FOODSECURE
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Conceptual framework for the analysis of the determinants of food and nutrition security

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Conceptual framework for the analysis of the determinants of food and nutrition security

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Abstract

This report presents a first step of the conceptual framework which will be used in the FoodSecure project to analyse the determinants of food and nutrition security. It draws on previous research and insights to develop a broad conceptual framework. The framework addresses drivers and determinants of food and nutrition security at multiple levels of aggregation. At the individual and household level, we make a distinction between drivers that affect the food and nutrition status, and drivers that affect the stability of this status. As gender is relevant in all dimensions of food and nutrition security at this level, we discuss it as a cross-cutting determinant. At the national and international level, food prices play a major role in food and nutrition security. We therefore discuss the drivers of food supply and demand, both in the short and long run. Finally, the framework describes the channels through which both micro- and macro-level policies are related to food and nutrition security.

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1. Introduction

The fight against hunger and food insecurity is one of the biggest challenges global societies have been facing in the last decades. The debate around food security issues has evolved in parallel with the definition of food security itself and reflects changes in the policy priorities, often inspired by new emerging threats. In recent years, the dramatic increase in food prices, the progressive scarcity of inputs such as land and water, the increase in life expectancy in developing countries paired with evolving life-styles and with the spreading of new food-related issues such as obesity, call for a complete revision of the strategies to achieve food security.

The EU-funded FoodSecure project aims at improving our understanding of the factors currently contributing to the resilience of the food system and at inspiring new policies that can mitigate risks and uncertainties caused by economic and climatic shocks, while providing for sustainable economic growth in a context of high and volatile food prices, limited natural resources, changing consumption patterns and lifestyles. The project will provide an analysis of the effects of short-term policies, with a view to designing consistent and coherent long-term strategies with desirable consequences. Support for effective and sustainable actions will include the identification of critical pathways for technological and institutional change and for EU policies in the areas of development aid, climate change, trade, common agricultural policy and renewable energy, including sustainability criteria.

This report presents a first step of the conceptual framework which will be used in the FoodSecure project to analyse the determinants of food and nutrition security. It builds upon previous work done at international research organisations and academic institutes (e.g. IFPRI, 2012; FAO/FIVIMS, 2008; FAO, 2003; UNICEF/IFAD, 1992; WFP, 2009; Ecker and Breisinger 2012). There is a large literature on food security and its determinants and drivers which goes back many decades. However, the focus of policy (and research) attention has shifted somewhat over the past decades due to changes in global food markets and economic development. The global food security "crisis" of the past 5 years has revived interest in global food security issues and policy questions – and has shifted attention (back) from the fate of poor farmers to that of poor consumers (Swinnen 2011; Swinnen and Squicciarini 2012).

Many of the traditional arguments remain relevant today. For example, in the 1990s UNICEF developed a conceptual framework to identify different pathways through which child and maternal malnutrition are affected as a part of a policy strategy to improve nutrition of mothers and children in the developing world (UNICEF 1998). Three different levels of causes are discerned: *immediate causes, underlying causes* and *root* or *structural causes*. The *immediate causes* reflect the direct causes of a problem at the individual level. Examples include individual health status and dietary intake. The *underlying causes* refer instead to more complex, contextual issues at the household level, such as household food and nutritional security status, care practices, and access to health services and facilities. Tackling underlying causes of a problem usually takes more time than tackling immediate causes. For example, a donation of a 10 kg rice bag to an individual or household may immediately solve a problematic dietary intake; but it takes more time and effort to solve the food and nutritional security status of a household in a sustainable way. The same goes for sustainable improvements in local access to health facilities. Finally, the *root* or *structural causes* refer to resource allocation at the societal level and reflect problems which require long-term interventions to change policies and societal attitudes (UNICEF 1998). The UNICEF framework laid the foundations for later frameworks on child malnutrition, food security, nutrition security and food and nutrition security such as the FAO/FIVIMS framework (2008), IFAD (s.d.), the framework of food and nutrition security of the WFP (2009) and the food security system framework of Ecker and Breisinger (2012).

Our conceptual framework does not want to re-invent the wheel. Instead we draw on previous research and insights to develop (and synthesize) a broad conceptual framework. We will look at drivers and determinants of food and nutrition security at every level of aggregation (individual, household, national and international), both in the short and long term[3]. We will also look at macro- and micro-level policies. The former refers to policies such as trade policies, which primarily affect determinants of food and nutrition security at the national level. The latter are instead policies such as education policies, which affect determinants at the household level. The

[3] In particular, the impact of short-run drivers will be explored in more detail in WP-6, while the impact of long-run drivers will be explored in more detail in WP-7 of this project.

channels through which both macro- and micro-level policies are related to the individual food and nutrition security status will also be discussed.

It may be important to emphasize that the present report – and the conceptual framework that is presented – is just the first step in the conceptual work in the FoodSecure project. As the project progresses and new models and analyses are completed, the framework itself will be extended in a series of specific issues within the broad question of food and nutrition security that the project addresses.

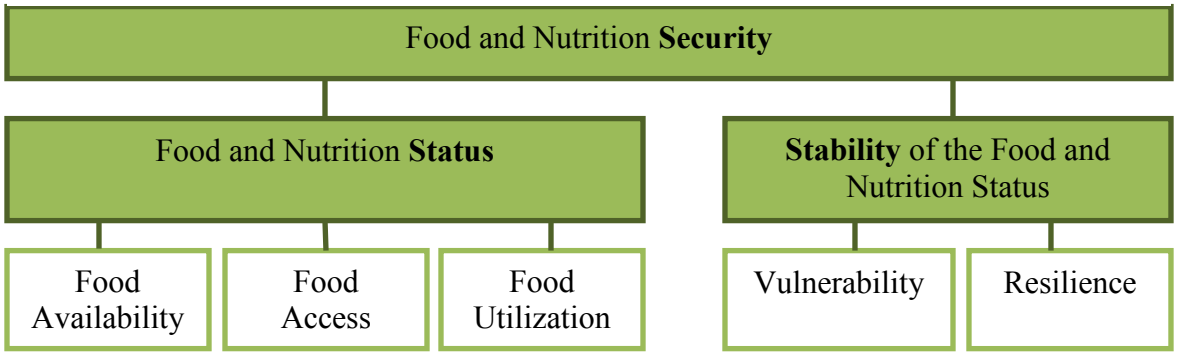
The next section presents a review of individual and household level determinants of food and nutrition security and of the related policies. The analysis of the determinants will distinguish between food and nutrition *status* - with its three components of *food access*, *food availability* and *food utilization* - and the *stability* of the food and nutrition status. The analysis of the related micro-level policies will then distinguish between short- and long-term policies. Section 3 focuses on the national and international level. In this case the short- and long-term determinants and the corresponding macro-level policies will be jointly discussed, keeping a key distinction between those affecting *food supply* and those affecting *food demand*. Section 4 concludes.

2. Food and Nutrition Security at the Individual and Household Level

At the World Food Summit in 1996, food and nutrition security was defined as the situation *'when all people, at all times, have physical and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life'* (FAO 1998). This definition of food and nutrition security reflects two key dimensions: (1) the food and nutrition ***status*** and (2) the ***stability*** of this food and nutrition status.

In our conceptual framework, ***food availability***, ***food access*** and ***food utilization*** determine the state of affairs, referred to as the food and nutrition *status* of an individual or a household (see Figure 1). *Stability* refers to two additional important dimensions, notably ***vulnerability*** and ***resilience*** towards the state of affairs. In line with Sarris and Karfakis (2008), vulnerability is defined as '*the likelihood of experiencing future loss of welfare, generally weighted by the magnitude of expected welfare loss*'; while *resilience* refers to the ability to recover from such a welfare loss. It must be stressed that the relation between food and nutrition *status* and the *stability* of the food and nutrition status is non-linear and that both categories and their dimensions are highly interlinked.

