

## 2. Food system concepts\*

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\* Paper derived from Ericksen and Ingram, (2004); and from Ericksen (2008).

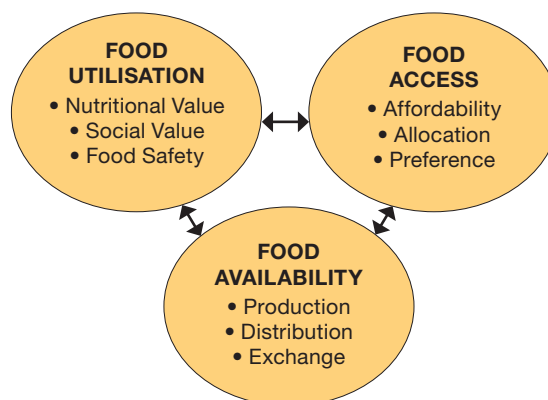
## 2. Food system concepts

The ESF/COST Forward Look on European Food Systems in a Changing World is based on an integrated and holistic approach to “food systems” to aid a comprehensive analysis of the interactions between European food systems and major drivers.

Food systems can be described as comprising four sets of *activities*: (i) producing food; (ii) processing food; (iii) packaging and distributing food; and (iv) retailing and consuming food. These activities lead to a number of *outcomes*, many of which contribute to food security, and others which relate to environmental and other social welfare concerns (see [Figure 2.1](#); and Box). Including the outcomes as part of the food system concept provides an explicit analytical lens for understanding food security, the principal objective of the food system<sup>1</sup>.

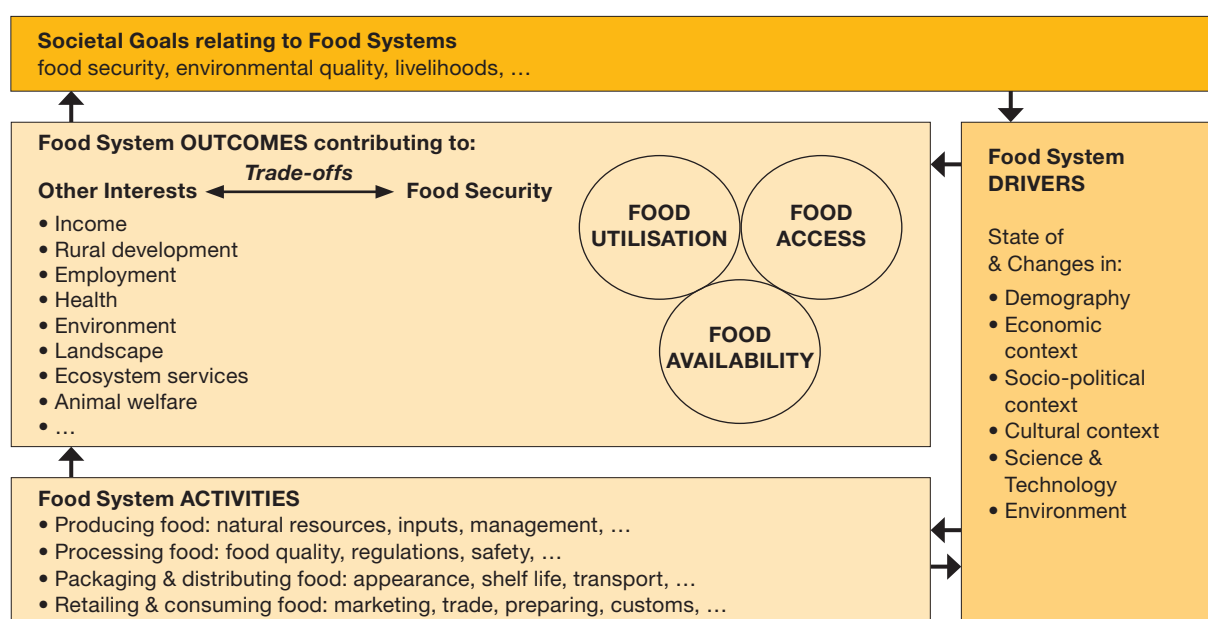
Food security is achieved when *all people, at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life* (FAO, 1996). Food security outcomes are described in terms of three components and their sub-components: food availability (production, distribution and exchange); food access (affordability, allocation and preference); and food utilisation (nutritional and social values, and food safety) (see [Figure 2.2](#)).

Because of the interest in both the interactions between drivers of change and food systems, and the



**Figure 2.2.** The three components of food security outcomes

trade-offs among food security and environmental goals, the ESF/COST Forward Look also needs to consider the determinants (or drivers) within its food system concept. The determinants comprise the interactions between and within biogeophysical and human environments which both determine how food system activities are carried out, and the nature of the outcomes. Further, although the food system activities have a large influence on food security outcomes, these outcomes are also directly determined by socio-political and environmental drivers.



