



Commercially viable agriculture and consumption of nutritious foods: a framework for identifying development pathways

A desk review

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Food systems in low and middle income countries are changing rapidly in response to economic and market developments, environmental impacts, and dietary changes. Within this context, informed policy and sustainable development processes are needed to shape climate-smart and resilient food systems for food and nutrition security at farming household level. This research project aimed to a) explore the complexity of the contextual dynamics in which smallholder farming households operate; and b) contribute to a better conceptual understanding of commercial food production strategies in relation to consumption choices.

A literature review was conducted, exploring both scientific and grey literature, in parallel to consultation rounds with a multidisciplinary team of agronomists, economists, nutritionists and international development specialists to explore existing insights, align available expertise, and find common ground on how to create a useful framework that would fit the specific interests and expertise of each of the actors involved.

Key elements for our framework were preliminary drawn from existing frameworks. A number of - non-exclusive - pathways were identified. These include subsistence-oriented production for the household's own consumption (source of food), whereby women – as producers as well as care takers – are seen as the crucial agents for household food security and health outcomes; production for sale in markets (source of income); and agricultural policies (national and global), affecting a range of supply and demand factors that establish the price of marketed food and non-food crops (food price policies). The important characteristics for the framework for viable commercial agriculture and consumption of nutritious foods evolve around different aggregation levels: the individual (gender and power dynamics), the household (household food production, income generation, food purchase choices, care practices, access to health care), the community (employment opportunity, collaboration, microfinance, care and social (infra)structure), and the regional/nation (price and trade policy) level.

Keywords: framework, food systems, agricultural commercialization, food and nutrition security, farm households, transition

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List of abbreviations and acronyms

ASEAN	Association of South East Nations
DFID	Department for International Development
FAO	Food and Agricultural Organisation
GF&NS	Global Food and Nutrition Security
LMICs	Low and Middle Income Countries
PLW	Pregnant and Lactating Women
UNEP-IRP	United Nations Environmental Programme – International Resource Panel
USAID	United States Agency for International Development
WCDI	Wageningen Centre for Development Innovation, Wageningen University & Research
WUR	Wageningen University & Research

Executive summary

Background

Food systems in low and middle income countries are changing rapidly in response to economic and market developments, environmental impacts, and dietary changes. Within this context, informed policy and sustainable development processes are needed to shape climate-smart and resilient food systems for food and nutrition security at farming household level. This research project aims to:

- Explore the complexity of the contextual dynamics in which smallholder farming households operate; and
- Contribute to a better conceptual understanding of commercial food production strategies in relation to consumption choices.

This desk review is part of the research project *Developmental agricultural pathways for viable commercial agriculture and consumption of nutritious foods*, implemented under the Global Food and Nutrition Security research programme of Wageningen University and Research (WUR). To grasp the complexity of the context in which farm households operate, a better understanding of food production strategies and consumption choices at multiple levels is required. Realised adaptation occurs in response to macro-level and community level interacting with farming household processes and capitals.

Approach

The desk review was done to articulate a conceptual framework for analysis of nutrition-sensitive and commercial viable agriculture pathways at different levels (macro, community, household) to capitalise on opportunities to stimulate improved food and nutrition security for vulnerable groups. Developmental pathways are seen as 'causal relations which are translated into mechanisms for action from macro to community to household levels that translate into time allocation for activities'.

For exploring the literature, both scientific and grey literature, Google Scholar, Web of Science and Scopus were explored, using generic search terms such as: pathways, framework, causal relationships, in combination with topic specific terms: commercialisation in agriculture, food security, nutrition security, food and nutrition security, nutrition sensitive agriculture, and nutrition specific interventions. Parallel to the literature review, consultation sessions were organised with a multidisciplinary team of agronomists, economists, nutritionists and international development specialists (n=8) to explore existing insights, align available expertise, and find common ground on how to create a useful framework combining commercialisation factors with food and nutrition security.

Findings and interpretations

The defined focus was on rural agricultural households, being production and consumption unit in one, thus representing a key linkage between agricultural commercialisation processes on the one hand, and nutritional outcomes on the other. Key elements to define our framework were preliminary drawn from several existing frameworks. For the nutrition components, we built on the UNICEF framework on maternal and child undernutrition, and the framework for Actions to Achieve Optimum Foetal and Child Nutrition and Development presented in the Lancet in 2013. To cover all components of food and nutrition security, highlighting the multiple entry points at multiple levels, we built on FAO's Food Insecurity and Vulnerability Information and Mapping System (FIVIMS). For the commercialisation components at household level, we built on the frameworks developed by Von Braun (1995), and Kanter et al. (2015) describing the linkages between agriculture, the food system, nutrition and public health.

Literature showed a number of - non-exclusive - pathways through which agriculture-oriented interventions and policies may lead to positive food security and nutritional outcomes. These included subsistence-oriented production for the household's own consumption (source of food), whereby

women – as producers as well as care takers - are seen as the crucial agents for household food security and health outcomes; production for sale in markets (source of income); and agricultural policies (national and global), affecting a range of supply and demand factors that establish the price of marketed food and non-food crops (food price policies, see Figure 1).

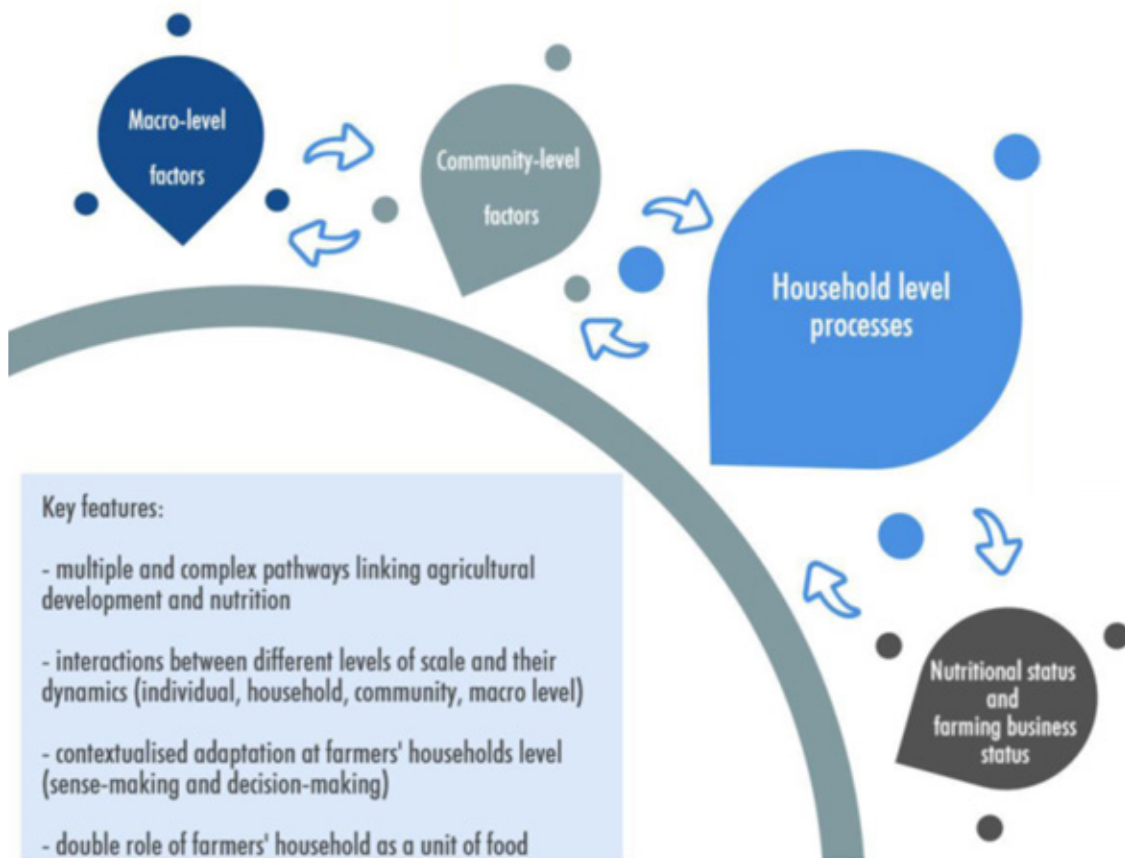


Figure 1 Key elements of the framework

Important characteristics of our framework for viable commercial agriculture and consumption of nutritious foods evolve around different aggregation levels: the individual (gender and power dynamics), the household (household food production, income generation, food purchase choices, off-farm labour, care practices, access to health care), the community (employment opportunity, collaboration, microfinance, care and social (infra)structure), and the regional and macro level (price and trade policy).

Conclusions

Rural agricultural household and intra-household decision-making and experiential dynamics represent the key linkage between agricultural commercialisation and nutritional outcomes. The key features of the framework for 'Development Pathways from Agricultural Commercialisation to Nutrition' highlight the multiple and complex pathways linking agricultural commercialisation with food security and nutrition. Key aspects that affect farm household's agricultural commercialisation processes relate to household sense- and decision-making behaviours relating to use of household assets, social practices and how these translate into time allocation and activity outputs. The framework also allows to analyse the influence of contextual, community- and macro level factors. Activity outputs such as surplus food, income, social safety nets, and education and training consequently generate activity outcomes such as caring and nurturing behaviour, non-food expenditure and food budget and consumption. These outputs result into two main household livelihood outcomes: household member nutritional status and farming business status.

It was acknowledged that development pathways between agricultural commercialisation and food and nutrition security cut across different levels. There is a need to further capture the processes of contextualised adaptation at the farm household level in terms of sense-making and decision-making processes and to explore the (non-linear) aspects of the conceptual framework, to better understand how human well-being, or benefits experienced throughout the life course, can be an outcome as well as an asset for innovative action at the farm household level to achieve household goals.

1 Introduction

The research project 'Developmental agricultural pathways for viable commercial agriculture and consumption of nutritious foods' is part of the Wageningen University and Research (WUR) Knowledge Base Global Food and Nutrition Security (GF&NS) programme. The GF&NS programme aims to inform long term policy and investment processes to shape climate-smart and resilient food systems that stimulate food and nutrition security, with a particular focus on the reduction of chronic undernutrition and micronutrient deficiencies. The research conducted under this programme will connect to long term decision-making processes in the public and private sector using qualitative and quantitative methods.

This report describes the main findings of a desk review exploring development pathways resulting in commercially viable and sustainable agriculture, with sustained access to and consumption of nutritious foods. The report also presents a conceptual framework for analysing agricultural pathways for viable commercial agriculture and consumption of nutritious foods.

1.1 Background

Food systems¹ in low and middle income countries (LMIC) are undergoing rapid changes in response to economic, environmental, and dietary changes. Root causes relate mainly to population growth and the consequences of climate change, going hand in hand with rapid urbanization rates. Food systems differ widely across the world, varying from traditional, intermediate and modern food systems (Table 1.1). It is estimated that globally most people (around 4 billion), notably in Asia, participate in food systems which could be called 'intermediate'. However, food systems may vary between and within countries (Westhoek, van Berkum, Özay, & Hajer, 2016).

Table 1.1 Food systems characteristics (Westhoek et al., 2016)

Food system feature	'Traditional' food systems	'Intermediate' food systems	'Modern' food systems
Estimated number of people in system	~1 billion	~4 billion	~2 billion
Principal employment in food sector	In food production	In food production	In food processing, packaging, logistics and retail
Supply chain	Short, local; small-scale structures	Supply chain has more actors than in 'modern' food systems	Long; consolidation in input, processing and food retail segment
Typical farm	Family-based, small to moderate	Combination of small-holder and larger farms	Industrial, large
Typical food consumed	Basic locally produced staples	Combination of basic products and processed food	Processed food with a brand name, more animal products
Purchased food bought from	Small, local shop or market	local shops, rapid supermarketisation	Large supermarket chain, restaurants and catering
Nutritional concern	Under-nutrition	Both under-nutrition as well as diet related diseases	Diet related diseases

NB: The terms 'traditional' and 'modern' are being used by lack of better alternatives. They certainly do not express a judgement (Westhoek et al., 2016)

¹ A food system is defined as: a system that embraces all the elements (environment, people, inputs, processes, infrastructure, institutions, markets and trade) and activities that relate to the production, processing, distribution and marketing, preparation and consumption of food and the outputs of these activities, including socio-economic and environmental outcomes (CFS-HLPE, 2014).

The agricultural sector², an important element of food systems, is dynamic and seeks to constantly adjust to these changes affecting markets, household needs, and consumer demands. In the coming years, one of the expected response strategies in developing countries and emerging economies is commercialisation of the smallholder agriculture, in order to promote and provide for high-value agricultural products, and to improve linkages between rural, urban and global markets.

1.2 Research aim and objectives

The overall research project seeks to identify development pathways in agriculture that stimulate both commercially viable agriculture and improve the production and consumption of nutritious foods. This will be done within a framework of understanding that market conditions and the functioning of institutions (laws, policy, education on agricultural production, etc.) basically shape the circumstances in which producers operate without much power to negotiate changes that would favour them (Figure 1).

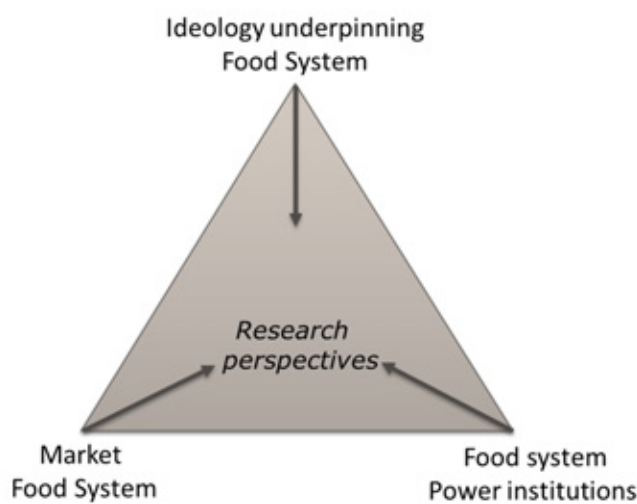


Figure 2 Framework of Food Systems interplay between ideology, market conditions, and power relations

More particularly, the aim is to identify nutrition-sensitive (commercial) development pathways in agriculture in which improved production technologies enable:

- Commercialisation, or: selling more yields at the (local, regional or national) market and increase income in this way;
- a more efficient use of (natural) resources in an environmentally sustainable way;
- Increased production of nutritious foods: balancing attention for the production of cash/staple foods and nutritious commodities like fruits and vegetables;
- Increased stability and availability of nutritious foods to vulnerable population groups.