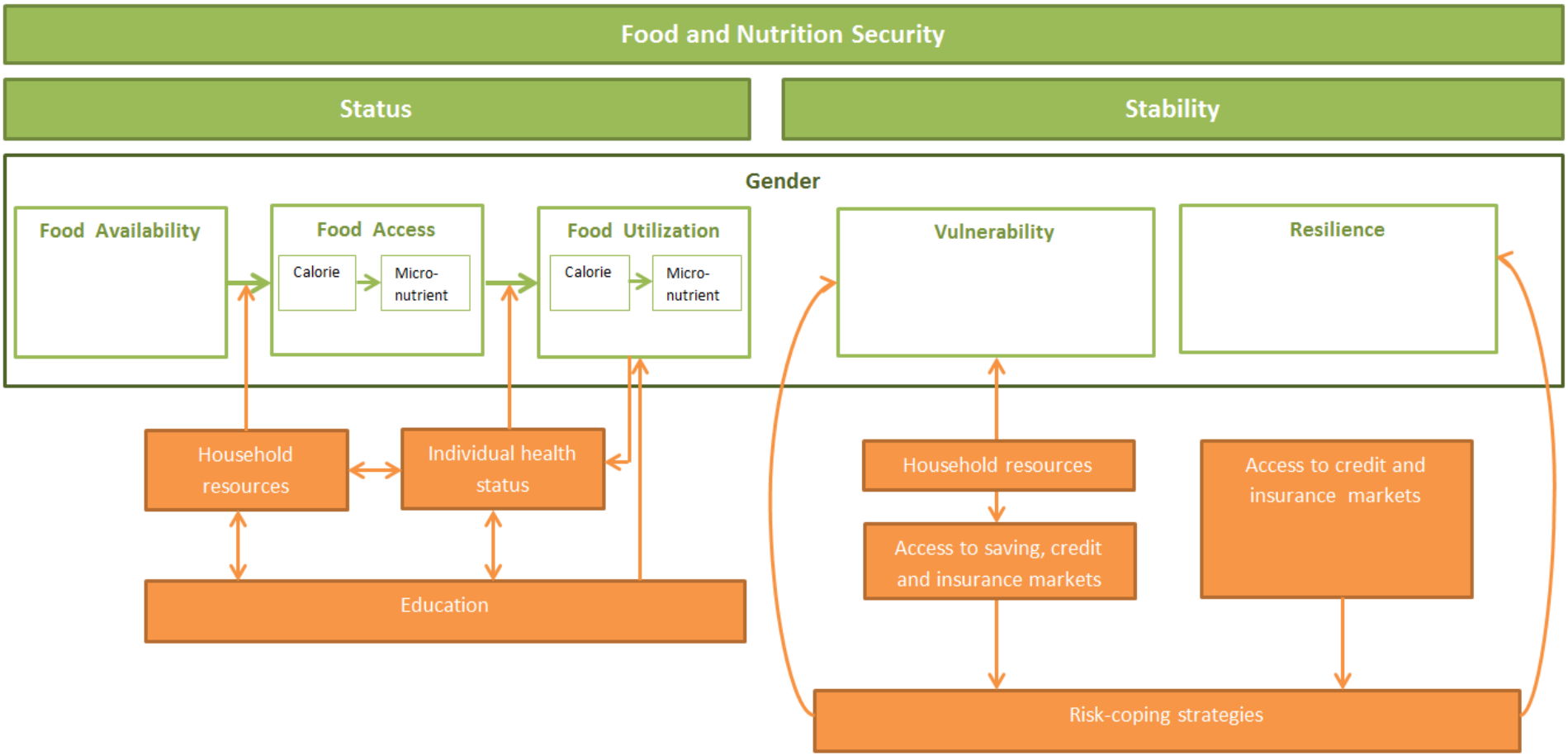
Figure 1: Dimensions of Food and Nutrition Security at the Micro-Level



In this section, we present our framework for the analysis of the major drivers of food and nutrition security at the micro-level, distinguishing between the two main pillars of status and stability. The main drivers of the food and nutrition *status* are discussed in Subsection 2.1. The main drivers of the *stability* of this status are addressed in Subsection 2.2. Given that gender-specific issues affect all the different dimensions of food and nutrition security, gender will be

analysed as a cross-cutting determinant. Figure 2 provides a visual overview of the drivers discussed. The figure shows that a strict separation of the two pillars is hardly possible; our analytical framework reflects an abstraction of a reality far more complex.
In subsection 2.3 we discuss micro-level policies that have a direct impact on the drivers and determinants of food and nutrition security at the individual and household level.

Figure 2: Conceptual Framework at the individual and household level



2.1. Food and Nutrition *Status*

As mentioned above, we distinguish three major dimensions of the food and nutrition status: *food availability*, *food access*, and *food utilization*. These three dimensions are strongly interlinked. The realization of *food availability* is a necessary but not sufficient condition for the realization of *food access*. In turn, the realization of *food access* is a necessary but not sufficient condition for the realization of *food utilization*. Each of these dimensions is discussed in more detail below.

2.1.1. *Food Availability*

Food availability can be described as the extent to which food is within reach of households (for example in local shops and markets), both in terms of sufficient quantity and quality (FAO 2006). It is often difficult to distinguish food availability from food access; their interrelation will be discussed in more detail in the next subsection.

Food availability at the micro-level is strongly related to the overall availability of food, which is determined by domestic food production, commercial food imports and food aid (FAO 2006). These are in turn influenced by domestic policies regarding food production, such as policymakers' focus on food self-sufficiency or food self-reliance. Other policies directly affecting *food availability* are agricultural subsidy programs, exchange rate policies affecting international trade opportunities and policies creating stable and attractive conditions for agricultural investments. In general, the *food availability* dimension reflects the supply side (Barrett and Lentz 2009) and will therefore be affected by all the drivers and determinants that have an impact on the domestic supply of food and the ability to finance food imports.

At a more local level, *food availability* is strongly contingent on road and market infrastructure, the degree of market integration, and local market institutions.

Women play an important role in the production of food. They are engaged in the production of food crops and the tenure of animals and often control the marketing and trade of the produce (World Bank 2009). According to Doss (2011), the share of women in the labor force has a significant impact on the national *food availability* and positively influences domestic food

productivity. The agricultural productive potential of women, however, is not exploited to its full extent due to asymmetries in ownership of and access to agricultural inputs such as land, credit, pesticides and technology (World Bank 2009; Deere and Doss 2006).

2.1.2. ***Food Access***

Household-level *food access* is considered to be achieved when a household has the opportunity to obtain food of sufficient quantity and quality to ensure a safe and nutritious diet (FAO 2006). To realize this, not only domestic and local *food availability* must be realized; households must also have access to the necessary resources to acquire food. Important drivers of food access are household resources, food prices, food preferences and socio-political factors such as discrimination and gender inequality.

Food access is to a large extent determined by food prices and household resources. Every household has a limited amount of resources at its disposal, including assets, labor, human capital, and natural resources. These resources are allocated across different income and non-income generating activities (Hoddinott 2012). Access to natural resources such as fields, forests, grasslands and water resources is a major determinant of the productive capacity of the food-producing household and therefore of household food supply decisions (UN Millenium Project 2005). Access to income-generating activities is a major determinant of the ability of households to purchase food. In India for instance the caste system excludes certain social groups from the economic system and thus prevents them from acquiring the income needed to satisfy their dietary needs. In general, the allocation of household resources to food production, wage labor or other business activities allows the household to access food, either directly through food production or indirectly through income generation (Hoddinott 2012). The returns to the investment of household resources in productive activities can be complemented by income and in-kind transfers from family, neighbours or the state to improve food access (Hoddinott 2012).

Income generation and food production possibilities of the household are directly affected by individual characteristics such as the education level and health status. Education is linked to the development of cognitive skills that are likely to support income generation and food production (UN World Food Program 2006). Enhanced cognitive skills may

raise income levels and employability through better decision-making in the allocation and distribution of resources and an increased marginal productivity (Mukudi 2003). Education may also play an important role in household production decisions through a better knowledge of nutrition and health practices (Feinstein et al. 2006; Cutler and Lleras-Muney 2006; Luo et al. 2012). For instance, a better knowledge of the amount of essential micronutrients contained in different crops might lead households to increase their production of nutritious crops.

The health status of an individual directly affects his/her ability to learn and to work. An improvement (worsening) of the health status can give rise to a virtuous (vicious) cycle. A better nutritional and health status enhances the returns to education (Behrman 1996; Bobonis et al. 2006; Halterman et al. 2001) and increases an individual's labor time and labor productivity (UN World Food Program 2007; Rutten and Reed 2009). The increased resources made available by a better health status can be subsequently invested in an improved diet and hence lead to further health improvements.

The quantity and quality of food that a household can acquire given its resources will depend on domestic food prices, which are generally determined by *food availability* and aggregate food demand. For given prices and income, individual preferences will determine the consumption of different commodities, including food. Dietary preferences can be influenced by factors such as culture, religion and social status (see e.g. Atkin, 2013).

Socio-political factors such as ethnic favouritism, social discrimination and gender inequality may also have an important impact on food access (see e.g. Dohrmann and Thorat 2007; Jayne et al. 2001). Dohrmann and Thorat (2007) for instance argue that social discrimination in India prevents certain groups from participating in public food assistance programs. Gender inequality in access to labor markets, financial services and productive resources such as land still pervades many developing countries and poses important constraints on the productive capacity of women, who in many societies play an important role in the provision of food through direct production or income generation (FAO, 2011). According to FAO statistics, 79% of economically active women in least developed countries report agriculture as their primary economic activity (Doss 2011). In addition, several studies have shown that women are more likely to dedicate a substantial share of their labor and non-labor income to food and the well-

being of their families (Hopkins et al. 1994; Hoddinott and Haddad 1995). Gender (in)equality may thus have substantial effects on household food access.

It needs to be stressed that at the individual and household level it is difficult to distinguish *food availability* from *food access*. In regions where local markets are malfunctioning, households generally depend on food production as a means to have access to food, in which case (local) food availability and food access strongly overlap. However, even in regions were local markets are well developed it is not always straightforward to distinguish between the two. Household food production is often an important source of income in developing countries. An increase in food prices will generally raise the returns to household farm labor and may boost food production. A price increase may therefore positively affect *food access* through an improved *food availability*. The resulting increase in income may further improve *food access,* although this effect can be counteracted by the higher cost of food. In any case, this example illustrates that *food availability* cannot always be easily separated from *food access*.

