests that the integration of terroir and agroecology could add a specific sensory and quality experience to agricultural products, while agroecological practices could provide environmental protection. In this context agroecological terroir creates a framework for scaling-out local

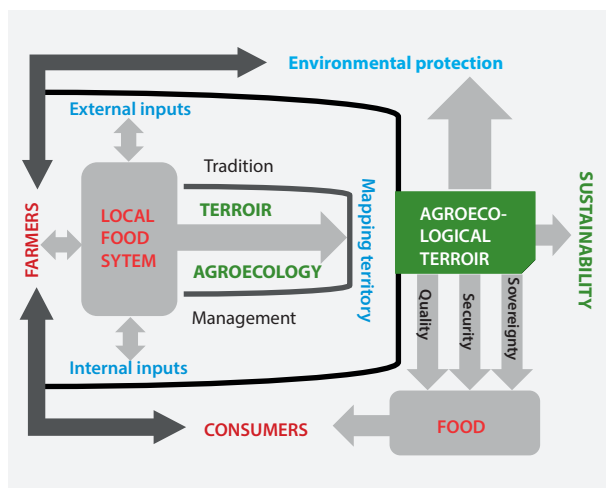


FIGURE 2 The positioning of agroecological terroir for the improvement of local food systems

food systems and make them more visible and appealing for consumers. For that reason, the benefit from agroecological terroir can be reproduced and could present a strategic option in the promotion of different agricultural regions and add a new experience in local food consumption. The present study emphasises the importance of the proposed agroecological terroir approach and its implication for a better understanding of sustainable food systems development in future.

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