To fully grasp the complexity of the context in which farmers in LMICs operate, in particular the smallholders who are producers and consumers at the same time, a better understanding of food

² Agricultural sector, in the broadest sense, includes four kinds of functions: the *green* functions relate to landscape and wildlife management, animal welfare, maintenance of biodiversity, improvement of nutrient recycling and limitation of carbon sinks. The *blue* functions relate to water management, water quality, flood control, water harvesting and creation of (wind-) energy. The *yellow* functions relate to the role of farming for rural cohesion and development, cultural and historical heritages, regional identity, and agro-tourism. The *white* functions produced by agriculture relate to food security and safety (Van Huylenbroeck, Vandermeulen, Mettepenningen, & Verspecht, 2007).

production strategies and consumption choices at multiple levels is required: the farm (household), the regional and the national level. In the current debates on strengthening food and nutrition security, there is growing consensus on the need to reduce barriers between disciplines and sectors, particularly those between different food value chain actors, consumers and policy makers. This will require a focus on changes in social contexts.

The aim of the desk review presented here, is “to define a generic framework to capture the key processes that determine farm household commercialisation processes and household food and nutrition security”. In addition, strategies and development pathways for food and nutrition security will be examined.

1.3 Methodological approach

A desk review was conducted, exploring both scientific and grey literature. Since our main interest was to identify development pathways relating to causal relationship between viable commercial agriculture and consumption of nutritious foods, the combination of terms used were:

- Generic: Pathways, framework, causal relationships, in combination with:
- Topic specific: commercialisation in agriculture, food security, nutrition security, food and nutrition security, nutrition sensitive agriculture, nutrition specific interventions.

Google Scholar, Web of Science and Scopus were the databases explored.

In parallel, a number of consultation sessions were organised with a multidisciplinary team of agronomists, economists, nutritionists and international development specialists (n=8) to explore insights, align available expertise, and find common ground on how to create a useful framework combining commercialisation factors with food and nutrition security (see Appendix 1).

The desk review was geared towards the articulation of a conceptual framework for analysis of nutrition-sensitive and commercial viable agriculture pathways at different levels (macro, community, household) to capitalise on opportunities to stimulate improved food and nutrition security for vulnerable groups.

1.4 Operationalising viewpoints and definitions

In order to explore ‘development pathways leading from commercially viable and sustainable agriculture to sustained access to and consumption of nutritious foods’ and a framework for identification, a set of concepts was identified and defined:

Generic definitions

- *Developmental pathways*: are seen as causal relations which are translated into mechanisms for action from macro to community to household levels that translate into time allocation for activities.
- *Conceptual framework*: the way ideas are organized to achieve a research project’s purpose (Shields & Rangarjan, 2013). As such it is an analytical tool with several variations and contexts. It is used to make conceptual distinctions and organize ideas.
- *Households*: From an economic perspective - in the case of small-holders - the household is the level of decision making for food consumption and decision making for agricultural practices. For household food security and nutrition it is a group of people who eat from a common pot, and share a common stake in perpetuating and improving their socio-economic status from one generation to the next (Carloni & Crowley, 2005).
- *Livelihoods*: a livelihood comprises the capabilities, assets (including both material and social resources) and activities required for a means of living. A livelihood is sustainable when it can cope with and recover from stresses and shocks and maintain its capabilities and assets both now and in the future, while not undermining the natural resource base (Carloni & Crowley, 2005).

Topic specific definitions

- *Agricultural commercialisation*: entails an “agricultural transformation process in which individual farms shift from a highly subsistence-oriented production towards more specialized production targeting markets both for their input procurement and output supply” (Jaleta, Gebremedhin, & Hoekstra, 2009). As such, commercialization generally implies increased market transactions for capturing the gains from specialization (Von Braun, 1995). These increased market transactions may have the potential to translate into the realisation of household welfare outcomes including better nutrition and caring practices;
- *Food security*: Food security exists 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, 1996);
- *Nutrition security*: When all people, at all times, have access to adequate food, care and feeding practices, and sanitation and health (UNICEF, 1991);
- *Food and nutrition security*: Food and nutrition security exists when all people at all times have physical, social and economic access to food, which is consumed in sufficient quantity and quality to meet their dietary needs and food preferences, and is supported by an environment of adequate sanitation, health services and care, allowing for a healthy and active life (UNSCN, 2013);
- *Nutrition-sensitive agriculture*: is a food-based approach to agricultural development that puts nutritionally rich foods, dietary diversity, and food fortification at the heart of overcoming malnutrition and micronutrient deficiencies (ISCN, 2014);
- *Nutrition-sensitive interventions/programmes*: address the underlying determinants of foetal and (child)nutrition and development, with a focus on access to, and stability and availability of nutritious foods to vulnerable population groups (Ruel & Alderman, 2013);
- *Nutritious foods*: Foods containing essential substances needed for life and growth, i.e foods rich in essential (micro-)nutrients such as fruits, vegetables, fish, meat, dairy products and biofortified staple foods for (Hawkes & Ruel, 2012).

1.5 Outline of the report

Chapter two describes the findings on the literature review addressing agriculture and nutrition linkages. Chapter three describes the current views on development pathways in commercialisation of agriculture in relation to food and nutrition security, and the most commonly used frameworks. Chapter four describes the synthesis of our literature findings, and the development of a conceptual refined framework for analysis of agricultural pathways for viable commercial agriculture and consumption of nutritious foods.

2 Literature review of developments in linking agriculture to nutrition

This chapter describes the key developments and current insights on developments in linking agriculture to food security and nutrition, and in linking agricultural commercialisation to food security and nutrition.

2.1 Agricultural development and food and nutrition security

In the past decades much attention has been given to food security. The main focus was largely on staple grains (McDermott, Aït-Aïssa, Morel, & Rapando, 2013). The dominant agricultural pathways to promote food and nutrition security were related to increasing incomes of farmers, workers and market actors, enabling improved production as well as the purchase of food, goods and services, and increasing national agricultural production and efficiency in order to increase food availability and reduce food prices. Current world food systems have been performing incredibly well when it comes to producing staple grains such as maize, rice and wheat. Much food and calorie intake come from these grains, in combination with oils, sugars and fats. However, especially in low-income and middle-income countries, dietary intake of nutrients and vitamins remains relatively low (Hunter & Fanzo, 2013).

On the other hand, dominant strategies for improved nutrition outcomes mainly focused on the immediate and underlying causes of malnutrition, addressing dietary intake, hygiene and sanitation, and care. In the early nineties, the UNICEF food and nutrition security framework was developed, which still forms the basis of many frameworks. It distinguishes between the different causes of maternal and child undernutrition: basis causes: lack of human, financial, social, physical or natural capital, unfavourable socio-economic or political contexts); underlying causes: income poverty, resulting from lack of employment, assets, remittances; and immediate causes: inadequate intake, or disease (Gross, Schoeneberger, Pfeifer, & Preuss, 2000; UNICEF, 1991). This has generated a wide variety of nutrition-focused individual-level interventions, usually conducted by, or under supervision of health-related agencies.

Thus, agricultural development and nutrition interventions have long worked separately, at best working in parallel, achieving separate successes (Du, Pinga, Klein, & Danton, 2015). Internationally, a renewed emphasis on food and nutrition security from a food systems perspective has revitalised the debate on agricultural development for improved nutrition. Global donors and international actors have responded to make 'nutrition-sensitive agricultural programmes and policies' work, and 'make agriculture work for nutrition', acknowledging that 'presence of food is just not enough for nutrition' (Webb, 2013).

The focus gradually shifted from improving food production, the quantity, and access to food, to the *quality of diets*, or the possibility to have food at all times, building on a human impact oriented perspective in terms of nutrition outcomes. This generated possibilities by which food systems interventions are intended to directly affect food and nutrition security while also taking into consideration cross-cutting issues such as gender, intra-household resources and dynamics and food safety (Webb, 2013).

The possible ways in which agricultural interventions link to nutrition outcomes is, however, still not fully understood (Thompson & Amoroso, 2014). In particular ways to accelerate the progress of nutrition improvements for vulnerable groups still requires programming of effective, large scale nutrition-sensitive interventions addressing key underlying determinants of nutrition. According to Hunter and Fanzo (2013), agriculture will continue to be instrumental in achieving better health and

nutrition for all populations throughout their whole lives, but there is a need for “more holistic and multi-sector packages that combine child and maternal care and disease control together with nutrition-sensitive programming from agriculture, education, social protection have been limited in their development and implementation” (Hunter & Fanzo, 2013, p.2).

2.2 Evidence base for nutrition-sensitive agriculture interventions

Based on several review studies looking for effectiveness of agricultural interventions aimed at improving nutritional status, Meeker and Haddad (2013) argue that results in nutrition outcomes are mixed (Arimond et al., 2011; Berti, Krusevec, & FitzGerald, 2004; Corinna Hawkes & Ruel, 2007; Kawarazuka, 2010; Masset, Haddad, Cornelius, & Isaza-Castro, 2011; Ruel, 2001; Webb & Kennedy, 2014). Nutrition-sensitive agricultural interventions may be successful in promoting the production and consumption of specific (nutritious) foods. But the main gap in available evidence relates to sustained changes in the overall diet (or indeed micronutrient status). In addition, nutritional status is usually not monitored using anthropometric indicators or measurements. There is no generic evidence for the impact of these interventions on nutrition outcomes at the national level or in farm household surveys, usually only for projects or case studies. There is, however, some evidence for impacts on vitamin A intake and status from homestead food production programmes and distribution of bio-fortified vitamin A-rich orange sweet potato (Meeker & Haddad, 2013).

The key challenge faced by nutrition-sensitive agriculture practices is that knowledge and information provision becomes much more complex as the intervention goes beyond nutritious food production and consumption patterns but also includes intra-household power relations and gender dynamics. Programme objectives expand to include households in market-oriented systems which simultaneously lead to income, food and other household consumption. As the level of intervention scales up from households to communities and value chains the organisation of knowledge, information, inputs, financial services, output markets becomes more challenging (McDermott et al., 2013).

Hawkes and Ruel (2011) suggested that, if the agricultural sector is to play a more effective role in improving nutrition by increasing the access, acceptability, and quality of diets, there needs to be a greater focus on what happens between production and consumption. This is particularly relevant at the level of the smallholder, who is producer and consumer at the same time. Producer and consumer decisions cannot be separated due to market imperfection (Taylor & Adelman, 2003). A suggested way is the use of the “value chain” concept (Benson, 2011). A value chain focus requires the engagement of not only the agriculture sector, but also other sectors involved, and approaches are needed to help overcome intersectoral barriers, which create disincentives to closer cooperation. Integrating nutrition into value chains also requires a closer look at how value chain analysis and development are conducted, with a particular focus on nutrition goals:

- Increase the supply of accessible (available and affordable) nutritious foods for the poor (and for different target groups) all year round;
- Increase the demand for and acceptability of nutritious foods for the poor;
- Increase the coordination among value-chain actors and activities that are essential to increasing the supply of and demand for nutritious foods for the poor;
- Address the trade-offs between the economic returns and nutritional benefits of agriculture in the value chain.

Limitations to the value chain approach for achieving nutrition benefits are:

- The focus on value addition and differentiated products may by-pass poor consumers because food products may become too expensive;
- Consumers are not usually seen or treated as actors in the value chain;
- “Value” in most value-chain literature/interventions is defined in terms of economic value, rather than in social or societal value;
- The focus on single food commodities in value chain analysis tends to easily overlook the need for dietary diversity;

- The focus on competitive markets leaves out other – symbiotic (Wegerif & Hebinck, 2016) or informal– markets whereby seeds, foods, production resources are exchanged between neighbours or villagers (Hawkes & Ruel, 2011).

Webb (2013) further explored the connection between agricultural interventions and nutrition with a particular focus on intermediate linkages and mechanisms, with the aim to identify cross-cutting issues, such as food preferences/taste, seasonality, women’s health, and the role of sanitation. He identified a number of impact pathways, based on work of the World Bank (2007), through which agriculture oriented interventions and policies may lead to positive food and nutrition outcomes:

- Subsistence-oriented production for the household’s own consumption;
 - Income-oriented production for sale in markets;
 - Reduction in real food prices associated with increased agricultural production;
 - Empowerment of women as agents instrumental to household food security and health outcomes;
- Ruel and Alderman (2013) specified these into *direct* - food production for direct household consumption - and *indirect* - purchase of food via income) – linkages whereby it invariably seems that women play a key role as mediators;
- The indirect relationship between increasing agricultural productivity and nutrition outcomes through the agriculture sector’s contribution to national income and macroeconomic growth.

These pathways are not exclusive, though, but can be used in combination in comprehensive intervention strategies.

In a review conducted in the Irish AgriDiet project by Meeker and Haddad (2013), the main pathways through which agriculture is hypothesised to affect nutrition outcomes are further specified as:

1. *As a source of food*: increases household availability and access to food from own production;
2. *As a source of income*: increases income from wages earned by agricultural workers or through the marketing of agricultural produce;
3. *(Fluctuating) Food prices*: agricultural policies (national and global) affect a range of supply and demand factors that establish the price of marketed food and non-food crops; this price in turn affects the income of net seller households, the purchasing power of net buyers, and the budget choices of both;
4. *Women’s social status and empowerment*: women’s participation in agriculture can affect their access to, or control over, resources and assets, and increase their power to make decisions on the allocation of food, health, and care within their household;
5. *Women’s time allocation patterns/habits*: women’s participation in agriculture can affect their time allocation and the balance between time spent in income-generating activities and time allocated to household management and maintenance, care giving, and leisure;
6. *Women’s own health and nutritional status*: women’s participation in agriculture can affect their health (for example through exposure to agriculture-associated diseases) and nutritional requirements (for example through increased energy expenditure); their health and nutritional status can, in turn, affect their agricultural productivity and hence their income from agriculture.