2.1.3. ***Food Utilization***

Food utilization refers to an individual's dietary intake and his/her ability to absorb nutrients contained in the food that is eaten. Hence, *food utilization* relates not only to the quantity of food that is eaten, but also to the quality of the diet. For this reason, both calories and micronutrients appear in the utilization box of Figure 2. In particular, the food consumed by an individual must be of sufficient quantity and quality to satisfy not merely subsistence needs, but also energy needs for daily activities, notably income generation (UN World Food Program 2007).

Food access, as described in the previous section, is a necessary but not a sufficient condition to ensure an adequate food and nutrition status (Barrett and Lentz 2009). For example, a household might have access to all the necessary food products for a balanced diet, but still prefer to buy hypo- or hyper-caloric food. Banerjee and Duflo (2006) indeed document that an increase in household income does not necessarily lead to an increase in the quantity or quality of food consumed, but can be spent on items such as alcohol or fastfood. Alternatively, an unequal distribution of food within the household might cause some members to eat more and others less

than required. In both cases, at least some household members will not absorb the required amount of micronutrients, resulting in a poor food and nutrition status.

Proper *food utilization* from an early age is fundamental for the physical and mental development of an individual and determines future income generation possibilities. Research has shown that children suffering of malnutrition in the early stages of life have a higher propensity to become overweight and to be affected by a variety of chronic diseases. Popkin et al. (1996) show that in Brazil, China, South Africa and Russia stunting is related with overweight status. Today many developing countries are confronted with the "*double burden of malnutrition",* facing both the prevalence of undernourishment - especially among young children - and a rise in overweight, obesity and related chronic diseases. A possible cause of this double burden is the relatively low price of food that is high in calories but low in nutritious value, which might lead poorer households to prefer these unhealthy food products. In general, staple foods are cheaper than high-value foods such as vegetables, meat, fish and dairy, which contain more essential micronutrients. As households grow richer, they tend to shift to more diversified diets that include larger proportions of these high-value food products (Ruel 2002). Increases in the real incomes of households will therefore generally lead to improvements in the food and nutrition status of household members by improving their dietary intake.
Nevertheless, there may also be undesirable indirect effects linked to this shift in diets. First, if demand increases due to higher incomes, prices of high-value food products are expected to increase. Households that did not benefit from a positive income shift can then become more food insecure. However, the increased demand for high-value food- also induces a lower demand for staples, thereby decreasing their price and hence increasing food security for the poorest. Second, an increased demand for high-value products will increase competition for land previously devoted to staple crops, thereby putting additional pressure on prices of staple crops and exacerbating food insecurity for households that are left behind in income growth (Laborde et al. 2013). To avoid such scenarios, policymakers should ensure that growth is inclusive and pro-poor.

In addition to relative price considerations, an individual's dietary intake is also to a major extent determined by care practices applied in the surrounding environment. Care is broadly defined as

'*the provision in the household and the community of time, attention and support to meet the physical, mental and social needs of the growing child and other household members'* (ICN 1992). The capacity of the caregiver - usually a woman - to meet the needs of different household members depends on resource availability, but also on her knowledge of what appropriate care is. This, in turn, is often correlated with the education level of the caregivers. Education can for instance increase awareness of the importance of breastfeeding. In general, education plays a crucial role in the dispersion of information concerning health, nutrition and hygiene (Robeyns 2006). An individual's personal level of education will matter for his own choice of nutrient intake, but this mostly applies from the moment an individual can decide independently what he/she will consume.

Other important determinants of *food utilization* that are related to care practices are the individual health status and intra-household choices regarding the distribution of food. Individual health affects one's ability to absorb nutrients, also known as "nutrient utilization". If an individual suffers from a disease, he will have a reduced desire to eat and a constrained absorption of energy and nutrients (UN World Food Program 2007). This interdependence between health and food and nutrition status creates a vicious circle: an individual who does not consume an adequate diet will have a lower capacity to resist infections, which will lead to longer, more severe and more frequent occurrences of sickness that, in turn, lead to a reduced appetite and malabsorption and further worsen the dietary intake (UNICEF 1998).

The health status of an individual crucially depends on his/her health environment and access to health services. The quality of the health environment depends on various factors, including water supply, sanitation, housing conditions and waste disposal. A poor health environment increases the risk of infections and prolonged disease and may hinder proper health care. Access to health services is essential to prevent and combat diseases through immunization and the provision of drugs and supplements (Tomkins and Watson 1989). Education and knowledge once again interact with these dimensions, as they help households in creating healthier environments and taking the correct preventive actions against diseases (UN World Food Program 2006). Household resources also play a key role: higher real incomes allow for better access to health services and for an improved health environment within the household.

Intra-household food distribution patterns determine the dietary intake and nutrition level of each individual member. Education and gender inequality play an important role in defining these distribution patterns. In developing countries, adult male members of the household are often favoured in terms of food intake (Haddad et al. 1996; Thomson and Metz 1998). As a result, it is possible within a specific household to have at the same time food secure and food insecure household members. Increasing the bargaining power of the caregiver in the household, for instance by improving women's access to education, might therefore have important consequences for the health and nutrition status of the different household members. Recent studies show that children of women who participate more in the household decision-making process are less underweight and wasted (Shroff et al. 2011). Education of the caregiver may also reduce discrimination between children of different sexes within the household (e.g. Thomas 1994).

2.2. Stability of the Food and Nutrition Status

We now turn to the second major dimension of food and nutrition security, which relates to the *stability* of the food and nutrition status and focuses on what happens to livelihoods when households are hit by temporary negative shocks. We first look at the immediate effect of these negative shocks (*vulnerability*). Then we discuss the effects on the longer term, i.e. whether households are able to recover easily or whether they are pushed into a poverty trap from which recovery is laborious or even impossible (*resilience*).

2.2.1. ***Vulnerability***

Vulnerability at the level of food and nutrition security can be described as the risk that the food and nutrition status of the household is undermined by negative shocks. Households generally face multiple negative shocks over time, and each shock may affect the general welfare and food and nutrition status of the household. By adopting particular livelihood strategies to deal with these shocks, households can ease the welfare impact and reduce their vulnerability to food and nutrition insecurity. Livelihood strategies therefore are a major determinant of the degree of vulnerability of the household, and which livelihood strategies are adopted will depend on the household's resources and its ability to access saving, credit and insurance markets.

Three possible livelihood strategies can be identified: (1) *risk prevention*; (2) *risk mitigation*; (3) *risk coping*.

Risk prevention is an ex-ante action taken by the household to reduce the probability of unexpected events (Heitzmann et al. 2002). At the household or individual level these actions may consist of less risky production, migration, proper feeding or prevention of diseases (Holzmann and Jorgensen 2000).

Risk mitigation strategies are also adopted before the shock has been realized and have the purpose of reducing the negative welfare impact of future shocks (Heitzmann et al. 2002). When households are able to ease the general welfare impact of future shocks, the consequences for food consumption and nutrition will also be mitigated to a large extent. Three main mitigating strategies can be undertaken by a household. The first is *portfolio diversification*, which reduces overall risk exposure to a specific shock by investing resources in income and non-income activities from which the returns are not perfectly interrelated (Holzmann and Jorgensen 2000). Having multiple jobs is an example of a strategy to reduce income volatility.

A second mitigating strategy is formal or informal *insurance*. Insurance relies upon the idea of risk sharing. Formal insurance mechanisms are market-based and generally have the advantage of being able to rely on a large pool of uncorrelated obligors. Informal insurance mechanisms - which rely on social networks and relationship-based risk sharing rather than formal markets - often benefit from low information asymmetry and reduced problems of moral hazard (Holzmann and Jorgensen 2000). Community arrangements such as marriage and funeral insurance groups are examples of informal insurance mechanisms (Townsend 1994; Udry 1994; Ligon et al. 2002; Fafchamps and Lund 2003). It must be noted, however, that insurance mechanisms in developing countries do not always work properly. Hence, from a policy perspective the development of prevention mechanisms could be more efficient. Investment in irrigation, which reduces the risks of dry land farming, could for instance be an alternative to developing agricultural insurance mechanisms.

The third mitigation strategy is *hedging*, which is based on exchanging future (price) risks (Holzmann and Jorgensen 2000). The benefits of hedging can be illustrated with the following example. In Sudan, at the beginning of the rain season sorghum prices are high in the Twic area

and low in the Abyei area, and vice versa for livestock prices. Smallholders can therefore make price arrangements to stabilize future prices for sorghum and livestock in both areas (Deng 2012).

Risk coping is an ex-post strategy taken to limit the impact of a welfare loss once it occurs (Heitzmann et al. 2002). Coping strategies can consist of selling assets, withdrawing savings, migrating, seeking temporary employment, withdrawing children from school and reducing the diversity of the diet (Heitzmann et al. 2002). Women often reduce their own consumption after a shock to leave more food for the other household members (Quisumbing et al. 2008). Risk coping strategies depend to a large extent on household resources, but social networks also play an important role: the larger the social network, the larger the possibilities of finding support whenever a negative shock hits the household (Woolcock and Narayan 2000). Education also matters in this context, as it positively affects the ability of individuals to connect with other people and to cooperate, which generally leads to larger social networks (OECD 2003). There are several channels through which households can expand their social network. Poor women in Bangladesh and India for instance form self-help groups to support each other in case of need.