**Figure 2.1.** Key Food System Drivers, Activities, Outcomes and Feedbacks. [Derived from Ericksen, P.J. and Ingram, J.S.I. (2005) *IHDP Annual Report 2004-5*, pp. 45-46; and from Ericksen, P.J. (2008) Conceptualizing food systems for global environmental change research. *Global Environmental Change* 18, 234-245.]

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## Food Chain and Food System concepts in the context of Food Security

One of our principal societal goals is to achieve and maintain food security. In 1996 the World Food Summit (held at the UN Food and Agriculture Organization of the United Nations) defined food security as: *when all people, at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life.*

We, as a society, actively engage in a number of different *activities* to help ensure our food security. These include: (i) producing food; (ii) processing food; (iii) packaging and distributing food; and (iv) retailing and consuming food. These *activities* are often referred to as the “food chain”, and are considered to be a continuum from primary production (including the production of animal feed) to the consumption of food by the consumer.

A more holistic approach is to specifically link these *activities* to a number of *outcomes*, many of which contribute to food security (i.e., to those aspects relating to availability of food, access to food and food utilisation). These *activities* also contribute to many other outcomes which relate to other social welfare and environmental concerns (e.g., income, rural development, animal welfare, employment, health, environment, landscape and a range of ecosystem services such as provision of clean water).

The food system concept includes both the activities and the outcomes, and as such provides a more holistic approach; including the outcomes as part of the food system concept provides an explicit analytical lens for understanding both food security (the principal objective of the food system) and the trade-offs with other societal goals. By specifically linking activities + outcomes, the food system approach helps understand both linear and non-linear links

between activities as part of the outcome analysis. The food system concept is especially useful for analyses of the interaction of changes in and stresses brought from, for example, changes in CAP, international trade, and/or climate, as it:

- (i) identifies interactions of stresses and/or issues of concern within the food system, e.g.:
  - a. multiple vulnerabilities within the food system
  - b. embodied water and carbon in food
- (ii) allows analysis of multiple food system outcomes, e.g.:
  - a. food security
  - b. ecosystem services
  - c. social welfare
- (iii) identifies possible intervention points for improving any desired outcome, e.g.:
  - a. improved nutrition
  - b. reduced GHG emissions
  - c. higher income from agriculture
- (iv) can be used to help analyse trade-offs between outcomes of different management options for achieving desired outcome, e.g.:
  - a. *Fair-trade* food consumption vs. embodied carbon
  - b. fisheries biodiversity vs. runoff from intensive agriculture
  - c. issues regarding multiple trade-offs

By specifically linking activities + outcomes, the Food System approach helps understand both linear and non-linear links between activities as part of the outcome analysis.

In order to capture these concepts holistically and to allow the analysis of driver impacts, adaptations, and feedbacks, the Forward Look analysis of food systems must therefore include:

- interactions between and within biogeophysical and human environments which determine a set of activities;
- the activities themselves;
- outcomes of the activities (contributions to food security, environmental security, and other securities); and
- other determinants of food security (stemming in part from the interactions in bullet one).

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1. **Note:** Food systems may or may not result in food security for the unit of analysis of concern (household, community, district). Determinants/drivers can “disrupt” or “distort” the food system so that it does not deliver food security.

## The food system activities

Food system activities are grouped into four categories:

**Producing** food includes all activities involved in the production of the raw food materials. These range from the process of obtaining inputs such as land and labour, preparing land, breeding animals, planting crops or obtaining young animal stock, caring for the growing food material (including weeding, thinning, fattening, vaccinating, etc.), and then harvesting or slaughtering it. A variety of social, economic, physical and biological factors determine these activities, from land tenure to input prices to agricultural or harvest technology to government subsidy provisions intended to protect or promote production. Key actors include farmers, hunters, fishermen, the multiple suppliers of production inputs including agricultural labourers, and land owners.

## 2. Food system concepts

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**Processing** food includes the various transformations that the raw food material (e.g., grain, vegetable, fruit, animal) undergoes before it is sent to the retail market for sale. All of these activities “add value” to the raw material in an economic sense, but these activities may also significantly alter the appearance, nutritional value, content and storage life of the raw materials. For example, wheat undergoes extensive processing and packaging before it is sold as bread, and increasingly the dairy industry involves much more processing and packaging of raw milk. The determinants of these activities are quite different from those pertaining to producing food, and involve a different set of actors and motives, although most actors in the food supply chain are to some extent motivated by the desire to capture more of the final market price for themselves. The main exception to this is the regulatory bodies established to control quality and safety. However, many of the standards set in this sector are privately determined, raising concerns about safety and health outcomes. The key actors are the middlemen who buy from producers and sell to processors; the owners and managers of processing and packaging plants; and trade organisations that set standards.

**Packaging and distributing** food is heavily influenced by a range of factors including, for instance, the appearance of the final product and other demands of the retailer, the shelf life needed, transportation infrastructure, trade regulations and storage facilities. Location of the market vis à vis the producing and/or processing site is crucial and migration and changes in demand are having a major influence. Consumer preference and the need to reduce waste are also key factors. As with processing, the determinants of these activities are quite different from those involved in producing food, and involve a different set of actors and motives, although – again – most actors in packaging and distributing activities are keen to capture more of the final market price.

