

## **The food system perspective**

Food systems are broadly conceived as the network of actors and the set of activities ranging from food production to consumption and waste, which interact with one another, and with the surrounding ecological, social, political/cultural and economic environment [1,2]. The food system also comprise structural conditions such as rules, standards and policies, and actors that support operation, optimization and innovation of the system [2]. The normative goals of a food system are to provide food security and nutrition, environmental security and social welfare [3].

Worldwide, food systems can be structured in multiple configurations of actors, activities and structural conditions, following different production/consumption paradigms and values [4,5]. Roughly speaking, two oppositional paradigms can be distinguished to which food systems adhere: the agro-industrial paradigm, and the territorial and ecological paradigm [4]. Food systems aligned to the agro-industrial paradigm enact an industrial approach to food and farming, with state and industry support primarily geared to producing large amounts of standardized foods [5,6,7]. This paradigm is nowadays the dominant logic underpinning food systems [2].

Alongside the dominant food systems, multiple forms of alternative food systems have evolved following a territorial and ecological logic. These systems offer an alternative to dominant food systems by capturing new modes of agricultural production, commercialization and consumption and follow principles of diversification, agroecology and alternative food networks.

Parallel to both the dominant and alternative food systems, food systems combining elements of the two oppositional paradigms can also be found [4]. Therefore, these systems are characterized as hybrid food systems.

Depending then on how a food system is configured, performance in terms of satisfying food security and nutrition, environmental security and social welfare varies. Food systems may perform well in terms of economic outcomes and poorly in environmental and social welfare, whereas other systems may emphasize environmental security and social welfare at the expense of economic outcomes.

## **Diagnosis tool for characterizing food systems and the transition states**

Understanding and promoting a sustainable transition benefits from the awareness of the co-existence of food systems, i.e. dominant, alternative and hybrid forms, and the transition pathways presented in a given country or territory. This overview can support policy makers and practitioners and can inform policies and actions to support a certain desired sustainability transition pathway, that is, what kind of configurations of food systems is preferred for a desired performance in terms of each of the three food system goals. The question is then how can we characterize co-existing food systems and classify them in terms of their support by mainstream practices or alternative ones?

A common point in different attempts to characterize food systems is that three interrelated food system components are distinguished: (i) the agricultural production system, (ii) the value chain and (iii) the structures for support of agricultural production systems and value chains.

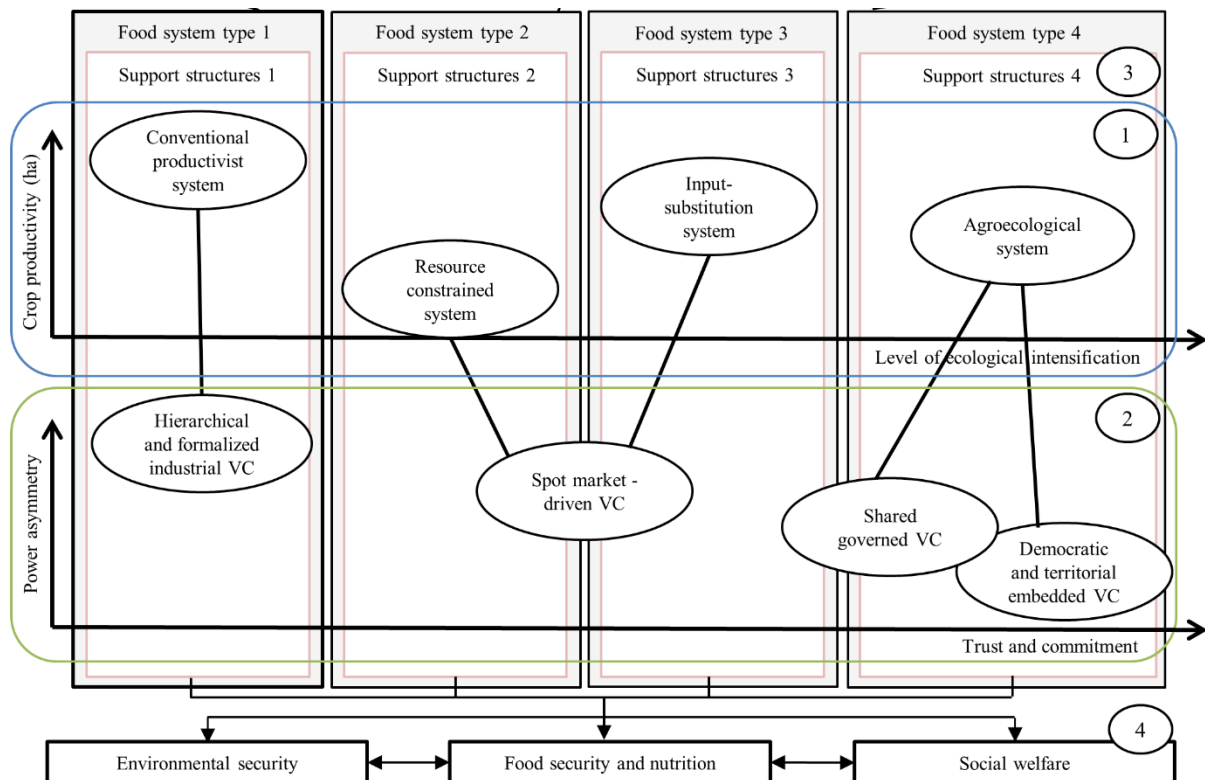
The *agricultural production system*, comprises the farm structure and the set of practices to transform land, capital and labor into useful products that can be consumed or sold. Agricultural production systems may range from dominant large scale conventional production systems to agroecological ones with a continuum of production types between these two extremes.