Vulnerability to food and nutrition insecurity can be temporary or chronic (FAO 1996). The risk profile of an individual or household will depend on the channels through which the individual has access to food and on the adopted risk strategies (IFAD s.d.). Which strategy is chosen generally depends on the type of shock, its structure (size, spread, frequency and duration) and the endowments of the household (Carter 1997).

Although essential to combat vulnerability to food and nutrition insecurity, these strategies do not come without a cost. Most ex-ante livelihood strategies tend to reduce household income or wealth in the absence of shocks (Sarris and Karfakis 2008). For example, risk prevention and mitigation strategies may depress investment in new technologies or reduce agricultural productivity as a result of diversification (Carter 1997). These ‘side effects’ will have an impact on household resources and consequently affect food and nutrition security in the short and long term.

Vulnerability to shocks can increase over time if the household has to cope with repeated shocks (HLPE Committee of World Food Security 2012a). This mostly relates to *resilience* to shocks, and will be discussed in more detail in the next subsection.

2.2.2. ***Resilience***

In the context of food and nutrition security, *resilience* can be defined as the time needed to achieve or surpass the pre-shock status of well-being. It is important to stress the difference between *resilience* and *vulnerability*. Vulnerability is the probability of a household becoming food and nutrition insecure after, say, a food price shock. Resilience is the time needed for the household to get back to its food and nutrition status as it was before the shock.

The strategies adopted by households to reduce the time needed to regain the pre-shock level of well-being can consist of both ex-ante and ex-post measures (Alinovi et al. 2008). In practice, most of the measures aimed at reducing vulnerability that were described in the previous subsection can also be used to increase resilience. For instance, by insuring food production against extreme weather variability, a household simultaneously decreases its ex-ante vulnerability and increases its resilience: whenever an extreme drought destroys the harvest, the compensation coming from the insurer will allow the household to quickly recover from the negative shock. Portfolio diversification is another possibility to insure against extreme events such as droughts. In case a shock destroys the harvest, the household can focus on other economic activities and (at least partially) recover the loss of income and food.

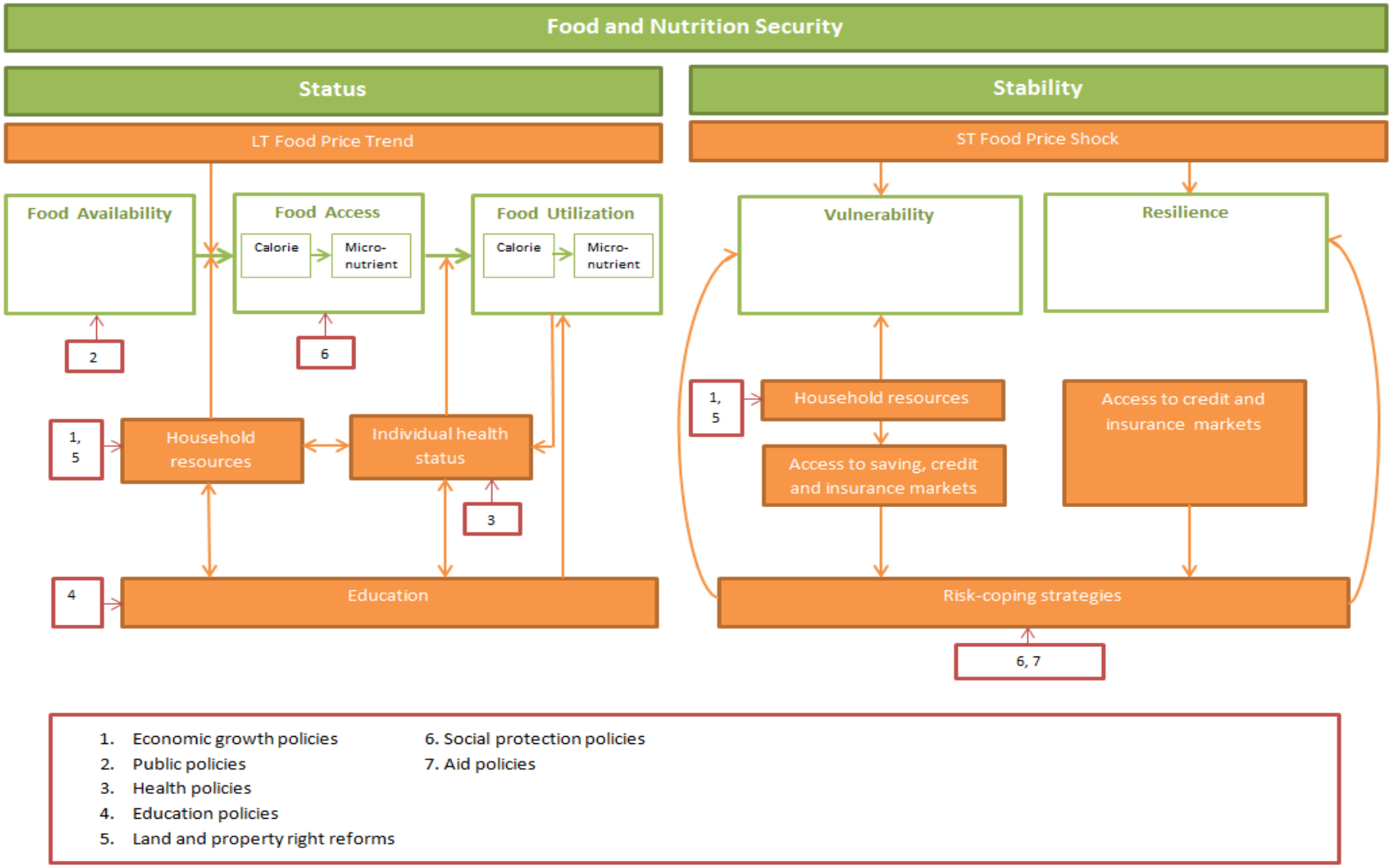
2.3. Micro-Level Policies

In order to realize food security at the individual level, policymakers should promote micro-level policies that ensure the achievement of a satisfactory food and nutrition status - defined in terms of an adequate quantity of macro- and micronutrients[4] - for every citizen.

Several micro-level policies can influence the drivers of food and nutrition security at the individual and household level. In the short term, aid and social protection policies can mitigate the effects of temporary income shocks resulting from conflict, natural disasters, etc. In the long term, public services, growth policies, social policies and natural resource policies are likely to affect the individual and household food and nutrition status. Figure 3 shows how micro-level policies interact with drivers at the individual and household level. These interactions will be discussed in more detail below.

[4]Macronutrients can be divided into three groups: proteins, fat and carbohydrates. Micronutrients are essential dietary elements that are needed only in very small quantities, such as vitamins and minerals.

Figure 3: Linking micro-level policies with the individual and household level



2.3.1. *Short-Term Policies*

Short-term food policies such as social protection policies and food aid attempt to prevent and mitigate the negative effects of nutrition and non-nutrition shocks.

Social protection policies have the primary goal of easing the negative impact of shocks on household livelihoods and securing current and future food consumption, dietary diversity and micronutrient absorption (Fan et al. 2011). There is a broad range of social protection policies: social safety nets, insurance mechanisms, social assistance policies and inclusion programs for the economic and social integration of the most vulnerable (HLPE Committee of World Food Security 2012a). The availability of financial resources, as well as targeting, design, and implementation of social protection policies are essential determinants for the effectiveness of these policies (Alderman and Hoddinott 2007). Social protection policies that target women generally have a larger impact on household food security, since women are often the caregivers in the household and responsible for the production, processing and preparation of food (HLPE Committee of World Food Security 2012a). The negative impact of nutrition shocks on livelihood strategies can be mitigated by social safety nets. Pangaribowo (2012) for instance showed that the Indonesian social safety net program, which highly subsidized rice during the economic crisis, enabled the poor to increase expenditures on nutritious food and healthcare.

Especially in poor countries with a weak government capacity, food aid is one of the means to cope with nutrition and food supply shocks in the short term. Food aid, however, might also have negative and unintended side effects on the price stability and local availability of food in the longer term. First, the expectation of food aid might displace formal and informal insurance mechanisms and enhance risk taking behaviour (*moral hazard*). Second, if food aid is provided in kind, it increases the supply of food, which in turn might depress local food prices if the food market is not completely integrated in the national or international market. Downward pressure on food prices might crowd out commercial activities, also known as the *market displacement* effect. If food aid is provided in the form of a cash transfer, it may increase the price of food as a result of an increased demand in combination with an incomplete market integration (Barrett 2006).

2.3.2. *Long-Term Policies*

Economic growth and public policies affect an individual's food and nutrition status mostly through their impact on household resources, the individual health status and education.