These pathways are to be considered as complex, encompassing economic, social and gender considerations, suggesting that investing in agricultural production alone does not necessarily result in improved nutrition (Meeker and Haddad, 2013). In addition, Webb (2013), following Hawkes and Ruel (2012), noted that it is important to realise that addressing these pathways as causal chains between intervention and outcomes, holds the risk of making too simple associations.

It is important to consider the role and influence of external factors and contexts on a case-to-case basis, having a potential impact on the development pathways defined. For example, the adoption of a certain technology or best practice in agriculture may have the intention to increase crop production and income generation. However, the way in which farmers, markets and other stakeholders react to these changes may show different results, leading to limited impact on nutrition. This is in line with the findings of Berti et al. (2004), who found that interventions affecting multiple pathways had more effect than one-sector interventions.

In sum, based on a summary of the different ways how essential nutrition knowledge can underpin nutrition-sensitive agriculture, lessons for improving nutrition through agriculture include: efficient and effective production of diversified, highly nutritious and bio fortified foods, enhancing value chains to improve nutritional quality and food safety, better policies and investments, and requirements for capacity development and extension to scaling-out and sustaining improved nutrition outcomes through agriculture (McDermott et al., 2013). Webb (2013, p.7) concluded, based on the research exploring the validity of the main pathways describing agriculture to nutrition linkages and the interventions based on them, that:

- The evidence for positive net impacts on nutrition is scarce;
- When positive impacts have been observed, the mechanisms by which this happens are not fully clear;
- Positive impacts seem to revolve around interventions that link multiple sectors, but the contribution of each of these sectors remains unclear in most cases;
- Impact can be achieved via multiple pathways but the roles of the different pathways needs to be further explored;
- There is a need for pathway alignment: women's roles matter a great deal via agriculture, dietary choices and healthcare, but not many interventions target all three at the same time;
- The nutrition impacts of price and trade policies on household level choices have not been fully explored;
- Study and research methods might not be fully able to explore and recognise evidence for the linkages.

Relevant entry points to kick-start or improve nutrition-sensitive agriculture approaches, identified by Jaenicke and Virchow (2013), should depart from a multilevel perspective and include:

- (i) enabling policies and government structures expressing the political will to fight malnutrition and micronutrient deficiencies;
- (ii) appropriate mechanisms for intersectoral and inter-organizational collaboration within the countries;
- (iii) increased awareness of nutrition-sensitive agriculture and capacity to design and implement relevant projects at different levels;
- (iv) appropriate focus on those groups who will benefit most from nutrition-sensitive approaches without being exclusive; and
- (v) an approach cognizant of the elements of the food chain and recognizing the links between its various elements from production through to consumption as well as relevant technological, economic and societal innovations.

3 Agricultural commercialisation

A focus on commercialization and expansion of scale in the agricultural sector is a common response to tackle food and nutrition insecurity. In this paper, commercialisation refers to the agricultural transformation process in which individual farms shift from a highly subsistence-oriented production towards more specialized production targeting markets both for their input procurement and output supply (Jaleta, Gebremedhin, & Hoekstra, 2009). Commercialization can occur on the output side of production with increased marketed surplus, but it can also occur on the input side with increased use of purchased inputs. Commercialization is not restricted to just cash crops: The so called traditional food crops are frequently marketed to a considerable extent, and the so-called cash crops can be retained, to a substantial extent, on the farm for home consumption (Von Braun, 1995).

The emphasis in agricultural development strategies has long been on increasing food production, especially in low- and middle income countries. Notably small holder farmers have been given priority when targeting agricultural development interventions. This has often been through the introduction of a wide diversity of crops (such as legumes, fruits, vegetables and animal source products) which also have the potential to positively affect nutrition (Carletto, Ruel, Winters, & Zezza, 2015).

As smallholders progress from subsistence towards market orientation, the success and failure of this process is influenced by socio-economic factors, farm resources, and individual skills determinants whose effects are also influenced by the drivers. So far, it remains unclear what the effect of commercialization is on income and food and nutrition security of smallholders, especially under the conditions of a transforming economy. Smallholders often face challenges and constraints to commercialize: changes in the socio-economic/demographic environment driven by growing population, urbanization and changing diets, global interconnectedness, export policy of a country, technology, food industry restructuring and consequences of climate change presents opportunities for smallholder market participation. Commercialisation of agriculture can have several adverse effects, especially in terms of equity and environmental consequences. With the increase of mechanisation, a consistent part of the rural labour force needs to be relocated in the industrial and service sector, with consequent loss of human and social capital (Pingali & Rosegrant, 1995). Commercial systems face environmental consequences due to the increased use of agricultural chemicals (Pingali, 2001). Where property rights are unclear phenomenon such as land grabbing can take place. Also, commercialisation may lead to a decline in crop diversity for households (Rerkasem et al., 2009). In some cases, farmers that invested in cash crop resulted worse off in terms of nutritional status than subsistence farmers (Anderman, Remans, Wood, DeRosa, & DeFries, 2014).

Nevertheless, the expected income-mediated positive results at household and societal level are generally greater than the constraints experienced (Zhou, Minde, & Mtigwe, 2013). Tendencies of specialization and commercialization in agriculture could, theoretically, be perceived as more efficient than subsistence farming. Gains in income may occur through comparative advantages, economies of scale and different changes caused by social learning effects (Gebremedhin & Jaleta, 2010). When these factors are favourable, they facilitate or enable the success of the commercialisation process, but when unfavourable they hinder the process causing its failure. Most successful cases are based on collaborative efforts between different actors along a particular value chain as successful commercialization has proved difficult without partnerships and all-inclusive approaches (Zhou et al., 2013). On the other hand, due to market imperfections, risks for agricultural households may also increase: commercialization of agriculture may result in a decline in crop diversity for households (Rerkasem et al., 2009), or in employment opportunities. Households risk to become less self-sufficient and more dependent on local markets. In regions where markets are not well-integrated, volatile market prices of crops and inputs, inefficient marketing institutions and poor infrastructure may pose risks to household income (Immink & Alarcon, 1993; Jaleta, Gebremedhin, & Hoekstra, 2009). Moreover, due to the lack of access to credit, households may become less able to mitigate

these risks (Immink & Alarcon, 1993). In such regions subsistence farming serves as a kind of insurance against the risks and costs of the market (Von Braun, 1995).

3.1 Areas of tension linking agricultural commercialisation to nutrition

Acknowledging that the impact of agricultural interventions on the nutritional outcomes at household or individual level is hard to identify (Kanter, Walls, Tak, Roberts, & Waage, 2015) and the signalled lack of evidence is surprising given the multiple pathways of potential influence of these types of programmes (Ruel & Alderman, 2013). One reason might be that several of the programs documented so far were not originally designed with clear nutrition goals and actions from the outset and were “retrofitted to be nutrition-sensitive” (Meeker & Haddad, 2013). Other reasons might be related to contextual factors of influence, or to the entire agricultural value chain. During our review of frameworks and pathways, several issues of tension became explicit between agricultural development and food and nutrition security.

Dury et al. (2015) explored the main pathways linking commercialisation in agriculture to nutrition and identified a number of potential risk areas. A first risk related to *income*: an increase in income may not necessarily improve nutrition options and choices, as these are heavily dependent on control over income and income regularity. A second risk related to the *mismatch* in food availability and diversity. This may play a role at meso- and macro-levels where food availability may be dominated by a certain type of crops promoted by agricultural interventions, in particular when the focus is mostly on staple or cash crops, potentially leading to simplified/monotonous diets (Gillespie & Kadiyala, 2011). A third risk related to *price drops* as a result of increased production of a certain crop leading, with diverse and ambivalent consequences on nutrition security. Price drops of agricultural products can have both positive and negative effects, dependent on factors such as what type of product it relates to; whether the household is in an urban or rural area; and whether the household is a net seller or buyer. Policies that emphasise one crop could lead to substitution as more farmers switch to the subsidized crop, potentially increasing the prices of other crops. The fourth risk related to the *role of women* as key actors in the pathways. In some cases agricultural interventions have the consequence of decreasing the women’s role in decision-making and increase the workload for women. This may be because extension projects are specifically targeted at men, or that increased agricultural activities take time and energy away from other household responsibilities. The fifth risk related to *health and environmental degradation* resulting from agricultural interventions. Some farming practices have shown negative effects on the environment or the quality of food, consequently affecting nutrition security and health. Intensified livestock farming, for example, may increase the presence of disease and decreased hygiene practices. Exposure to pesticides holds potential risks for health of people working with them, and those who eat exposed food products. Irrigation might bring risks related to water-borne diseases and virus-transmitting insects. A sixth risk relates to the fact that *people might become excluded* from agricultural interventions supporting commercialisation, thereby creating or reinforcing inequalities. This may be linked to a wide spectrum of factors including diminishing or limited access to land, access to finance and resources, access to human and social capital (Dury et al., 2015).

Also USAID, based on the USAID Spring programme, flagged a number of critical issues relating to the planning and development of market oriented agricultural development interventions for improving nutrition (USAID, 2016), stating that the aims and strategies for agricultural development for improved nutrition are hard to align. The main hurdles according to the USAID Spring experiences relate to:

- The first area relates to *beneficiary targeting*, highlighting the fact that nutrition-specific and – sensitive programmes typically target the at risk groups: the nutritionally vulnerable, such as pregnant and lactating women (PLW), and children under two years of age. Agricultural market development programmes typically target smallholder farmers producing, or having the potential to produce (including PLW), usually using facilitation as implementation strategy, thus encouraging

self-selection. Thus, the overlap between economically vulnerable, and the nutritionally vulnerable groups may be limited.

- The second area relates to the *intervention approach*. Nutrition-specific programmes generally use stepwise and sequential approaches for implementation, building on a cascade strategy of capacity building at multiple levels. They start with training government staff, then local trainers to train community leaders, who then educate and train the target population. Agricultural development programs work, whenever possible, through existing market actors (private sector, leverage commercial incentives) and focus on public-private liaisons. The common denominator in both strategies is the focus on behaviour change mechanisms of actors involved. There are substantial differences, however, in professional paradigms underpinning the different actions.
- The third area relates to *the commercialisation of food*: Agriculture and nutrition are both concerned with markets for food, particularly because many smallholder farmers are net buyers of food, representing farmer households in transition, producing for consumption and for markets. Agricultural programmes typically promote the production and sale of a small number of crops that have high market demand but may not be nutrient-rich. When nutritious crops are selected, smallholder farmers who previously produced for home consumption may switch to selling these nutritious crops.
- The fourth area relates to *monitoring and evaluation*: This is challenged by the fact that nutrition-sensitive agricultural activities may contribute to reductions in stunting, underweight, and wasting – the classic nutrition indicators –, but are unlikely to directly cause them, particularly in the absence of complementary interventions such as nutrition behaviour change communication. Indicators for agricultural development activities typically include increases in total production, sales, and incomes. Linking such outcomes to improvements in nutrition is difficult and highly context-specific. In addition, changes at the household or individual level are relatively easy to measure directly but there are no defined methods for measuring systems-level change.

In the current debates on strengthening food and nutrition security through nutrition-sensitive agriculture, there is growing consensus on the need to reduce barriers between disciplines and sectors, particularly those between consumers, different food value chain actors, and policy makers. This will require a focus on changes in the social contexts, where farmer level and people are central, leading to new social arrangements and innovations. However, the causal chain from results of commercialisation in agriculture to nutritional impact is rarely articulated during activity design processes: nutrition-sensitive agricultural market development activities should articulate the theory of change, what is within the manageable interest of the activity, and causal pathways connecting agriculture and nutrition results. Intermediate indicators should be defined and tracked to verify assumptions made in the causal pathway (USAID, 2016).

Private sector players nowadays increasingly seek to get involved in smallholder farming and market systems. These actors act in parallel to government actors and development organisations, traditionally playing the biggest role in agricultural development and extension (McDermott et al., 2013). Also new technologies and innovations, such as mobile phone connections, are becoming available to urban as well as rural communities. These new constellations of actors and information technologies enable increased information and knowledge exchange, also challenging more cross-sectoral cooperation, because pathways linking agriculture and nutrition are largely indirect and require awareness, support from policy, and investments (McDermott et al., 2013).

In sum, to grasp the dynamics and contexts in which smallholders operate, taken from the dual perspective of farmers being (commercial) producers as well consumers, a better understanding is needed of the choices and decision making strategies relating to (food) production strategies on the one hand, and consumption choices on the other. Specialisation and commercialisation could represent a more efficient strategy than subsistence for smallholders (Gebremedhin & Jaleta, 2010), but this requires a reorientation towards sustainable food systems, delivering *'food security and nutrition for all in such a way that the economic, social and environmental bases to generate food security and nutrition for future generations are not compromised would be needed'* (Westhoek, van Berkum, Özay, & Hajer, 2016); p.12).

4 Conceptual framework for identifying development pathways from commercially viable agriculture to consumption of nutritious foods

Within the scope of the research project 'Developmental agricultural pathways for viable commercial agriculture and consumption of nutritious foods' this desk review seeks contribute to generating the information base for long term policy and investment processes to shape climate-smart and resilient food systems that stimulate food and nutrition security, with a particular focus on the reduction of chronic undernutrition and micronutrient deficiencies. The overall aims are to explore the complexity of the contextual dynamics in which smallholder farming households operate - context defined by food systems, acknowledge global (trade and climate) national levels, and ongoing process of commercialisation in agriculture - ; and to contribute to a better conceptual understanding of commercial food production strategies in relation to consumption choices – the combination of agricultural production and consumption at farm household level.

More particularly, the aim is to formulate a framework for identification of nutrition-sensitive (commercial) development pathways in agriculture in which improved production technologies enable:

- Commercialisation, or: selling more yields at the (local, regional or national) market and increase income in this way;
- a more efficient use of (natural) resources in an environmentally sustainable way;
- Increased production of nutritious foods: balancing attention for the production of cash/staple foods and nutritious commodities like fruits and vegetables;
- Increased stability and availability of nutritious foods to vulnerable population groups.