**Retailing and consuming** food is increasingly influenced by how markets are organised, where they are located, and what sort of niche or premium category the product may fit in to. Advertising is a significant activity under retailing. It also involves everything from deciding what to purchase, through to preparing, eating and digesting food. Prices are very influential, as are income levels, cultural traditions or preferences, social values, education and health status. As diets and the food system globalise, the influence of advertising and the structure of the food supply chain also have a large influence on what people choose to eat. Key actors in retail are supermarket owners, the transportation sector, government ministries that regulate markets, a range of middlemen who go between the processors, packagers and the final markets, and consumers themselves.

### The food system outcomes and their determinants

The food security outcomes are highlighted in detail in the framework in [Figure 2.2](#). The three major categories of food security determinants are access, availability and utilisation. Food **availability** refers to the amount, type and quality of food that a unit (individual, household, community, region or nation, depending upon the scale of analysis) has at its disposal to consume. It may be produced locally, imported, or reflect a change in stocks. Availability may vary seasonally or by geographic location, as well as a host of other biogeophysical and socioeconomic factors. **Access** to food refers to ability of units to obtain access to the type, quality, and quantity of food they require. Food **utilisation** refers to the unit’s capacity (including strategies) to consume and benefit from food. This includes how it is prepared (for consumption) and utilised by the body. Each of these can be further broken down as follows.

#### Food availability

Three categories of determinants – production, distribution and exchange – contribute to food availability. Although familiar to many food security analysts, they have been modified slightly to fit the agenda of describing a food system holistically.

- **Production** = how much and which types of food consumed (by a given unit) are available through local production. The determinants of availability from local production include seed varieties, land-holding sizes, resource tenancy arrangements, irrigation availability, cropping cycle, labour availability, human capital, energy sources, input and output prices, available and adopted technologies, and the control local producers have over their own products.
- **Distribution** = how food for consumption is made available (physically moved), in what form, when and to whom. The determinants of distribution include transportation and infrastructure, public safety nets, storage facilities, availability of post-harvest processing, governance (power distribution, corruption, whether food has worth beyond consumption), security, and the enforcement of trade barriers and borders (regional and international).
- **Exchange** = how much of the available food is obtained through exchange mechanisms such as barter, trade, purchase, or loans. Determinants of exchange include income levels and purchasing power, informal social arrangements for barter, local customs for giving and receiving gifts, migration, gender and age structure, markets, terms of trade, currency value, and subsidies.

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## Access to food

Three groups of determinants contribute to accessibility of food: affordability, allocation, and preference.

- **Affordability** = the purchasing power of households or communities relative to the price of food. The determinants of affordability include pricing policies and mechanisms, seasonal and geographical variations in price, local prices relative to external prices, the form in which households are paid, income and wealth levels.
- **Allocation** = the mechanisms governing when, where and how food can be accessed by consumers. Markets are a key determinant of food allocation; government policies are often designed to correct market failures by allocating food to remote areas or at lower prices. Social capital (as a function of age, class, gender) influences informal allocation processes (e.g., within households), while at a broader scale social/political capital in urban areas influences where supermarkets are located. Both social and political capital influence rules for fishing, hunting and gathering in rural communities.
- **Preference** = social or cultural norms and values that influence consumer demand for certain types of food. Determinants may be religion, season, advertising, preparation requirements, human capital, tastes, customs and female labour force participation.

## Food utilisation

The three elements of food utilisation are nutritional value, social value, and food safety.

- **Nutritional value** = how much of the daily requirements of calories, vitamins, protein, and micronutrients are provided by the food people consume. Both over- and under-nutrition are issues. Determinants of nutritional value include diversity of food consumed, type of primary protein (animal or vegetable), disease incidence (which affects food absorption), education, facilities for cooking and preparing food, access to clean water, and hygiene practices.
- **Social value** = all of the social and cultural aspects of consumption, for example, eating meals together may be an important part of kinship, or it may be very important to always have food for guests, or special foods may be an integral part of important holidays. In some places eating locally- or organically-produced food is highly valued. Understanding the determinants of social value requires insight into the community and household relations, as well as cultural customs.
- **Food safety** = this refers to the dangers introduced from the addition of chemicals during production, processing and packaging, and food-borne diseases

such as salmonella and Creutzfeldt-Jakob disease (CJD). The main determinants of this are the procedures and standards and regulations (or lack of) for food production, processing and packaging.

## References

- Ericksen, P. J. (2008). Conceptualising food systems for global environmental change (GEC) research. *Global Environmental Change* 18(1): 234-245.
- Ericksen, P. J. and J. S. I. Ingram (2005). *Global Environmental Change and Food Systems (GECAFS)*. IHDP Annual Report 2004-5. pp. 45-46.
- FAO (1996). *Report of the World Food Summit*. FAO, Rome.