Economic growth is expected to contribute to food and nutrition security, both at the level of access to food and at the level of reducing vulnerability to shocks. Economic growth will also facilitate food and nutrition security by generating the necessary financial resources for the provision of education and health services and social protection measures. The impact of economic growth on individual citizens will however depend on the distribution and composition of growth and on the conditions under which growth takes place (Fan and Brzeska 2012). If, for example, economic growth is concentrated in sectors with a low intensity of unskilled labor, it may be less pro-poor than if economic growth occurs primarily in sectors with a high intensity of unskilled labor (e.g. in the case of manufacturing in China). In many developing countries agriculture is the exclusive source of income for small farmers and agricultural laborers, among whom food and nutrition insecurity is pervasive. Pro-poor growth policies especially targeted to rural households, such as the development of pro-poor supply chains, could help narrowing the gap. Smallholder participation in supply chains can for instance help to overcome credit and input constraints, leading to wealth creation through increased productivity, access to new technologies and technical training (Abebe et al. 2013). Agricultural supply chain development may also lead to important benefits for poor households through the employment of low-skilled labor (Minten et al. 2009; Maertens et al. 2011; Maertens and Swinnen 2009). Supporting labor-intensive employment in the rural non-farm sector may also create employment opportunities for the poor and at the same time reduce the demographic pressure on agriculture. Institutions are of paramount importance in determining the speed at which growth trickles down. Democratic governments tend to allow for a better response against the negative effects of an unequal distribution of resources and problems of food and nutrition insecurity (Palma et al. 2009; Franco et al. 2004), as they pay more attention to people's well-being, empowerment of women and social capital.

Yet, growth in itself is not enough to ensure individual food and nutrition security, as Dreze and Sen (2011) argue: *'Growth, of course, can be very helpful in achieving development, but this*

requires active public policies to ensure that the fruits of economic growth are widely shared, and also requires—and this is very important—making good use of the public revenue generated by fast economic growth for social services, especially for public healthcare and public education.' The development of public policies increases the ability of individuals to have access to schooling and health services, which, as explained in the previous sections, are crucial factors to fight food and nutrition insecurity. Health and nutrition policies can strengthen the positive impact of public institutions by promoting for instance food for education, nutrition campaigns, food fortification and biofortification. Depending on local priorities, policies may focus on the fight against hunger and malnutrition, or/and on the emerging problem of overweight and obesity.

The impact of the food and nutrition status on health, household resources and education also has important implications at the national level. The health status of a nation creates a direct cost for society, which in turn translates into a cost for the households through for example higher taxes. In addition, lower human capital and productivity negatively affect the country's economic development, with negative repercussions at the individual level.

Property rights and land tenure influence the nutrition status at the household level. First, securing property rights and improved land access reduces the vulnerability to expulsion by the state or commercial interest and promotes investment of land, labor and capital in food production and businesses. Increased investment results in higher availability of resources and thus enhanced access to food. However, land tenure and property rights is a necessary but not a sufficient condition for agricultural and economic growth (Roth 2010). Legal reforms with respect to the use and ownership of lands, is particularly important for women. In Ghana only in 10 per cent of the households women were in possession of land compared to 16-23 per cent of the men and the share of land held by women positively affected food expenditures (Doss 2006). The share of female landownership in West Asia and North Africa is smaller than 5 per cent of the total of agricultural landholders (HLPE Committee of World Food Security 2012 a). This asymmetry in ownership has a negative impact on women's agricultural production (World Bank 2009).

Given the important role of women in agriculture and in all the different dimensions of food and nutrition security, policies that support and stimulate productive activities of women in general, especially in agriculture, have great potential in terms of improving food security (FAO 2011). Gender-sensitive policies must go beyond the improvement of female land tenure and property rights. More gender-sensitive agricultural policies, such as women-focused training sessions regarding agricultural technologies, might give large returns in terms of increased productivity, which in turn will positively affect food and nutrition security through an increased food availability. Gender-sensitive education policies and information campaigns can improve women's access to education and knowledge, which may improve food access by increasing the income generation and employment possibilities of women. Female access to education and knowledge may also improve food utilization by improving knowledge of nutrition and health care and by increasing female participation and bargaining power in the household decision-making process. In general, policies that promote gender equality are expected to have positive effects on food and nutrition security at the individual and household level.

3. Food and Nutrition Security at the National and International Level

So far, we have reviewed a set of determinants affecting food and nutrition security at the individual and household level and a range of policies directly affecting them. In the following section we shift our attention to the national and international drivers of food and nutrition security and the related policies. The main distinction in this case will be between factors that affect food and nutrition security in the short term and those affecting food and nutrition security in the longer term (see Figure 4). The short term drivers mostly act on the *stability* dimension, while the long term drivers determine the *trend* of the different determinants. Yet, it is not always straightforward to separate short- and long-term effects: a short-term driver often also has long-term consequences. For example, a sharp increase in food prices resulting from a natural disaster can lead to a temporary decline in nutrition status, which may affect a child's ability to study, which in turn may affect its educational progress and ultimately its life-long income generating capacity.

When discussing the macro-level short-term and long-term drivers and policies, we will split the analysis between drivers affecting the supply side and drivers affecting the demand side. We will conclude this chapter by looking at the links between the macro-level drivers and policies and the micro-level drivers and policies previously discussed (section 4.2).

3.1. Macro-Level Drivers and Policies

The major channel through which macro-level drivers and policies affect food and nutrition security is the food price channel.

In the *short term*, food price shocks are generated by a sudden shock in food supply or in food demand. Natural disasters, conflict, food stocks, the balance of payments, agricultural production and trade are all factors that affect *food supply* in the short term. *Food demand* is primarily affected by conflict, aid and social protection policies.

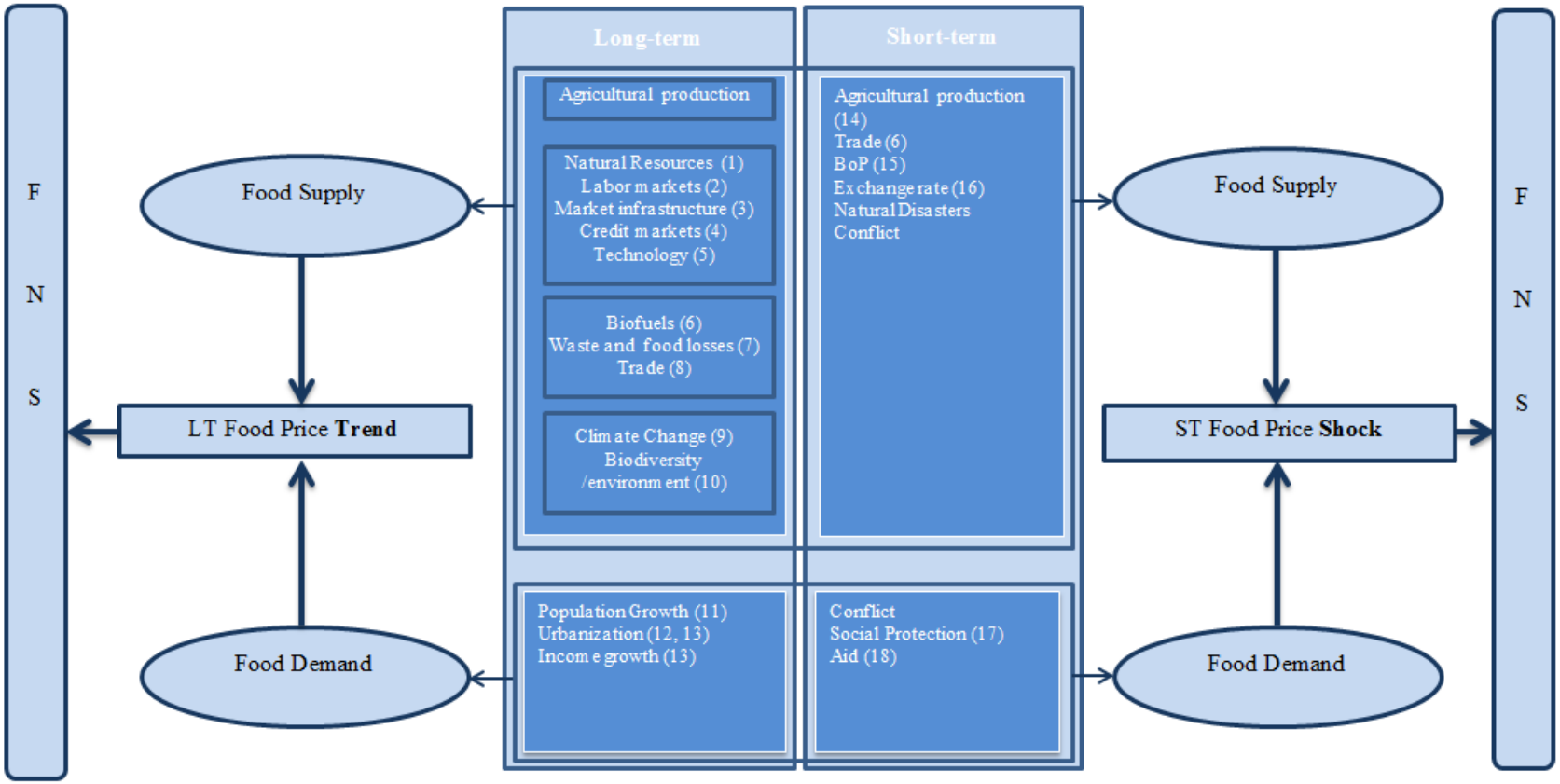
The *long term* food price trend is determined by the balance between long-term food demand and supply trends. Long-term *food supply* trends are determined by agricultural production, research

and technology, trade patterns, growth, exchange rates, natural resources, climate change and environmental and biodiversity changes. The long-term *food demand* trend is influenced by population growth, urbanization and income growth.