Based on the outcomes of the multidisciplinary dialogue, the common ground for a framework was found in:

- A focus on rural agricultural household level dynamics, forming the key linkage between agricultural commercialisation processes and nutritional outcomes;
- The acknowledgement that pathways between agricultural commercialisation and food and nutrition security cut across different levels, and can take various shapes and forms, potentially leading to positive as well as negative consequences;
- It was agreed that there was a need to capture the interrelatedness within the flexible framework, in the sense that well-being, or benefits throughout the life course (Black et al., 2013), are an outcome in itself, but at the same time provide an input for new processes and decisions that may impact other household goals.

Therefore, the important characteristics for a conceptual framework for viable commercial agriculture and consumption of nutritious foods should evolve around different aggregation levels: the individual (gender and power dynamics), the household (household food production, income generation, food purchase choices, care practices, access to health care), the community (employment opportunity, collaboration, microfinance, care and social (infra)structure), and the regional/national (price and trade policy) level. These elements, emerging from practical every document reviewed, form the backbone of the conceptual framework to be developed, alongside with identifying the key actors, assets and processes that shape nutrition sensitive development pathways in farm households in a commercializing agriculture.

This chapter presents the overall synthesis of the findings of the literature and framework reviews in the form of a refined framework for identifying and analysing of development pathways for viable commercial agriculture and consumption of nutritious foods. As indicated earlier, the underlying theoretical concept of the framework builds on a food systems perspective. This entails that there are many dimensions and outcomes that are affected by how food is produced and consumed.

4.1 Review of frameworks linking agriculture to nutrition

A number of existing frameworks linking agriculture to nutrition were reviewed to serve as a basis for the formulation of a conceptual framework for identifying development pathways from commercially viable agriculture to consumption of nutritious foods. While authors may differ in the definition of specific pathways, four key areas are recurrent in the literature and have been taken on by the Study Group in charge of the Lancet Series on Maternal Health and Nutrition (Ruel & Alderman, 2013). These four broad areas are: (i) food prices, (ii) income from agriculture, (iii) consumption of own production due primarily to market imperfections, and (iv) factors linked to gender. The latter include issues such as women's social status and empowerment in agriculture, women's time, and women's health and nutritional status, all of which can be both influenced by their role in agriculture and affect their productivity in agriculture and ability to care for their family and especially their young children (Pinstrup-Andersen, 2013).

The frameworks reviewed are:

- FAO Food security framework; incorporates food availability, accessibility, utilisation and stability, as food insecurity is a fluctuating condition relating e.g., seasonality, income insecurity, or climate conditions (FAO 1996);
- UNICEF framework on maternal and child undernutrition covering the basis, underlying and immediate causes of malnutrition and nutrition insecurity (UNICEF, 1991);
- the FAO FIVIMS, Covering both what is often referred to food and nutrition highlighting the multiple entry points at multiple levels for food and nutrition security (FAO, 1998; Webb, 2013);
- The Lancet Series on Maternal Health and Nutrition. In this model the main factors and levels linking the food economy with households and individual nutrition status are described. Especially relevant for this topic is how the contextual environment and the food economy affect household livelihood strategies, assets and activities;
- The Conceptual pathways between agriculture and nutrition: Feed the Future programme (Du, Pinga, Klein, Danton, & Jeyakumar, 2015); adapted from (Gillespie et al., 2012);
- The 'commercialisation at household level framework' (Von Braun, 1995; Von Braun & Kennedy, 1994);
- The conceptual framework on linkages between agriculture, the food system, nutrition and public health (Kanter, Walls, Tak, Roberts, & Waage, 2015).

Table 4.1 summarizes the frameworks exploring linkages and pathways between agricultural interventions and nutrition-related outcomes.

As is emphasised by GloPan, taken from a food systems perspective, there is a need to include dynamics related to environment, health, education and socio-economics (Global Panel on Agriculture and Food Systems for Nutrition, 2016). This requires a multilevel approach of contextual elements that affect farm household decision-making and livelihood outcomes. Different combinations of national and regional political, environmental and cultural factors, agricultural commercialisation processes, and institutional realities, together with local and household considerations, influence the decisions and activities of agricultural households. Through these combinations, different pathways and options arise that can affect food and nutrition outcomes.

The conceptual framework to be developed departs from the existing frameworks (Von Braun, 1995; FAO, 1996; DFID, 1998; Black et al., 2013; Webb, 2013; Hertforth & Harris, 2014; Kanter et al., 2015), but seeks to highlight three main contributions:

- it embraces a multi-level approach taking in account several factors that affect farm household livelihood outcomes. This emphasises the interactions between macro dynamics and the household considerations;
- the rural agricultural household interactions with the external environment are the focus of this framework. In this space farmers negotiate their assets with the external environment through their decision- and sense-making behaviours. These dynamics generate pathways which cut across different levels and can take various shapes and forms, potentially leading to changes for farmers' livelihood;

-
- it considers time thanks to the inclusion of a life course perspective (Black et al., 2013). From this point of view the relations between inputs and outcome are non-linear, providing new processes and decisions that impact new household goals.

Table 4.1 Overview frameworks exploring linkages and pathways between agricultural interventions and nutrition-related outcomes (see also Appendix 2)

Theme	Framework title	Source	Key elements
Food Security and sustainable livelihoods	Food security	FAO 1996	<p>Four-pillar framework, highlighting access, availability, stability and utilisation of food:</p> <ul style="list-style-type: none"> • <i>Food availability</i>: The availability of sufficient quantities of food of appropriate quality, supplied through domestic production or imports (including food aid). • <i>Food access</i>: Access by individuals to adequate resources (entitlements) for acquiring appropriate foods for a nutritious diet. Entitlements are defined as the set of all commodity bundles over which a person can establish command given the legal, political, economic and social arrangements of the community in which they live (including traditional rights such as access to common resources). • <i>Utilization</i>: Utilization of food through adequate diet, clean water, sanitation and health care to reach a state of nutritional well-being where all physiological needs are met. This brings out the importance of non-food inputs in food security. • <i>Stability</i>: To be food secure, a population, household or individual must have access to adequate food at all times. They should not risk losing access to food as a consequence of sudden shocks (e.g. an economic or climatic crisis) or cyclical events (e.g. seasonal food insecurity). The concept of stability can therefore refer to both the availability and access dimensions of food security.
	Sustainable livelihood framework	DFID, 1998	<p>Framework grounded in five critical concepts for assessment and analysis:</p> <ul style="list-style-type: none"> • The <i>vulnerability context</i>: The risk that the food and nutrition status of the household is undermined by negative shocks. • <i>Livelihood assets</i>: <ul style="list-style-type: none"> ○ Diversity in assets ○ Ability to access, defend and sustain these assets ○ Abilities to transform those assets into income, dignity, power and sustainability ○ human and social capabilities to use and defend assets • <i>Institutions</i> • <i>Livelihood strategies to deal with shocks</i> <ul style="list-style-type: none"> ○ Risk prevention: strategies to reduce the probability of occurrence of unexpected negative events ○ Risk mitigation: strategies to reduce the impact of future negative shocks ○ Risk coping: strategies to limit the impact after negative shocks have occurred ○ Resilience: The time needed to achieve or surpass the pre-shock status of well-being • <i>Livelihood outcomes</i>: Living conditions that imply an improved quality of life according to people's own criteria, influenced by the vulnerability context.
	Food Insecurity and Vulnerability Information and Mapping Systems (FIVIMS)	FAO, 1998	<p>Framework based on the food security and sustainable livelihood framework described above : a framework for analysing food insecurity and livelihood vulnerability, linking the:</p> <ul style="list-style-type: none"> • overall (vulnerability) development context, relating to the Socio-economic and political environment • the performance of the food economy • household <ul style="list-style-type: none"> ○ livelihood strategies, assets and activities; ○ Food access, vulnerability to food & nutrition insecurity ○ Care practices;

Theme	Framework title	Source	Key elements
			<ul style="list-style-type: none"> o health and sanitation • Individual measures of well-being
	UNICEF conceptual framework for malnutrition	Unicef, 1991	<ul style="list-style-type: none"> • Conceptual framework identifying causes of maternal and child undernutrition as multisectoral, embracing food, health and caring practices: • Immediate (or direct) causes: disease or inadequate dietary intake • Underlying causes influencing households and communities: household food insecurity, inadequate care; unhealthy household environment and lack of (access to) health services • Basic causes around the structure and processes of societies: social, economic and political context: lack of capital (financial, human, physical, social, or natural).
	Framework for Maternal and child undernutrition and overweight in low-income and middle-income countries	Black et al. 2013, the Lancet	<ul style="list-style-type: none"> • Framework for action identifying nutrition-specific and nutrition-sensitive approaches, leading to optimal fetal and child growth and development - encompassing both undernutrition and overweight - from a life course perspective: • <i>Building an enabling environment</i>: Knowledge and evidence, Politics and governance, Leadership, capacity, and financial resources; Social, economic, political, and environmental context (national and global) • <i>Nutrition sensitive programmes an approaches</i>: food security, including availability, economic access, and use of food; Feeding and caregiving resources (maternal, household and community levels); Access to and use of health services, a safe and hygienic environment • <i>Nutrition specific interventions and programmes</i>: Breastfeeding, nutrient-rich foods and eating routines; feeding and caregiving practices, parenting, stimulation; low burden of infectious diseases
Agriculture to Nutrition	Pathways for impact of nutrition sensitive agriculture	Herforth & Harris, 2014 Feed the Future	<ul style="list-style-type: none"> • Framework identifying programming principles for agricultural programs and investments to strengthen impact on nutrition: • Incorporate explicit nutrition objectives and indicators into their design and track and mitigate potential harms while seeking synergies with economic, social, and environmental objectives. • Assess the context at the local level to design appropriate activities to address the types and causes of malnutrition. • Target the vulnerable and improve equity through participation, access to resources, and decent employment. • Collaborate and coordinate with other sectors (health, environment, social protection, labor, water and sanitation, education, and energy) and programs through joint strategies with common goals to address concurrently the multiple underlying causes of malnutrition. • Maintain or improve the natural resource base (water, soil, air, climate, and biodiversity), which is critical to the livelihoods and resilience of vulnerable farmers and to sustainable food and nutrition security for all. Manage water resources in particular to reduce vector-borne illness and to ensure sustainable, safe household water sources. • Empower women by ensuring access to productive resources, income opportunities, extension services and information, credit, and labor- and time-saving technologies (including energy and water services) and by supporting their voice in household and farming decisions. Equitable opportunities to earn and learn should be compatible with safe pregnancy and young child feeding. • Facilitate production diversification, and increase production of nutrient-dense crops and small-scale livestock (for example, horticultural products, legumes, livestock and fish at a small scale, underutilized crops, and biofortified crops). Diversified production systems are important to vulnerable producers to enable resilience to climate and price shocks, more diverse food consumption, reduction of seasonal food and income fluctuations, and greater and more gender-equitable income generation. • Improve processing, storage, and preservation to retain nutritional value, shelf life, and food safety; reduce seasonality of food insecurity and post-harvest losses; and make healthy foods convenient to prepare.

Theme	Framework title	Source	Key elements
			<ul style="list-style-type: none"> • Expand markets and market access for vulnerable groups, particularly for marketing nutritious foods or products vulnerable groups have a comparative advantage in producing. This can include innovative promotion (such as marketing based on nutrient content), value addition, access to price information, and farmer associations.
Commercialisation in agriculture relating to health and nutrition	Commercialisation of agriculture in relation to food security	Von Braun, 1995	<p>Basic relations in the commercialization process</p> <ul style="list-style-type: none"> • <i>Exogenous factors</i> that determine commercialization & <i>Endogenous factors</i> that tend to affect the influence of commercialization on income and nutrition • <i>Exogenous determinants</i> of commercialization: population change, availability of new technologies, infrastructure & market creation, macro-economic and trade policy <ul style="list-style-type: none"> ◦ Technological change (e.g. new seeds, improved agricultural practices) --> increased total factor productivity ◦ Increased commercialization can occur without technological change, but technological change without increased commercialization seems unlikely ◦ Commercialization implies increased market transactions for capturing the gains from specialization • <i>Endogenous consequences</i> of commercialization: related to decision making in the household (see figure for examples), e.g. <ul style="list-style-type: none"> ◦ Allocation of income for food and non-food consumption ◦ Distribution of available food and other items among household members ◦ Time spending household member
	Conceptual framework of the links between agriculture, the food system, nutrition and public health;	Kanter, Walls, Tak, Roberts, & Waage, 2015	<p>Conceptual framework, building on exiting frameworks to develop a more comprehensive framework that presents key domains linking agriculture and food systems to nutritional outcomes and public health.</p> <p>Important elements of the relationships presented in the existing frameworks include:</p> <ul style="list-style-type: none"> • the 'market pathway', which includes food processing, packaging and transport; • the 'own production' pathway; • the income pathways for either non-agricultural or agricultural-based income; • the contributions of food consumption, care (e.g., women's time in the face of their role in agricultural production and innovation) and health (e.g., foodborne diseases and aflatoxins); • the key themes of 'gender' and 'household quality of care' being strongly related to both household agricultural activities as well as dietary intake.

4.2 Development of conceptual framework

In order to identify development pathways linking agriculture commercialisation processes to household food security and nutrition, different aggregation levels are taken into consideration. At macro-level demographic, environmental, social, political, institutional and economics factors impact the agricultural value chain. These factors are interrelated with each other and occasionally they may directly affect household level processes (i.e. natural disaster). At community level, the socioeconomic and environmental factors are contextually adapted to small scale elements relevant for farmers' households such as the presence or absence of nutritious food, services, technologies, social networks, regulations and laws, health, education and care services.