The *value chain*, comprises the network of actors such as traders, wholesalers, processors, retailers and exporters that operate jointly to bring agricultural products to consumers. Organization, coordination and operation of activities in value chains can take many forms. For example, value chains may range from hierarchical and formalized value chains, in which actors are often fully dependent on a specific value chain party (e.g. large

processor or large retailer), to democratic and territorially embedded value chains that organize themselves at the community level around trust and horizontal decision making.

The *support structures*, refer to the structures that influence the creation, adoption and dissemination of innovations; provide support to agricultural producers and value chain actors to obtain information, skills, capabilities and technologies; and enable various forms of interaction and learning processes at different levels [8]. These structures comprise R&D activities and programs, extension services, and economic and innovation policy. Varying innovation policy mixes, multiple public and private R&D agendas, and different approaches for extension exist. Each either supporting dominant modes of agricultural production and value chains, and thus reproducing the current state of affairs (e.g. subsidies to fossil fuel-based agrochemicals and commodity crops), or providing the structural conditions to support the development of innovations of a more radical nature (e.g. farmer field schools, and agroecological policies).

Due the heterogeneity within each of the components that comprise a food system, characterization of food systems calls for the following steps: (1) identifying the agricultural production systems in a given country/territory based on a set of structural and functional characteristics; (2) identifying and describing the value chains that link each of the agricultural production system types to markets and consumers and; (3) identifying the set-up of structures that support an agricultural production system type and its associated value chain. Combining the agricultural production system types with their value chains, along with their enabling and encompassing set-up of support structures, results in multiple types of co-existing food systems, with varying performance in terms of food security and nutrition, environmental security and social welfare. The dominant food systems will be those that are supported by mainstream practices in agricultural production systems and value chains (these systems have the highest market share in terms of production volume and sales); niche food systems will be those systems whose practices deviate radically from those that are found in the dominant food systems; and hybrid food systems will be those systems that combine a mix of characteristics of dominant and alternative food systems.



**Figure 1.** Example of co-existing food systems. Food systems result from the interrelation between (i) a type of agricultural production system (number 1), (ii) a type of value chain (number 2), and (iii) a set-up of support structures (number 3). Food system goals include food security and nutrition, environmental security and social welfare (number 4).

### **Sustainability transitions in food systems**

As result of ongoing socio-economic and environmental external pressures such as climate change, social movements and consumers advocating more healthy food, there are ongoing debates in countries and regions about how to re-orientate food systems towards more ecological, social and environmental lines [9]. The subjective concept of sustainability hinders the consensus on the "best" sustainable transition pathway. A first broad transition pathway involves the gradual replacement of agro-industrial conventional production methods by more environmentally friendly methods (e.g. precision agriculture techniques, integrated pest management practices, and efficient food processing and food packaging alternatives), in order to reduce harmful environmental effects and satisfy consumer demand for green products. Although accumulation of these changes in dominant food systems may conduct to transformational changes, these changes perpetuate the dominant logic underpinning current industrialized modes of production, distribution and consumption of foods [10]. A second broad transition is induced by the alternative food systems. These systems seek to overcome "business as usual" solutions to sustainability issues by reshaping food practices, not only from a technical perspective, but also through changes in social interactions and modes of organization. These alternative food systems exemplify a radical move away from the productivist paradigm towards ecological agricultural production systems, and localized and ecological value chains. These alternative food systems include, among others, agroecological production systems and biodiversity-based agriculture, supported by multiple forms of alternative food networks such as community supported agriculture (CSA), food cooperatives, farmers' markets, and box-schemes.

Implementation of the framework to characterize food systems as dominant, alternative and hybrid forms will help to identify the predominant sustainable transition pathway in a given country/ region. Such information will help to support reflection, decision making and informed discussion on what is our vision of future food systems and, what type of sustainable transition pathway do we want to support. Are we supporting the renewed "greener" agro-industrial paradigm or are we supporting alternative food systems to break into the mainstream?

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