Before we discuss the different drivers and related policies, it is important to note that countries must take into account their endowments and initial conditions when deciding on which policies and strategies to implement. For example, net-exporting and net-importing countries will need to implement different agricultural policies. Similarly, agriculture-based countries may focus mainly on increasing productivity of the agricultural sector, while transforming countries may adopt a strategy of shifting to high-value agricultural production (World Bank 2007).

In the following sections we will jointly discuss the short- and long-term determinants of food and nutrition security and the corresponding macro-level policies, keeping a distinction between food supply and food demand.

Figure 4: Macro-level drivers and corresponding policies



1. Natural resource policies
2. Labor market policies
3. Development of market institutions
4. Credit market policies
5. R&D policies/Innovation policies
6. Biofuel policies
7. Waste policies
8. Trade policies
9. Climate change policies
10. Biodiversity/environmental policies
11. Population growth policies
12. Rural-urban policies
13. Nutrition and health policies
14. Food stock policies
15. Balance of payment policies
16. Exchange rate policies
17. Social protection policies
18. Aid policies

3.1.1. *Drivers and Policies Affecting Short-Term Food Price Volatility*

A. Food Supply

The short-term food supply is mostly determined by agricultural production, food stocks, trade, the balance of payments, exchange rates, conflicts and natural disasters.

Short-term changes in agricultural production resulting from weather fluctuations, conflict and natural disasters are likely to affect the short-term food supply. Food stocks are an important tool to cushion the impact of food supply shocks by mitigating the increase in food prices and ultimately the impact on food and nutrition security. Currently the global stocks of maize and wheat are at historically low levels, leaving the world vulnerable to food price spikes and undermining the proper functioning of markets.

Trade and trade policies influence the food supply both in the short term and the long term. A short-term example of trade policy is the implementation of food bans or export restrictions, but this type of policies increases the possibility of further destabilizing world food markets in times of crisis (Fan et al. 2011; Rutten et al. 2013). For instance, during the food price crisis of 2007-2008, the ban on rice exports from India and other rice exporters affected the rice import possibilities of Bangladesh. Rice storage started to increase in response to the increasing domestic price of rice, which led to a further increase in prices and exacerbated food insecurity (Deb et al. 2009).

The ability to acquire food on the international market depends on the balance of payments and the exchange rate. A problematic balance of payments restricts the borrowing capacity of countries, which, in turn, may limit the ability to import food (FAO 1996). The exchange rate affects the transmission of international prices to domestic prices. For instance, a depreciation of the domestic currency makes food less affordable (UN World Food Program 2009). In the long term countries can structurally undervalue their currency, which artificially renders exports cheaper and imports more expensive. When a country is a net-importer of food, food will become more costly.

Violence and social conflicts typically have a direct and immediate impact on the food and nutrition status of an individual, but they may also have more long-lasting effects. Conflicts may indeed disrupt the production capacity and access to food and affect livelihoods, assets and the health and nutrition status of entire countries (Messer et al. 2001). In conflict zones, several causes of declining food and nutrition security can be identified. First, food production may be reduced due to the devastation of crops, livestock, land and water resources. Second, the destruction of the transport and market infrastructure may have a negative impact on the production and distribution of food and generate an increase in prices. Third, the faltering of the food production is often reinforced by the use of hunger as a weapon (Messer et al. 2001). In a similar way, natural disasters can have a dramatic impact on both the economic and the food security status.

B. Food Demand

There are two main channels through which food demand can be affected by macro-level policies in the short-run: *aid* and *social protection* policies. Both can help to maintain the demand for food high whenever a shock hits a country, preventing the most vulnerable citizens from dropping back in their food and nutritional status.

3.1.2. *Drivers and Policies Affecting Long-Term Food Price Trends*

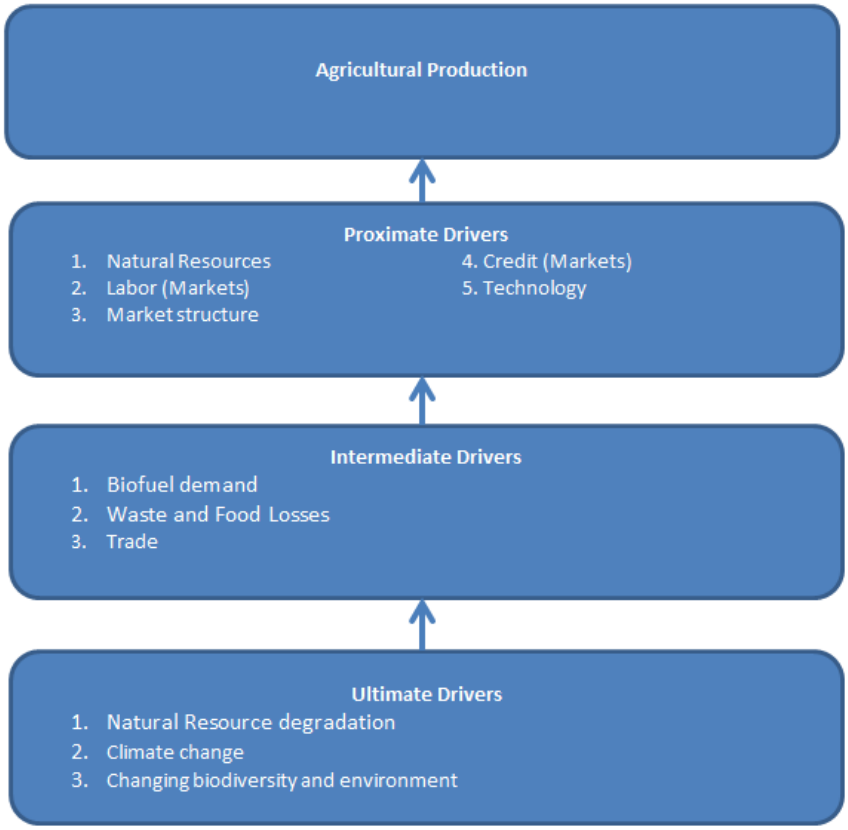
A. Food Supply

As explained in the previous chapters, *food availability* – and hence food supply – is a necessary condition to achieve food and nutritional security. In the long term *food availability* is defined by domestic food production and commercial food imports (FAO 2006).

The *domestic food supply* is directly linked with domestic agricultural production, which in turn is determined by its *proximate*, *intermediate* and *ultimate* drivers (see Figure 5) [5]. It must be noted that, depending on the initial conditions and on the availability of agricultural resources, countries will choose different strategies to enhance agricultural production.

[5] This categorical division is based on the paper of Szirmai (2012). For more information we refer to this article.

Figure 5: The long term food supply drivers



Each one of the drivers mentioned above relates to a different set of policies that can be promoted to enhance agricultural production and, thus, food supply. We start by looking at the *proximate drivers*, represented by *natural resources*, *labor markets, market structure, access to credit* and *technology.*

Natural resources such as water, land, forests, fisheries, etc. represent essential inputs for food production, which are going to be undermined by both climate change and the urbanization process. Installing community based natural resource management systems is one way to stop the threats to future imbalances in the eco-systems. Increasing soil and land productivity, development of the agroforestry are examples of such policies (Dejene 2003).

Labor and labor markets are an important input for the production of food. Labor markets determine how economic growth will translate into development and poverty reduction by way of their impact on household incomes through employment (as discussed above). Economic growth will benefit the poorest households the most if demand for unskilled labor can be stimulated.

The *market structure* also plays an important role, as transaction costs affect the ability of producers to access markets. Transaction costs depend on a range of market characteristics, including market infrastructure and information (IFPRI 2011). Output increases can be promoted by enhancing access for producers to input and output markets. To support this, governments can invest in market infrastructure and promote agricultural investment. The existence of competitive and efficient markets is a crucial determinant of access and trade of food.

Access to credit is fundamental for allowing agricultural investments and remains a considerable problem - especially for smallholders in developing countries. Smallholders are often credit constrained because they lack assets to provide as collateral. Policies aimed at developing and stimulating financial services at the level of the smallholder would therefore greatly benefit agricultural production. One example is public support programs that stimulate access to financial services through intermediate contracts (World Bank 2007).

Technology can also substantially affect agricultural production. In the past, agricultural productivity increases were to a large extent driven by investments in genetic improvements, which often required complementary external inputs within intensive production systems. Genetically modified crops in terms of food, feed and non-food are one of the most obvious examples of innovative technologies with implications for food and nutrition security. Genetic modification can affect food and nutrition security via income effects through a higher yield and more nutritious food – also known as biofortification (Qaim 2009). Achieving further progress in productivity in the face of changing environmental conditions presents new challenges in terms of technological innovation, but also in terms of institutional innovation and the role of different actors (e.g. public vs. private). These trends affect both the rate and direction of innovation and its diffusion. Specific issues to be addressed include the role of institutional arrangements

governing the conservation and use of genetic resources in agricultural innovation and the possible consequences for biodiversity.