The rural agricultural household is identified as the unit of analysis, as the space where production and consumption strategies are negotiated with the external context. The interaction between farmers' decision-making behaviours, assets allocation strategies, change and innovation, influenced by the external environment can contribute to generate different pathways (Von Braun, 1995). It is crucial to understand the role of farmers in linking agricultural commercialisation processes and nutritional outcomes. Several factors influence farmers' decision- and sense-making. Household capitals (natural, physical, human, social, financial) can be allocated in different ways. Farmers negotiate on time allocation. The quantity of time dedicated to social and productive activities generate a different set of activities outputs, such as surplus food, income, social safety nets, and education and training. Some of these resources will be allocated to guarantee food, health and care for the family members. Finally, all these complex interrelations between external influences and household decision making will end in different outcomes in terms of household members' nutritional and economic security (Frankenberger & McCaston, 1998).

The main elements of the framework are outlined in Figure 4.1 and delineates different levels, different factors, relations and processes:

- *Different levels within the framework* are defined to highlight the different aggregation levels and how they may have an impact at the household level. These factors may be interrelated and occasionally may directly affect household level processes (i.e. natural disaster);
- *Different factors within the framework* are defined to highlight different parts of the food system;
- *Relations and processes within the framework* are defined to highlight the transformation processes that take place when macro-level factors, and/or community level factors interact with household assets, embedded socio-cultural practices and norms, and household decision-making strategies, which eventually translate into household livelihood benefits (Households as producers and Households as consumers).

4.3 Farm household as key entry point

Farm households are situated within the wider context of a policy environment, climate and regional and (inter)national food systems. In rural agrarian economies, the farm household, being producer and consumer at the same time, is the level at which decisions are made when it comes to whether or not to embark on commercialisation in agricultural production. Therefore, the farm household is the key focus for our framework, and the main unit of analysis within the food system. This is in line with the Food and Agriculture Organisation (FAO) practices for food and nutrition security analysis – in the handbook on rural households, livelihood and well-being - taking the farm household as the key unit of analysis in research and programme implementation (Carloni & Crowley, 2005). The farm household can be defined as “a group of people who eat from a common pot, and share a common stake in perpetuating and improving their socio-economic status from one generation to the next”. Carloni and Crowley (2005) note that collective pooling of income, activities and expenditures are important aspects. Taking a farm household perspective provides a clearer picture of the on farm production and consumption of goods and services than when looking at individual farm household members.

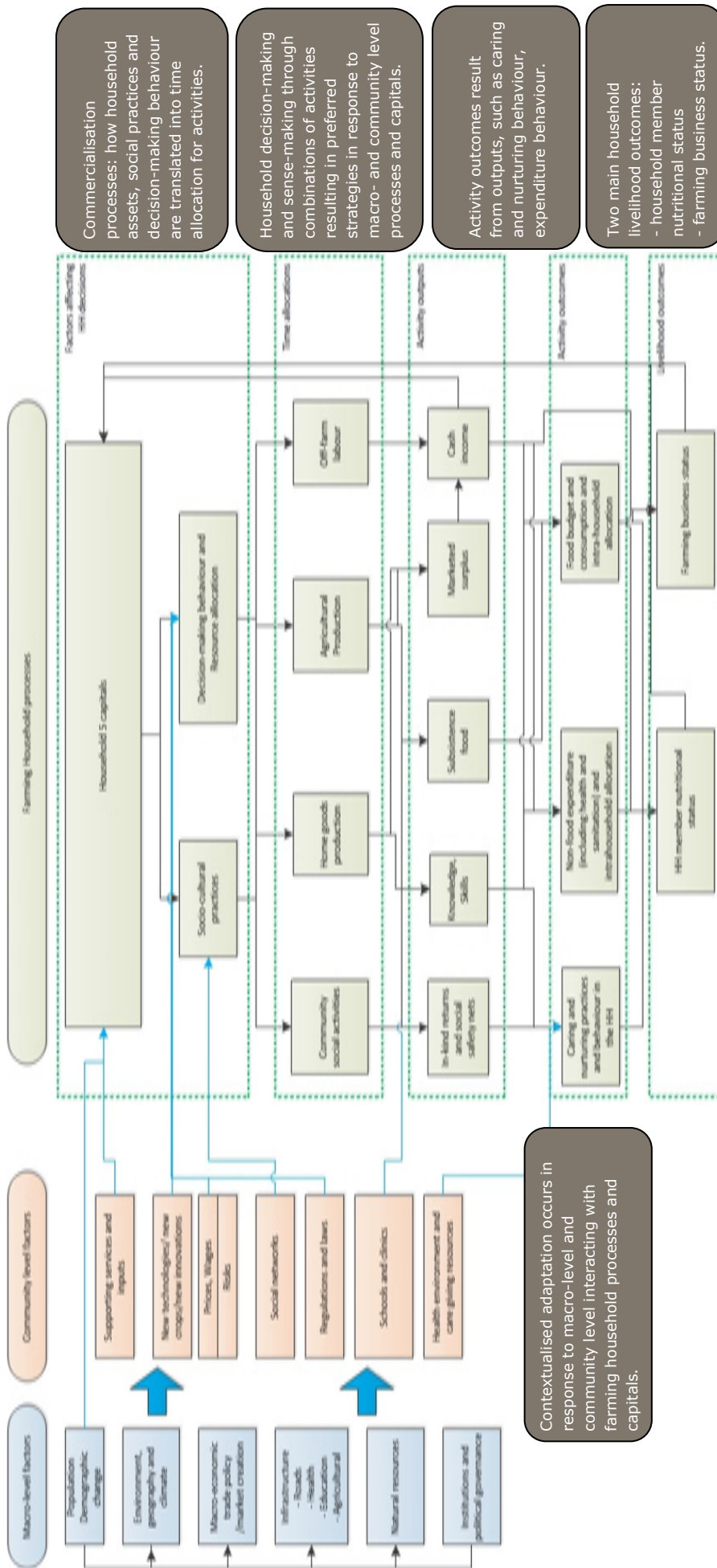


Figure 3 Conceptual framework for identifying development pathways of commercially viable agriculture for consumption of nutritious food.

Farm household determinants

Farm households can be described by a set of more or less 'fixed' or external factors, and a set of 'dynamic' factors (choices for smallholders, agent of the value chain or policy makers). With 'fixed' factors we mean the contextual and generally long-term determinants defining a household functions, and the factors best captured by the set of household livelihood capitals as defined in the Sustainable livelihood framework (Ashley & Carney, 1999; Bebbington, 1999) and the FIVIMs framework (FAO, 1998; FAO/FIVIMS, 2008), namely: (1) Human capital (male/female/child; household composition, demographics, age distribution, education), (2) social capital (social networks, cultural practices), (3) financial and physical capital (socio-economic status, assets), (4) farm capita (land, livestock), and (5) health (social and physical health and wellbeing, nutritional status).

The available capitals (natural, physical, human, social and financial) are used by the farm household to shape their future and achieve, often pre-set, goals. The capitals do not only operate as constraints but can also be framed as household level outcomes as well (Ashley & Carney, 1999; Bebbington, 1999). Bebbington (1999) indicated that it is important to see household resources as more than material means – access to assets are ways to make a living but also gives people capabilities to act, and form the basis of emancipation. In processes of development the way people use and access capitals changes. This depends on national and local drivers and trends. For instance, different resources such as credit, land, technologies and skills can become available. Environmental degradation and effects of climate change could also affect the extent of capital availability.

With 'dynamic' factors, we mean those factors which result from human interactions, and which are interrelated with one another, such as gender and power relations, decision making behaviours, role distribution, on- and off farm labour opportunities. Both sets of factors – fixed and dynamic - define whether or not farm households get involved in a transformation process from a subsistence-oriented production towards more specialized production targeting markets, and how they do it. Many of these decisions, however, are interlinked and activities are conducted together and in support of each other. As is shown in the FAO/FIVIMS framework, emergent trends and changes within the food system constellation (incorporating domestic food availability, climate and environmental stability, poverty status and market infrastructure) influence the household strategies, assets and household access to food (Webb, 2013). Therefore, a framework for viable commercial agriculture and consumption of nutritious foods at farm household level should include the four dimensions of food security: the availability, access, utilisation and stability of food. How increased income or food production translates into these four dimensions is still a major question.

Building our framework on the five capitals seems promising in order to unpack the mechanism that Von Braun (1995) signalled between resource endowments and how households allocate capitals to shape household decision making and implement household activities. It will also help to identify the different pathways at farm household level regarding the use capitals in relation to particular strategies, such as working on different crops, applying labour differently or migrating. In addition, it will help identify how agricultural commercialisation processes lead to access to new capitals, not only income, but new networks and social relations, for example.

Decision-making strategies for viable commercial agriculture and consumption of nutritious foods

The farm household decision-making process is a key mechanism that is essential to understand how the link between food production and food purchase might translate into better food and nutrition security. Von Braun (1995) highlighted the need to pay attention to resource endowments, which together with new technologies can lead to specific resource allocations in the form of land, labour and time distribution. These translate into more food or income that can be used for (more diverse) food consumption, sanitation and care practices. Kanter et al. (2015) distinguish between pathways such as the 'market pathway' (operating at national), household's own production, agriculture-based income and non-agriculture based income.

From these interpretations it becomes clear that availability and access to resources, the choices for different activities and income pathways for households, and household strategies are essential for improved life course benefits. Some farm household may want to specialize and focus on one (cash or subsistence) crop. Others may opt to rent out land and start other (off-farm) activities or focus on

food-self-sufficiency, or a combination of food and cash crop production. Others may decide to send a family member to the city – or even abroad – for labour migration or decrease pressure on food available (LIFT Fund, 2012). These different strategies are particularly in support of building financial and human capital, and of risk reduction, and seek to achieve life course benefits, access to assets and income, as well as food and nutrition security, at the farm household level.

In terms of identifying farm household strategies and outcomes of decision making, two main sets of variables can be used: behavioural variables, and farm household activities. Decision-making processes relate to people's behaviour and are not simply distinct goal-driven strategies and mechanisms, but entangled with unarticulated, non-rational, and habitual processes, linked with a variety of social and behavioural aspects, since production functions (the farm) and family functions (the household as consumer and care unit) go hand in hand.

Farm household activities

Farm household activities can be used as a proxy to identify the results of farm household decision making processes, for example in the form of income generating strategies, or crop production taking the farm household as a production unit. Or in terms of food and health procurement, care and education strategies when taking the household as a consumption/livelihood unit. Activities also depend on the way the five capitals are assigned or allocated, with the intention of being performed in such a way as to realise household benefits.

At the farm household level, several activities are performed by the household members, based on access to different forms of capital and their decision-making strategies. The activities are often part of an accepted division of roles and tasks with the farm household, often linked to gender and age. For example, care functions related to food and health are in most situations done by female members, as is food production for household consumption. Other household functions include the on-farm production of food and non-food products, agricultural labour on other farms, and non-agricultural labour activities. There is a spectrum of options available to households when it comes to use of their land: this can range from full time commercial food or cash crop production to a full focus on subsistence agriculture. In many cases it might be that there is a combination of both types of production attempted. Another activity that can be pursued is to lease land from other landowners in order to increase the area of land available for farming.

According to Von Braun (1995), on average women work less on commercialized crops than men or hired labourers. Women generally work more on subsistence crops. Thus, at least in terms of direct labour input, the cash crops and cash-intensive new technologies have largely become "men's crops". A shift from subsistence to commercialized crops then implies a shift between family labour and hired labour, whereby the assumption is that women may spend more time on care practices, and children (male and female) will have more time for their education.

Another distinction is on-farm and off-farm activities done by the household members. Off-farm labour can be seasonal labour or employment in various formal or informal businesses. This can include migration of family members to cities for study or work. On-farm activities are often related to care of other household members (children, old and sick), or working the land and crops. Responsibilities and labour division related to the functions is not necessarily equally distributed over the household members. For example, care tasks and food preparation are often done by women, while working in the field is often shared by household members.

Farm household benefits and outcomes

The outcomes of the process of agricultural commercialization are regarded as the life course benefits of farm households. These life course benefits fall under two categories: (1) benefits for the operational management of the farm household as a production unit, and (2) benefits for the farm household as a care unit, and a family, including nutritional status of household members.

The *commercially viable agriculture and improved production of nutritious foods* may encompass anticipated outcomes such as:

- Markets/infrastructure (physical capital);

- business viability: Good prices and income;
- Sustainability of household capital;
- Farm/value chain innovation practices’;
- Shifts in time allocation (off-farm labour, social and/or societal activities, education);
- In-kind returns and social safety nets;
- Improved production of nutritious foods, such as:
 - increased yields, or types/varieties of crops
 - Effects on natural capital (soil & water)
 - Use of agrochemicals (pesticides, herbicides, fertilizers)
 - Effects on human capital (workers: need for and health use of agrochemicals)

Improved consumption of nutritious foods would fall may encompass anticipated farm benefits such as:

- *Household diverse and nutritious diet and eating routine.* If income improves and food consumption improves from a low base, some nutritional improvement can be observed. However, if health is not addressed jointly, the nutritional improvement is small (Von Braun, 1995);
- *Household members’ improved nutritional status,* with long term benefits: cognitive, motor and socioemotional development, school performance, work capacity and productivity,
- *Improved health, and sanitation practices* and good household caring practices;
- *Non-food expenditure* (including health and sanitation) and intra household allocation.

The choice whether or not farm households will adopt agricultural commercialisation, however, is not simply a personal decision, but is influenced by many different factors. Some households might be better able to commercialize than others, for example as a result of differences in access to credit or infrastructure. Commercialisation of agriculture encompasses a process which touches upon multiple determinants and variables, at the input as well as the output side of production (Gebremedhin et al., 2010; Von Braun, 1995).

Pieters et al. (2013) highlighted that food availability, food access and food utilization determine the state the food and nutrition status of an individual or a household. Stability relates to two important dimensions, notably vulnerability and resilience towards the food and nutrition status. Vulnerability is defined as ‘the likelihood of experiencing future loss of welfare, generally weighted by the magnitude of expected welfare loss’ (Sarris & Karfakis, 2008). 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 (Pieters et al., 2013).

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 (Pieters et al., 2013).