The *intermediate drivers* are represented by *biofuel demand*, *waste and food losses* and *trade*. *Intermediate drivers* tend to stimulate agricultural production in a more indirect way compared to the *proximate drivers*. The related policies can be agricultural or non-agricultural policies, which may promote or hamper agricultural growth in an indirect way.

Biofuel demand can put additional pressure on the use of natural resources. An increased demand for energy and for biofuel crops - palm oil, sugar, seeds and maize – can put pressure both on the price of these crops and on the prices of other food crops due to the substitution effect (that is, competition for land). Another related concern is that biofuel production puts pressure on the availability of water for food production. In October 2012, the European commission proposed to reduce the conversion of land for biofuel production to encourage alternative biofuel production techniques using non-food products, such as waste (European Commission 2012). However, a higher demand for biofuels might also have a positive impact on food and nutrition security: to take full advantage of the increased demand countries could be stimulated to invest more in the agricultural sector, which would raise agricultural output and incomes (FAO 2008; Barilla Centre for Food & Nutrition 2011; Negash and Swinnen 2012).

Decreasing *waste and food losses* in developing and developed countries can reduce the pressure on the limited natural resources that we have at our disposal. Waste and food losses account for almost one third of the food produced for human consumption and occur both at the consumption and the production side (FAO 2012). The development of appropriate measures to reduce waste will be different for middle- to high-income countries compared to low-income countries, as these have different patterns of food waste and food losses. In middle- to high-income countries the problem is mainly located at the consumption side, both in terms of quantity and quality, while in low-income countries waste and food losses pertain to the first stages of the food supply chain – during harvest, storage, etc. (FAO 2012). Some examples of waste policies are awareness campaigns for consumers, the introduction of more efficient storage techniques and the resolution of stock management inefficiencies.

Trade reforms improve price incentives and lead to more efficient international markets. The economic efficiency effects of open trade can lead to overall welfare increases if trade reforms induce each country to produce according to its comparative advantage.

Finally, the *ultimate drivers* are represented by *degradation of natural resources*, *climate change*, and *changing biodiversity*. These phenomena put severe pressure on global ecosystems and could pose a serious threat to the possibility of providing sufficient food for future generations.

Climate change and environmental considerations are likely to constrain domestic food production in the future, especially through the occurrence of more frequent and more severe adverse climate shocks, an increase in average temperatures, reduced water availability and reduced yields, which are likely to translate into higher price variability. There are however regions in which food production may be positively affected (HLPE Committee of World Food Security 2012b). At the international level, changes in domestic food production will translate into changes in international agricultural prices. Policy interventions need to be designed so as to increase the resilience of the food supply and contribute to climate change adjustment. For instance, investments that facilitate the build-up of food stocks can assist in increasing the resilience of the food supply. Giving farmers access to information systems such as weather forecasting will enable them to take the appropriate actions to cope with the increased variability caused by climate change (HLPE Committee of World Food Security 2012b).

The *degradation of natural resources* and the decreasing diversity of both intra-specific and inter-specific nature are also likely to undermine the resilience of intensive agricultural production. Recent research has shown that improved varieties do not necessarily represent genetic erosion (Van de Wouw et al. 2010), but there has been a steady trend towards varietal uniformity in agricultural landscapes. Species diversity also needs to be examined, as intensification has reduced the diversity of crop and livestock species at various spatial levels and the diversity of other species in agro-ecosystems in many locations. This reduced diversity may render agricultural production systems more prone to considerable losses, and may also accelerate the evolution and spread of pest species (Goeschl and Swanson 2003). The role of

biodiversity in ensuring productivity and resilience in agricultural systems may differentiate according to scale and the type of production. The implementation of effective and sustainable natural resource management and conservation systems can restore agro-ecosystems and contribute to preserving biodiversity (Chappell and LaValle 2011).

Beyond domestic food production, food supply is in the long term also determined by *trade*. Trade has a direct impact on food supply through the flow of food exports and imports. While open trade allows for the acquisition of food in international markets to meet domestic food demands, it also allows for the export of food commodities – reducing their availability for local demand. The economic efficiency effects of open trade might lead to overall welfare increases (if it induces countries to produce according to their comparative advantage), which would generate the necessary resources to sustain food imports when needed. International market regulations such as the WTO agreements have the purpose of ensuring transparent and open trade between nations (WTO 2012). Such policies have the potential of creating more efficient trade of food products and reduce vulnerability of poor consumers and producers. Moreover, restrictions on open trade, such as import tariffs, quotas, non-tariff barriers, trade taxes and export subsidies, carry the risk of further destabilizing world food markets in times of crisis (Fan et al. 2011).

B. Food Demand

Long term food demand is mostly determined by three strongly interlinked factors: *population growth*, *urbanization*, and *changes in consumption patterns and lifestyles*.

The Population Division of the Department of Social and Economic Affairs of the United Nations predicts that the *population* in developing countries will continue to grow, while population in developed countries will remain stable (DESA/UN 2012). The demand for food will increase as the population grows and put more pressure on natural resources and food production (Barilla Centre for Food & Nutrition 2011).

In the coming decades, *urbanization* is expected to absorb almost all of the population growth - especially in developing countries - as the movement from rural to urban areas is expected to continue (DESA/UN 2012). Some countries have already adopted drastic measures to limit the

pressure from population growth. In 1979 China introduced the one child policy to stimulate the small-family culture. Increasing urbanization will further challenge access to appropriate food of adequate quality and quantity for urban households in developing countries, since these households are often net buyers (Barrett and Lentz 2009). For example, China has introduced the household registration system, also known as the Hukou system, to keep track of the mobility flows of the rural and urban population (Chan and Zhang 1999). Urbanization and more specifically the rural-to-urban migration is one of the channels through which obesity prevalence in developing countries is affected, since it exposes migrants to the urban lifestyle and dietary patterns (Misra and Khurana 2008). Health policies and nutrition campaigns are policies often used to change the health and nutrition behaviour of individuals, but the effectiveness of information campaigns is highly debated. Luo et al. (2012) for instance conclude that the effectiveness of health campaigns highly depends on the context. The authors found no impact of three different information and education campaigns on the prevalence of anaemia among primary school children in the northwest of China.

In addition to urbanization, income growth is also likely to lead to changes in *consumption patterns and lifestyles*. An increase in income leads to a higher dietary diversity: individuals tend to consume more high-value products such as meat, fish, milk, fresh fruit and vegetables (Regmi 2001). The increasing demand for meat raises the demand for grains (UN World Food Program 2009). Additionally, higher incomes and changing lifestyles increase the demand for energy, which in turn affects the production costs of agricultural commodities.

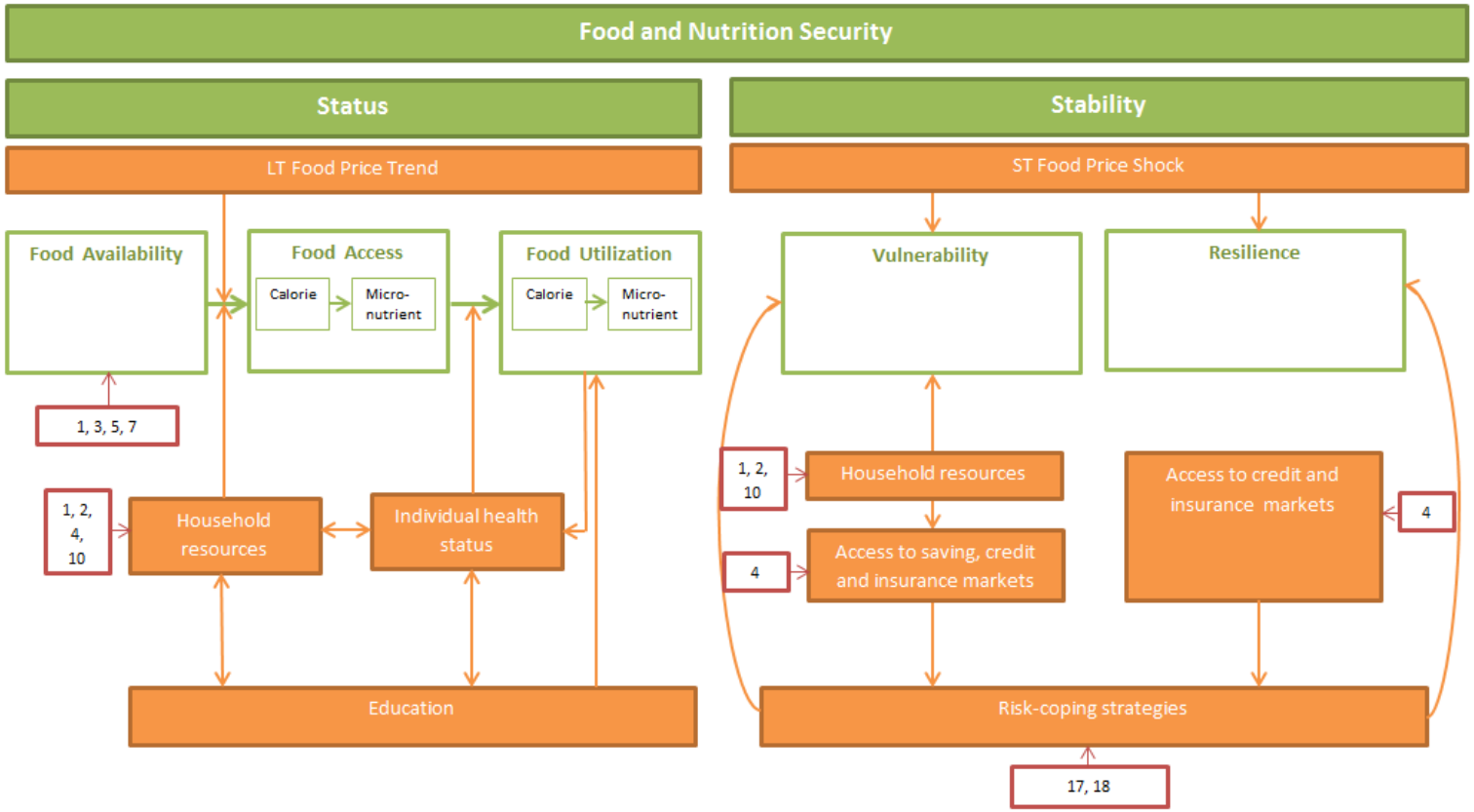
3.2. Connecting the Macro-Level Policies with the Individual and Household Level

Food prices are determined by the balance between the supply and the demand of food. In the long term a shift in demand and/or supply, caused by long-term drivers of food supply and demand, can change the food price trend upwards or downwards. The food price trend is a key driver of individual demand-and-supply decisions and, therefore, of food and nutrition security. Demand decisions depend on the relation between the household's real income and food prices. For net-consuming households an increase in food prices reduces the household's purchasing power, and therefore its access and demand for food. For net-producing households the direction of the impact of food prices and real incomes is less clear, since it will depend on the sources of

the price variation (Laborde et al. 2013; Swinnen 2011). The supply decisions of net-producing households are positively affected by longer term food price increases. In the short term, supply and/or demand shocks will affect the stability of the food and nutrition status of the household. The impact of such a price shock will depend on the household's implemented risk prevention, mitigation, and coping mechanisms (see Figure 6).

It must be noted that macro-level policies may not only affect food and nutrition security through the short- and long-term price channel; their impact might also flow directly to the determinants at the individual and household level. The stimulation of agricultural production can positively affect the income of farmers. Moreover, in settings where mostly women are involved in agricultural production, it can shift decision-making power within the household through an increase in the income generated by the female members. The consequences in terms of food and nutrition status have been explained in previous chapters. Another example is the development of new agricultural technologies, which tend to increase the food supply. Such technologies may also directly impact smallholders' productivity, which would increase their incomes and household resources (see Figure 6).

Figure 6: Linking macro-level policies with the individual and household level

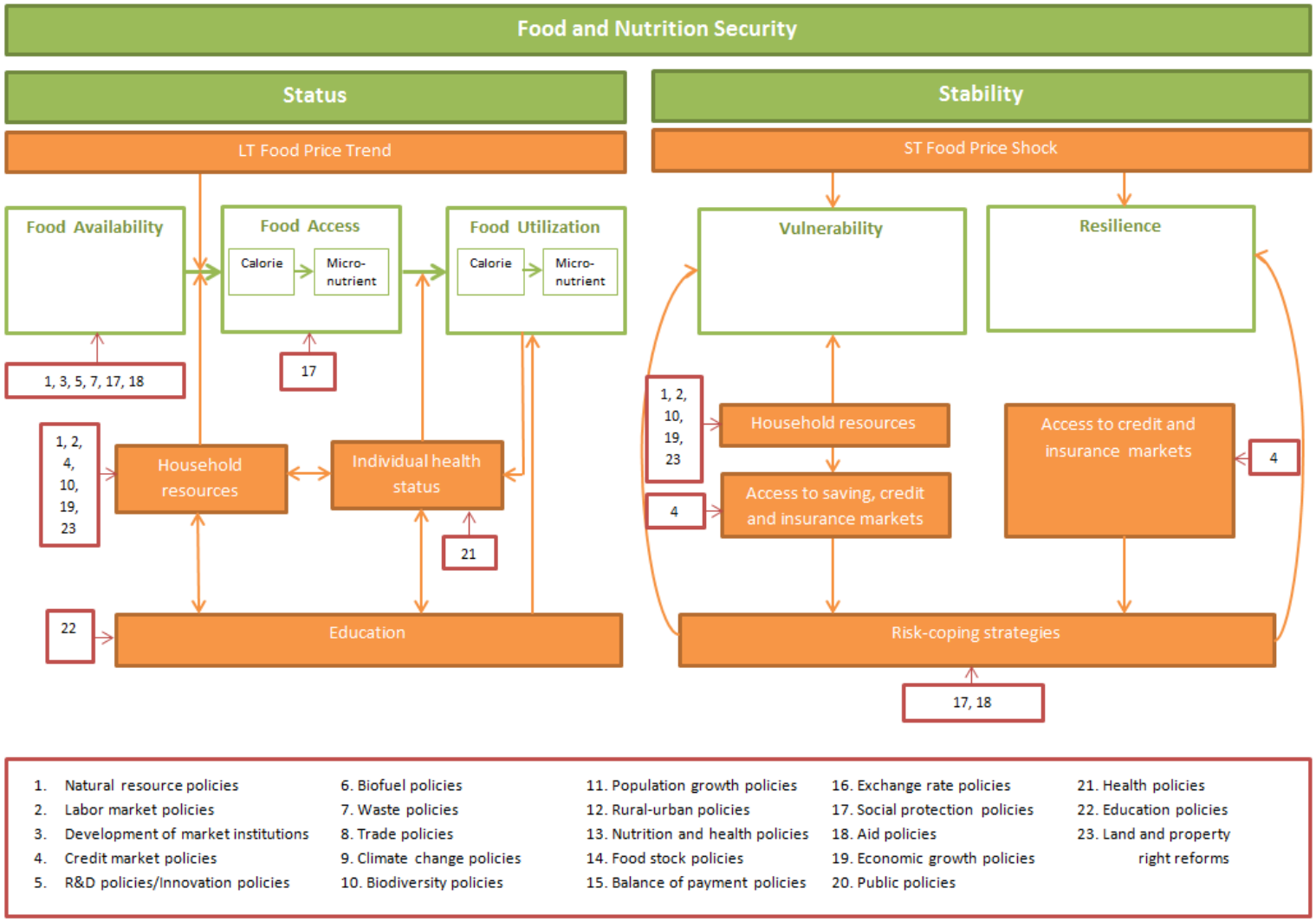


4. **Final Comments**

The report presents the conceptual framework to be used for the analysis of food and nutrition security. It provides a comprehensive and updated overview of the determinants of food and nutrition security at each level of aggregation (individual, household, national and international), both in the short and long term. It discusses the contribution of different micro- and macro-level policies to food and nutrition security. Figure 7 provides a graphical summary of the framework and its key aspects and illustrates that the food and nutrition security issue is complex and multi-dimensional. In order to combat food and nutrition insecurity, it is therefore important to work towards a convergence of several policy areas.

In combination with deliverable 1.2, this conceptual framework lays the foundation for the following Working Packages of the FoodSecure project. The quantitative (WP-2) and qualitative (WP-4) studies of the short- and long-term determinants of food and nutrition security as well as the modelling of the long-term drivers in the world food system (WP-7) will build on the framework presented here. As we have already noted in the introduction, the present report – and the conceptual framework that is presented – is merely the first step of the conceptual work within the FoodSecure project. As the project progresses and new models and analyses are completed, the framework itself will be extended in a series of specific issues within the broad question of food security that the project addresses.

Figure 7: Linking micro- and macro-level policies with the individual and household level



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FOODSECURE
FOR POLICIES THAT MATTER

The FOODSECURE project in a nutshell

Title	FOODSECURE – Exploring the future of global food and nutrition security
Funding scheme	7th framework program, theme Socioeconomic sciences and the humanities
Type of project	Large-scale collaborative research project
Project Coordinator	Hans van Meijl (LEI Wageningen UR)
Scientific Coordinator	Joachim von Braun (ZEF, Center for Development Research, University of Bonn)
Duration	2012 - 2017 (60 months)

Short description

In the future, excessively high food prices may frequently reoccur, with severe impact on the poor and vulnerable. Given the long lead time of the social and technological solutions for a more stable food system, a long-term policy framework on global food and nutrition security is urgently needed.

The general objective of the FOODSECURE project is to design effective and sustainable strategies for assessing and addressing the challenges of food and nutrition security.

FOODSECURE provides a set of analytical instruments to experiment, analyse, and coordinate the effects of short and long term policies related to achieving food security.

FOODSECURE impact lies in the knowledge base to support EU policy makers and other stakeholders in the design of consistent, coherent, long-term policy strategies for improving food and nutrition security.

EU Contribution	€ 8 million
Research team	19 partners from 13 countries

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