Also at the consumption side of farm household food, the process of commercialisation in food production may lead to changes in access, availability, affordability and utilisation of food. A household is considered food secure if it has the ability to acquire the food needed by its members to be food secure. Their food security status is not only dependent on the (caloric) quantities consumed, but also on its nutritional quality as well as the diversity in the consumed food products. And even within households, food and nutrition security may vary from member to member for two main reasons: first, the ability to acquire enough food may not be converted into actual food acquisition. Household preferences may not prioritize food acquisition over the acquisition of other goods and services such as school fees and housing. Second, the intra-household allocation of the food may not be based on the needs of each individual member. The existence of a large number of households with both undernourished and obese members at the same moment is a case in point. Furthermore, the extent to which individual food security results in good nutrition depends on a set of non-food factors such as sanitary conditions, water quality, infectious diseases and access to primary health care. Thus, food security does not in itself assure nutritional security at household level (Pinstrup-Andersen, 2009).

4.4 Community level

Farm household decision making is highly influenced by perceived events taking place in the community – the option to work at a new company, market prices for key goods, availability of new technologies. This affects the way risks and opportunities are perceived. Household strategies thus lie (partially) at the interface of community and environmental developments, readings of capital access, and current and potential activities the household can engage in. The prioritization toward (or lack thereof) certain activities over others influences how the different capitals will be allocated and translated into actions and activities.

Popkin (2014) explored drivers of food system changes at farm level in relation to agricultural commercialisation in low and middle income countries. Two key dynamics, both relating to labour opportunities in the community, were identified within the food system, namely (i) the rapid growth in retailing and consumption of packaged and processed foods, and (ii) the shift in food value chains including traditional traders to value chains where supermarkets seek to source directly from farmers and wholesale traders. With respect to household food security and nutrition, Popkin highlighted a few knowledge gaps and issues. Firstly, it is important to not only focus on the first 1000 days in the life of a child, which is most common among nutrition community approaches. Intergenerational aspects related to girl adolescence and transmission of undernutrition should also be into account. This is in line with Black et al (Black et al., 2013), who highlighted the need to take on board a life course perspective emphasising optimal fetal and child growth and (cognitive and motoric) development, and work capacity-encompassing both undernutrition and overweight. Secondly, it remains a challenge to provide fresh food, building on the emerging consensus that processed and packaged foods generally do not provide sufficient nutritional value. Thirdly, research on value chains showed that food value chains are increasingly transforming, with very different implications for urban versus rural inhabitants (Reardon et al., 2014).

Anderman et al. (Anderman, Remans, Wood, DeRosa, & DeFries, 2014), in their study, focused on the importance of exploring community-based strategies that try to mitigate trade-offs between cash crop production and food availability, access and utilization, thereby emphasising the need for proximity and logistics of nearby markets, and access to necessary inputs and assets required to fulfil a new household economic activity. For example, based on a case study in Ghana, the authors found that income may increase through cash crop production, but this effect on food security can be limited if local markets do not supply enough diversified food purchasing options simultaneously, or if other economic events take place that cause the rise of food prices. Cash crop income is often seasonal while traditional subsistence crops might be available in more seasons. In Ghana, for example, cassava, plantain and maize have multiple cycles per year. Cash crops may deliver lump sum cash only once or twice per year. This means that saving strategies might affect the spread of diverse food purchase throughout the year. Also, increased dependency on global cash crop prices will affect food purchasing power.

Community-level relations in framework relate to how macro-level factors translate or have an impact on community level dynamics, for example, the presence and accessibility of extension service providers in the community following agricultural policy and infrastructure. Also combinations of community level factors may contribute to household assets and decision-making factors, but can also affect activity outputs, activity outcomes and livelihood benefits, for example social networks take shape at community level/extended family level promote certain cultural practices relevant to households and can affect individual households over time through social change, innovation and forms of agency.

In sum, community level factors relate to:

- Supporting services and inputs such as credit and business support services
- New technologies/ new crops/new innovations
- Prices, Wages
- Risks (perceptions)
- Social networks
- Regulations and laws
- Schools and clinics
- Health environment and care giving resources

4.5 The wider context: policy, environment and climate

The wider context - political setting, in combination with the socio-economic and cultural factors, and geographic environment - co-determines to a large extent the options and choices of individual farm households for agricultural pathways for viable commercial agriculture and consumption of nutritious foods. For farmers, changes in the natural resource base and climate patterns may also have a significant impact on choices and possible development pathways. These food system level variables, acknowledging the possible impacts on development choices and investments, form an integral part of the framework.

The policy environment contains a wide range of determinants that can be considered. Important influences that shape the policy environment include population growth, climate change, and increased competition for natural resources. Trends of urbanisation, income and economic growth changes, agricultural policies and the globalisation of food supply chains heavily affect the policy environment and context. This has consequences for how national and regional food systems take shape. Agriculture and food system policies, but also governance of food value chains by large-scale agro processing companies, affect factors such as market prices for food, input availability and innovations. Especially taking into account nutrition and dietary outcomes, it should be realised that policy actions are not only confined to agricultural policies: health and education touch on important issues of awareness and choices of individual citizens (Global Panel on Agriculture and Food Systems for Nutrition, 2016) (Kanter et al., 2015).

Furthermore, important contextual determinants for the farm household as production as well as consumer and care unit are population structure and demographic information on migration, employment structure, relevance of agriculture for the economy, main crops produced in the agricultural sector, regional variation in food and nutrition security. But also poverty levels, access to credit, energy, and inputs (seeds, pesticides, and fertiliser), infrastructure, and education and health care infrastructure.

Ecker et al. (2011) stated that in low income countries, while in the early stages of national development, agricultural growth can do much to decrease calorie deficiency. Building on cross-country data, they sought to link national GDP data with the major national nutrition challenges in Malawi and Yemen, and found that in later stages of economic development, increased economic diversification is necessary: agricultural growth seemed to have no effect on child malnutrition. They concluded that non-income related and individual/household level factors may be increasingly important (Ecker et al., 2011).

Reardon et al. (2014) explored a number of potato and rice value chains in Bangladesh, China and India. The study distinguished four different types of value chains, referring to the transition stages of the respective food systems: traditional rural, rural-urban traditional, the intermediate/transitional value chain, and the modern value chain. The main differences in types of value chains related to the geographical range and the number/type of intermediary actor involved in the value chain. With regard to the rice value chains, it was found that in China especially the modern rice value chain is dominant, while Bangladesh is mostly characterised by rural-urban rice value chains. With regard to potato value chains it was seen that in Bangladesh the rural-urban chain was most present, but the transitional value chain was emerging rapidly, especially due to more cold storage facilities being available. In China the rural-urban chain was most witnessed. In India the transitional potato value chain was often observed, also due to increased presence of cold storage facilities. The main drivers of transition in these two value chains were increased scale and technology of rice milling and potato storage. This could be related to increased demand from urban areas, while on the other hand supply was reinforced by the availability of technology and cold storage facilities. Government subsidies played an important role in stimulating this supply-side dynamics through direct and indirect pathways (such as road and energy networks). Further support was attributed to the entrance of private sector: foreign capital investment, deregulation and privatisation, as well as the presence of large agribusinesses.

Reardon et al. (2014) found that a number of specific elements played an important role:

- *Distribution of value-added*: this relates to the importance of processing, storage and distribution, which is just as important as productivity while often receiving less emphasis. Also the distance needed to transport goods, depending also on type of crops (perishable or not) matters a great deal for farmer profit. Furthermore, the value added depended on quality of rice and seasonality for potatoes;
- *Transformation of value-chains can empower farmers and lead to more consumer benefit*: this is because more versatile chains open up opportunities for farmers to sell to different people. Other developments relate to technological developments (use of cell phones, mobile options for access to finance). For (urban) consumers benefits relate to broadening seasonality, better quality differentiation and options for traceability;
- *Cost formation in value chains*: it turned out that efficient input supply chains and correct use of inputs are important to reduce cost of food. Also, labour costs were a significant component of food price, and if labour costs rise increased mechanisation may take place. Finally, availability of irrigation water and energy costs were significant as well, especially related to post-harvest storage. In the light of increased transitions in value chains, energy cost fluctuations are likely to become more important to address in the future.

In terms of governance, Reardon et al (2014) found that the governments had relatively little direct influence on rice and potato in these three countries (Bangladesh, China and India). The private sector dominates these value chains. The main role for governments was to enable opportunities through: research, development and provision of seeds; investments in infrastructure, wholesale markets and power grids; and extension services. The authors conclude that government policy addressing food and nutrition security, should:

- Support clusters of activities in an integrated way along the value chain. Combinations of investments, technologies and infrastructure were important since they worked simultaneously;
- Acknowledge heterogeneity of settings and value chain components: different zones and farm types need different policies;
- Understand that smallholders and remote rural communities are often at a disadvantage when it comes to benefitting from transitional value chains, because they lack access to the means, or time;
- Support a dialogue between market modernisation and agribusiness with actors addressing poverty and food and nutrition insecurity, since dynamics related to globalisation and urbanisation are becoming increasingly important (Reardon et al., 2014).

Pieters et al. (2013) argued that 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 (droughts or floods) and environmental and biodiversity changes. The long-term food demand trend is influenced by population growth, urbanization (change of diets) and income growth (Pieters, Guariso, & Vandeplas, 2013).

In sum, important factors at macro level relate to the policy environment, involving the availability, access (markets and infrastructure), utilisation and sustainability of food (food security), food safety, nutrition security, including aid and trade policies (e.g. free trade zoning), food prices, and other support mechanisms at national level (e.g. subsidies). Macro-level factors in the framework be interrelated with other macro level factors, for example, political governance affecting infrastructure development. Or they can have an impact on community-level factors, for example macro-economic policies affecting community level market prices and risks, or community rules and regulations. Or they relate to environmental or natural factors, which may have a direct impact at household level processes, for example in case of a natural disaster like an earthquake.

4.6 Conclusions and way forward

Rural agricultural household and intra-household decision-making and experiential dynamics represent the key linkage between agricultural commercialisation and nutritional outcomes. The key features of the framework for 'Development Pathways from Agricultural Commercialisation to Nutrition' highlight the multiple and complex pathways linking agricultural commercialisation and food security and nutrition. Key aspects that affect farm household's agricultural commercialisation processes relate to household sense- and decision-making behaviours relating to use of household assets, social practices and how these translate into time allocation and activity outputs, and how contextual, community- and macro level factors are of influence. Activity outputs such as surplus food, income, social safety nets, and education and training consequently generate activity outcomes such as caring and nurturing behaviour, non-food expenditure and food budget and consumption. These result into two main household livelihood outcomes: household member nutritional status and farming business status.

It was acknowledged that development pathways between agricultural commercialisation and food and nutrition security cut across different levels showing the importance of applying food systems thinking. There is a need to further capture the processes of contextualised adaptation at the farm household level in terms of sense-making and decision-making processes and to explore the (non-linear) aspects of the conceptual framework, to better understand how human well-being, or benefits experienced throughout the life course, can be an outcome as well as an asset for innovative action at the farm household level to achieve lasting household goals.

References

- Anderman, T. L., Remans, R., Wood, S. A., DeRosa, K., & DeFries, R. S. (2014). Synergies and tradeoffs between cash crop production and food security: a case study in rural Ghana. *Food Security*, 6(4), 541-554.
- Arimond, M., Hawkes, C., Ruel, M., Sifri, Z., Berti, P. R., Leroy, J., Frongillo, E. A. (2011). Agricultural interventions and nutrition: lessons from the past and new evidence. In B. Thompson & L. Amoroso (Eds.), *Combating micronutrient deficiencies: food-based approaches* (pp. 41-75). Rome: FAO.
- Ashley, C., & Carney, D. (1999). Sustainable livelihoods: Lessons from early experience. London: Department for International Development.
- Bebbington, A. (1999). A framework for analyzing peasant viability, rural livelihoods and poverty. *World Development*, 27(12), 2021-2044. doi: [http://doi.org/10.1016/S0305-750X\(99\)00104-7](http://doi.org/10.1016/S0305-750X(99)00104-7)
- Benson, T. (2011). Cross-sectoral coordination in the public sector: A challenge to leveraging agriculture for improving nutrition and health. *Edited by Shenggen Fan and Rajul Pandya-Lorch*, 145.
- Berti, P. R., Krusevec, J., & FitzGerald, S. (2004). A review of the effectiveness of agriculture interventions in improving nutrition outcomes. *Public health nutrition*, 7(05), 599-609.
- Black, R. E., Allen, L. H., Bhutta, Z. A., Caulfield, L. E., Onis, M. D., Ezzati, M., Rivera, J. (2008). Maternal and child undernutrition: global and regional exposures and health consequences. *The Lancet*, 371(9608), 243-260. doi: [http://doi.org/10.1016/S0140-6736\(07\)61690-0](http://doi.org/10.1016/S0140-6736(07)61690-0)
- Black, R. E., Victora, C. G., Walker, S. P., Bhutta, Z. A., Christian, P., de Onis, M., Uauy, R. (2013). Maternal and child undernutrition and overweight in low-income and middle-income countries. *The Lancet*, 382(9890), 427-451. doi: [http://dx.doi.org/10.1016/S0140-6736\(13\)60937-X](http://dx.doi.org/10.1016/S0140-6736(13)60937-X)
- Carletto, G., Ruel, M., Winters, P., & Zezza, A. (2015). Farm-Level Pathways to Improved Nutritional Status: Introduction to the Special Issue. *The Journal of Development Studies*, 51(8), 945-957. doi: 10.1080/00220388.2015.1018908
- Carlson, A. S., & Crowley, E. (2005). Rapid guide for missions: analysing local institutions and livelihoods. In FAO (Ed.). Rome: FAO.
- Du, L., Pinga, V., Klein, A., & Danton, H. (2015). Chapter One-Leveraging Agriculture for Nutrition Impact through the Feed the Future Initiative. *Advances in food and nutrition research*, 74, 1-46.
- Dury, S., Alpha, A., & Bichard, A. (2015). The negative side of the agricultural-nutrition impact pathways: a literature review. *World Food Policy*, 2(1), 78-100. doi: 10.18278/wfp.2.1.5
- Ecker, O., Breisinger, C., & Pauw, K. (2011). Growth is good, but is not enough to improve nutrition: International Food Policy Research Institute (IFPRI).
- FAO. (1996). *World Food Summit*. Paper presented at the World Food Summit, Rome.
- FAO. (1998). *Guidelines for national food insecurity and vulnerability information and mapping systems (fivims): Background and principles*. Rome: FAO Retrieved from <http://www.fao.org/docrep/meeting/W8500E.htm>.
- FAO. (2016) Global Information and Early Warning System Country Brief Myanmar Rome: FAO.
- FAO/FIVIMS. (2008). FAO/FIVIMS Framework: Linkages Between the Overall Development Context, the Food Economy Households, and Individual Measures of Well-being. Rome.
- FAOSTAT. (2016). FAOSTAT country profile Myanmar 2014/2015. Retrieved November 28, 2016, from <http://www.fao.org/faostat/en/#country/28>
- Gebremedhin, B., & Jaleta, M. (2010). *Commercialization of smallholders: Does market orientation translate into market participation?* : ILRI (aka ILCA and ILRAD).
- Gillespie, S., Harris, J., & Kadiyala, S. (2012). The Agriculture-nutrition disconnect in india: what do we know? *IFPRI Discussion Paper*. Washington D.C., USA: IFPRI Poverty, Health, and Nutrition Division.
- Gillespie, S., & Kadiyala, S. (2011). Exploring the Agriculture-Nutrition Disconnect in India. *Leveraging Agriculture for Improving Nutrition and Health. 2020 Conference Brief 20* (pp. 1-4).
- Global Panel on Agriculture and Food Systems for Nutrition. (2016). *Food systems and diets: facing the challenges of the 21st century*. London.

- Gross, R., Schoeneberger, H., Pfeifer, H., & Preuss, H.-J. (2000). The four dimensions of food and nutrition security: definitions and concepts. *SCN News*, 20, 20-25.
- Haggblade, S., Boughton, D., Cho, K. M., Denning, G., Kloeppinger-Todd, R., Oo, Z. S., Wong, L. C. Y. (2014). Strategic choices shaping agricultural performance and food security in Myanmar.
- Hawkes, C., Friel, S., Lobstein, T., & Lang, T. (2012). Linking agricultural policies with obesity and noncommunicable diseases: a new perspective for a globalising world. *Food Policy*, 37(3), 343-353.
- Hawkes, C., & Ruel, M. (2011). *Value Chains for Nutrition: 2020 Conference Paper 4*. Paper presented at the Leveraging Agriculture for Improving Nutrition and Health, New Delhi, India. www.ifpri.org/sites/default/files/publications/2020anhconfpaper04.pdf
- Hawkes, C., & Ruel, M. T. (2007). From agriculture to nutrition: Pathways, synergies and outcomes. Washington D.C., USA: World Bank Agriculture and rural development department.
- Herforth, A., & Harris, J. (2014). Understanding and applying primary pathways and principles *Improving Nutrition through Agriculture Technical Brief Series* (Vol. Brief #1). Arlington, USA: USAID: Strengthening Partnerships, Results, and Innovations in Nutrition Globally (SPRING) Project.
- Hunter, D., & Fanzo, J. (2013). Agricultural biodiversity, diverse diets and improving nutrition. *Diversifying Food and Diets: Using Agricultural Biodiversity to Improve Nutrition and Health*, 1-14.
- IHLCS. (2011). Integrated Household Living Conditions Survey in Myanmar (2009-2010) - Poverty Profile. Yangon: United Nations Development Programme.
- Immink, M. D., & Alarcon, J. A. (1993). Household income, food availability, and commercial crop production by smallholder farmers in the western highlands of Guatemala. *Economic Development and Cultural Change*, 41(2), 319-342.
- ISCN. (2014). *Improving diets through nutrition-sensitive agriculture*. Paper presented at the 2nd International Conference on Nutrition: Better nutrition, better lives, Rome.
- Jaenicke, H., & Virchow, D. (2013). Entry points into a nutrition-sensitive agriculture. *The Science, Sociology and Economics of Food Production and Access to Food*, 5(5), 679-692. doi: 10.1007/s12571-013-0293-5
- Jaleta, M., Gebremedhin, B., & Hoekstra, D. (2009). Smallholder commercialization: processes, determinants and impact *Improving Productivity and Market Success of Ethiopian Farmers Improving Market Opportunities* (Vol. Discussion Paper). Addis Ababa: International livestock research institute (ILRI).
- Kanter, R., Walls, H., Tak, M., Roberts, F., & Waage, J. (2015). A conceptual framework for understanding the impacts of agriculture and food system policies on nutrition and health. *The Science, Sociology and Economics of Food Production and Access to Food*, 7(4), 767-777. doi: 10.1007/s12571-015-0473-6
- Kawarazuka, N. (2010). The contribution of fish intake, aquaculture, and small-scale fisheries to improving food and nutrition security: a literature review. *WorldFish Center Working Paper*(2106).
- LIFT Fund. (2012). Baseline Survey Results. Yangon: LIFT Fund.
- Masset, E., Haddad, L., Cornelius, A., & Isaza-Castro, J. (2011). A systematic review of agricultural interventions that aim to improve nutritional status of children. London: : EPPI-Centre, Social Science Research Unit, Institute of Education, University of London.
- McDermott, J., Ait-Aissa, M., Morel, J., & Rapando, N. (2013). Agriculture and household nutrition security—development practice and research needs. *Food Security*, 5(5), 667-678. doi: 10.1007/s12571-013-0292-6
- Meeker, J., & Haddad, L. (2013). A state of the art review of agriculture-nutrition linkages *An AgriDiet Position Paper*. Cork, Ir.: Department of Food Business and Development, University College Cork.
- Ministry of Environmental Conservation and Forestry. (2015). Myanmar's Intended Nationally Determined Contribution-INDC. Nay Phi Taw: Ministry of Environmental Conservation and Forestry.
- Myanmar Ministry of National Planning and Economic Development. (2010). Myanmar: Multiple indicator cluster survey 2009-2010 Yangon.
- NESAC. (2016). From Rice Bowl to Food Basket: Three Pillars for Modernising Myanmar's Agricultural and Food Sector.
- Pieters, H., Guariso, A., & Vandeplas, A. (2013). Conceptual framework for the analysis of the determinants of food and nutrition security *FOODSECURE Working Paper 13*.
- Pingali, P. L. (2001). Environmental consequences of agricultural commercialization in Asia. *Environment and Development Economics*, 6(4), 483-502. doi: 10.1017/s1355770x01000274

-
- Pingali, P. L., & Rosegrant, M. W. (1995). Agricultural commercialization and diversification: processes and policies. *Food Policy*, 20(3), 171-185. doi:[https://doi.org/10.1016/0306-9192\(95\)00012-4](https://doi.org/10.1016/0306-9192(95)00012-4)
- Pinstrup-Andersen, P. (2009). Food security: definition and measurement. *Food Security*, 1(1), 5-7. doi: 10.1007/s12571-008-0002-y
- Pinstrup-Andersen, P. (2013). Nutrition-sensitive food systems: from rhetoric to action. *The Lancet*, 382(9890), 375-376. doi: [http://dx.doi.org/10.1016/S0140-6736\(13\)61053-3](http://dx.doi.org/10.1016/S0140-6736(13)61053-3)
- Popkin, B. M. (2014). Nutrition, agriculture and the global food system in low and middle income countries. *Food Policy*, 47, 91-96.
- Rab, H. N., Drees-Gross, A. L., Ariyaprichya, K., Zin, M. T., Zorya, S., & Chavapricha, R. (2016). Myanmar economic monitor. Washington D.C.
- Reardon, T., Chen, K. Z., Minten, B., Adriano, L., Dao, T. A., Wang, J., & Gupta, S. D. (2014). The quiet revolution in Asia's rice value chains. *Annals of the New York Academy of Sciences*, 1331(1), 106-118.
- Rerkasem, K., Lawrence, D., Padoch, C., Schmidt-Vogt, D., Ziegler, A. D., & Bruun, T. B. (2009). Consequences of swidden transitions for crop and fallow biodiversity in Southeast Asia. *Human Ecology*, 37(3), 347-360.
- Ruel, M. T. (2001). *Can food-based strategies help reduce vitamin A and iron deficiencies?: a review of recent evidence* (Vol. 5). Washington D.C., USA: IFPRI.
- Ruel, M. T., & Alderman, H. (2013). Nutrition-sensitive interventions and programmes: how can they help to accelerate progress in improving maternal and child nutrition? *The Lancet*, 382(9891), 536-551. doi: [http://dx.doi.org/10.1016/S0140-6736\(13\)60843-0](http://dx.doi.org/10.1016/S0140-6736(13)60843-0)
- Sarris, A., & Karfakis, P. (2008). Household Vulnerability in Rural Tanzania No. 17. *Commodities and Trade Policy Research Working Paper*. FAO.
- Shields, P., & Rangarjan, N. (2013). *A playbook for research methods: integrating conceptual frameworks and project management [2]*. Stillwater: New Forums Press.
- Taylor, J. E., & Adelman, I. (2003). Agricultural Household Models: Genesis, Evolution, and Extensions. *Review of Economics of the Household*, 1(1), 33-58. doi:10.1023/a:1021847430758
- Thompson, B., & Amoroso, L. (2014). *Improving diets and nutrition: food-based approaches*: CABI.
- UNICEF. (1991). Conceptual framework for nutrition UNICEF.
- UNSCN. (2010). A Road Map for Scaling-Up Nutrition (SUN) (pp. 22). Rome: UNSCN.
- UNSCN. (2013). *Nutrition impact of food systems*. Paper presented at the UNSCN Meeting of the Minds, Rome.
- USAID. (2016). Convergence and tension in nutrition-sensitive agricultural market development activities [Draft] *Discussion Paper* (Vol. Multi-sectoral nutrition strategy 2014–2025). Washington, D.C, USA: USAID.
- Van der Have, R. P., & Rubalcaba, L. (2016). Social innovation research: An emerging area of innovation studies? *Research Policy*, 45(9), 1923-1935. doi: <http://dx.doi.org/10.1016/j.respol.2016.06.010>
- Van Huylenbroeck, G., Vandermeulen, V., Mettepenningen, E., & Verspecht, A. (2007). Multifunctionality of agriculture: a review of definitions, evidence and instruments. *Living reviews in landscape research*, 1, 1--38.
- Von Braun, J. (1995). Agricultural commercialization: impacts on income and nutrition and implications for policy. *Food Policy*, 20(3), 187–202.
- Von Braun, J., & Kennedy, E. (1994). Commercialization of Agriculture, Economic Development and Nutrition. In Von Braun J & Kennedy E (Eds.). Baltimore, MD.: Johns Hopkins Press.
- Webb, P. (2013). Impact pathways from agricultural research to improved nutrition and health: Literature analysis and research priorities *Background Paper prepared for the ICN2*. Rome: FAO.
- Webb, P., & Kennedy, E. (2014). Impacts of Agriculture on Nutrition: Nature of the Evidence and Research Gaps *Food and Nutrition Bulletin*, 35(1), 126 -132
- Wegerif, M. C., & Hebinck, P. (2016). The Symbiotic Food System: An 'Alternative' Agri-Food System Already Working at Scale. *Agriculture*, 6(3), 40.
- Westhoek, H., van Berkum, S., Özay, L., & Hajer, M. (2016). Food systems and natural resources. Paris: United Nations Environment Programme-International Resource Panel.
- Zhou, S., Minde, I. J., & Mtigwe, B. (2013). Smallholder agricultural commercialization for income growth and poverty alleviation in southern Africa: A review. *African Journal of Agricultural Research*, 8(22), 2599-2608.

Appendix 1 Iterative approach for consultation and sense-making

To define a generic framework to capture the key processes that determine farm household food and nutrition security, an exploratory, iterative consultative approach was adopted (Figure A1). Starting in April 2016, a dialogue evolved between Wageningen Plant Research, Wageningen Economic Research and Wageningen Centre for Development Innovation on the development of a conceptual framework suitable for use for further case-based studies.

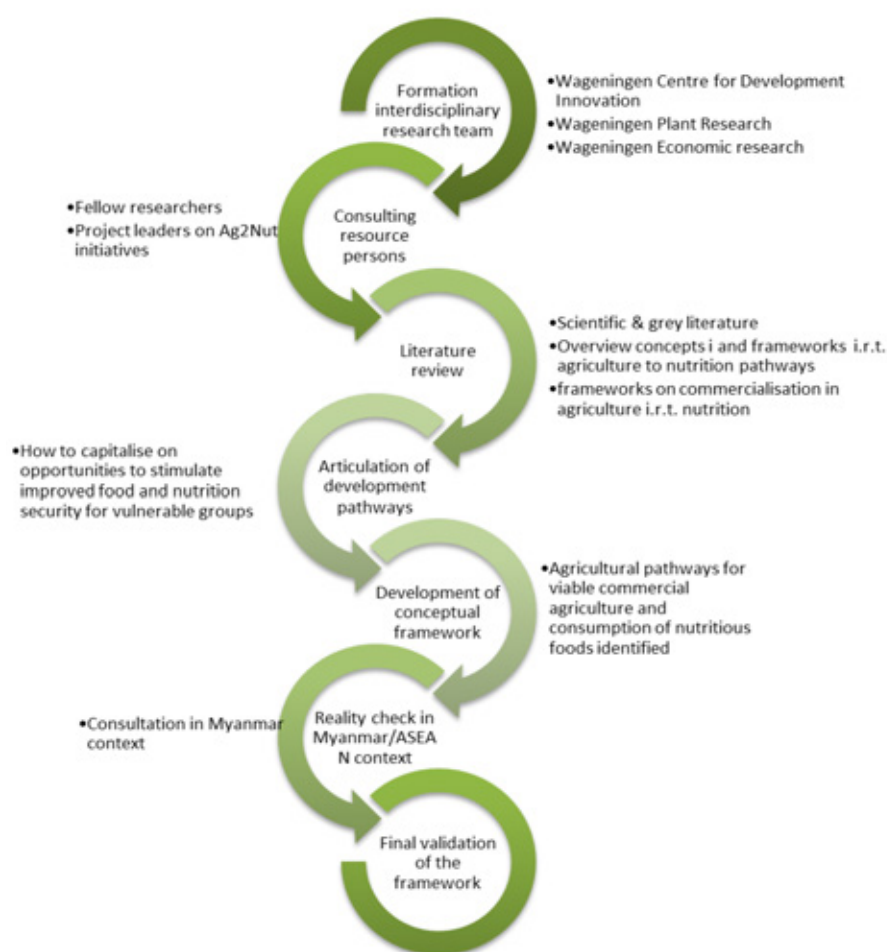


Figure A1 Approach towards development of a framework for agricultural pathways for viable commercial agriculture and consumption of nutritious foods

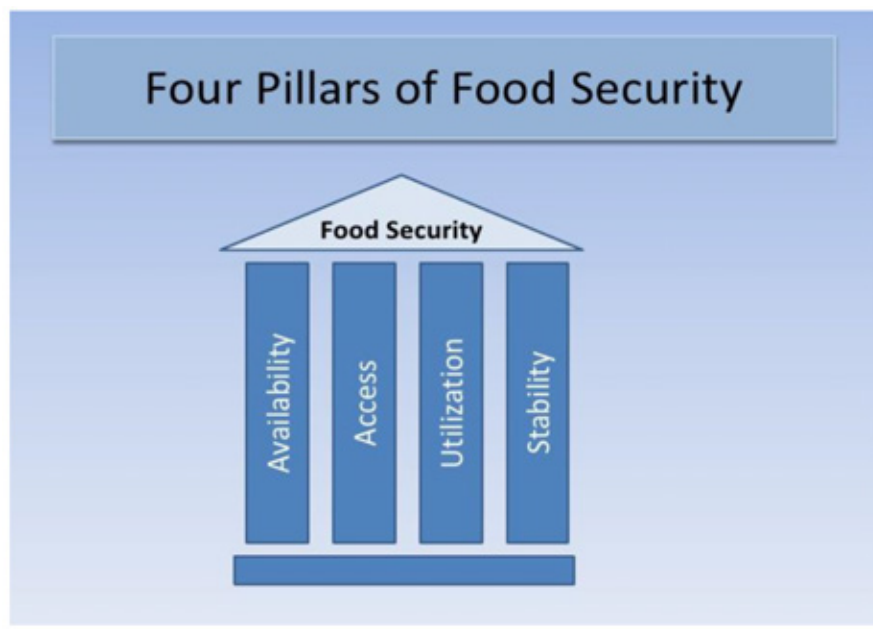
Working sessions were organised between April and September 2016, to explore existing insights, align available expertise, and to find common ground on how to create a useful framework that would fit the specific interests and expertise of each of the institutes. Economic Research was looking for a framework that would enable them to do scenario development on commercialisation in agriculture development and food and nutrition security for the region. Plant Research International preferred the emphasis on agricultural production of households, and cautioned not dive into 'intra-household' dynamics to maintain the opportunity to shift between national, regional and community levels. CDI emphasised the need to incorporate the four components of food and nutrition security and aspects of social innovation.

A common ground for the framework was found in:

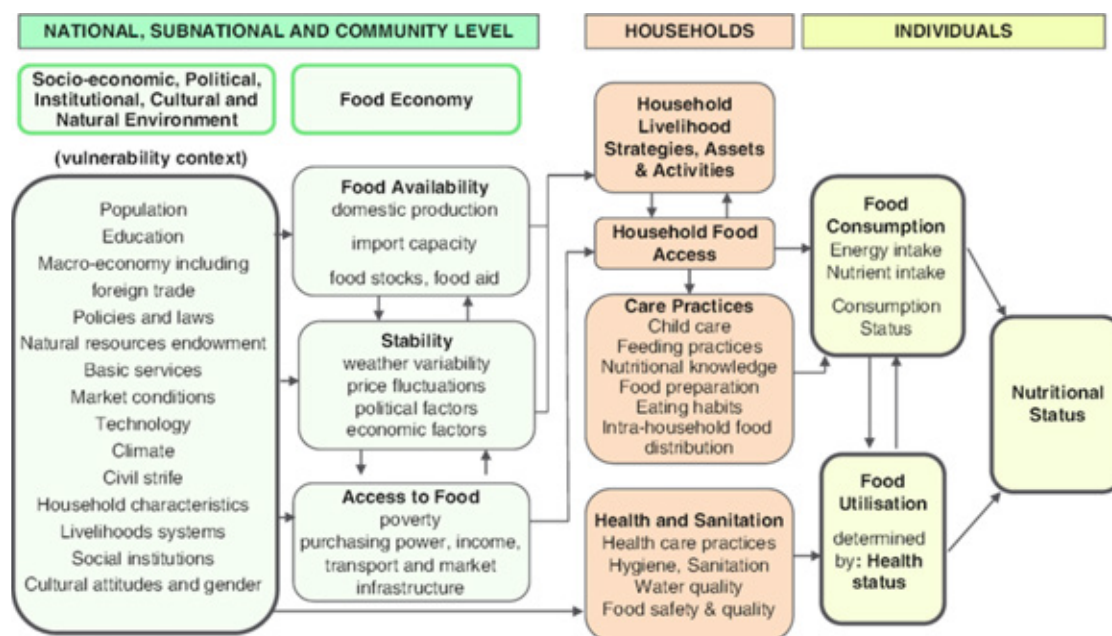
- A focus on rural agricultural household level dynamics, forming the key linkage between agricultural commercialisation processes and nutritional outcomes.
- The acknowledgement that pathways between agricultural commercialisation and food and nutrition security can take various shapes and forms, potentially leading to positive as well as negative consequences.
- It was agreed that there was a need for a flexible non-linear framework. Non-linear in the sense that 'well-being', 'healthy lifestyles' etc., do not need to be the end goals: from healthy lifestyles new processes and decisions are made that impact other household goals.

Appendix 2 Frameworks reviewed

I Food security

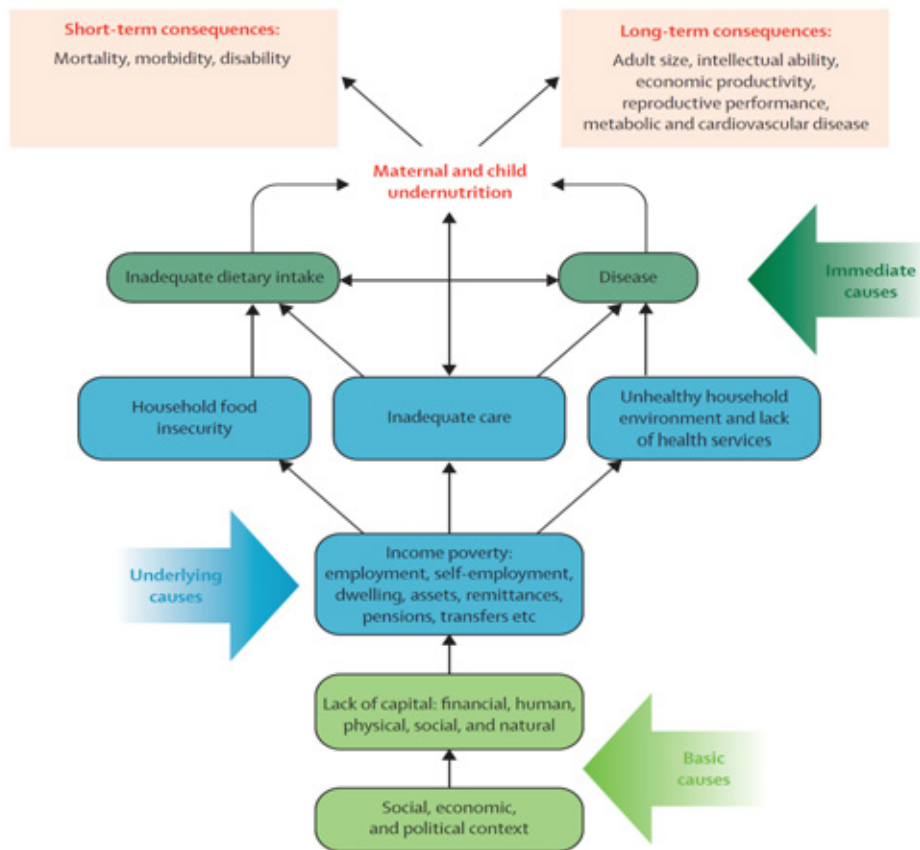


FAO: Framework Food Security (1996)

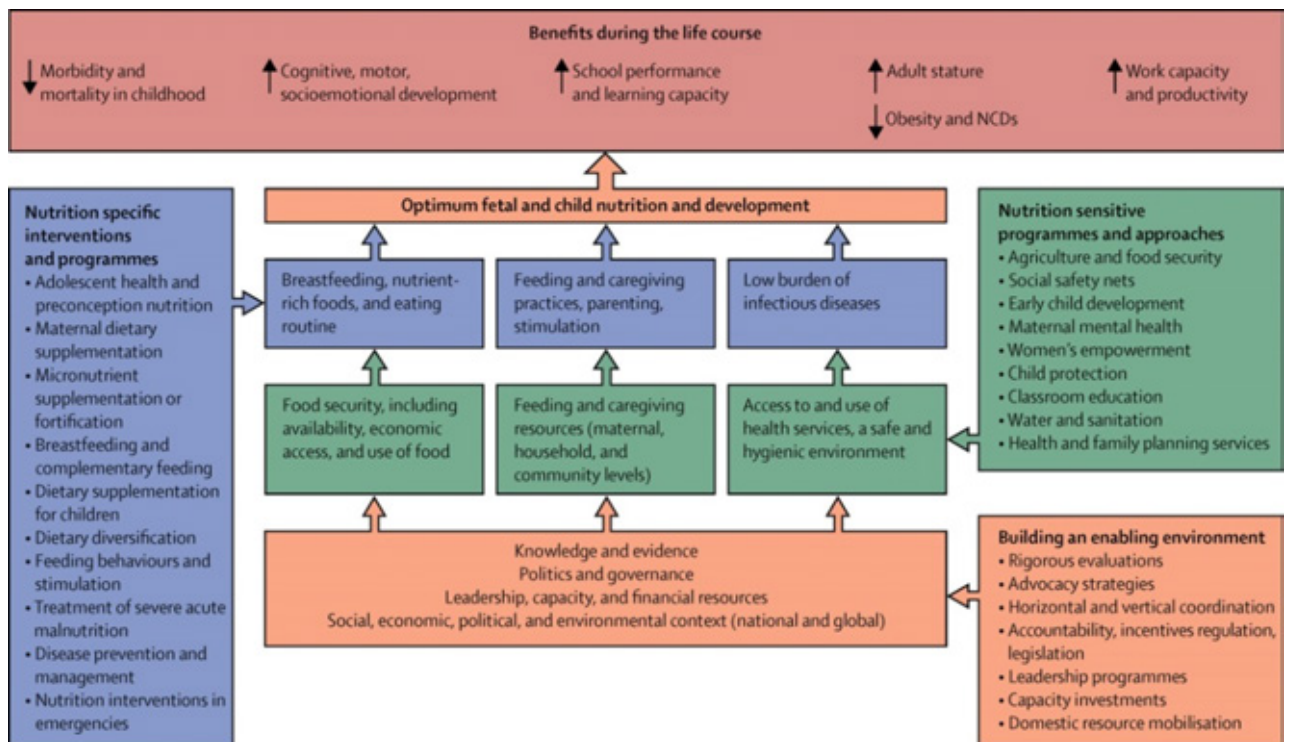


FAO/FIVIMS Framework (FAO/FIVIMS, 2008)

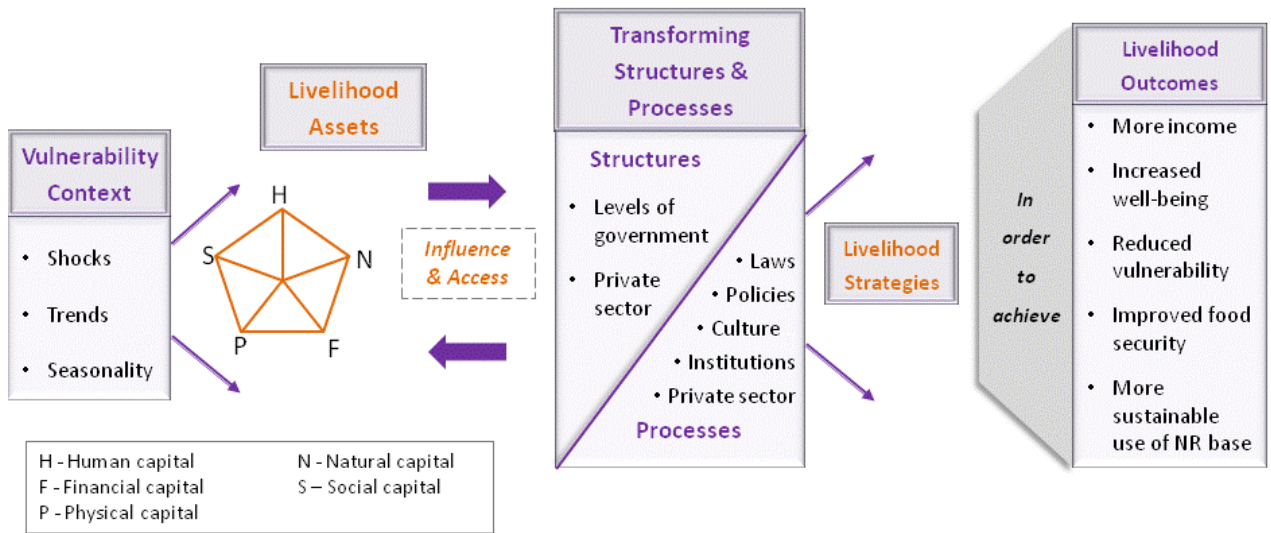
II Nutrition security & livelihoods



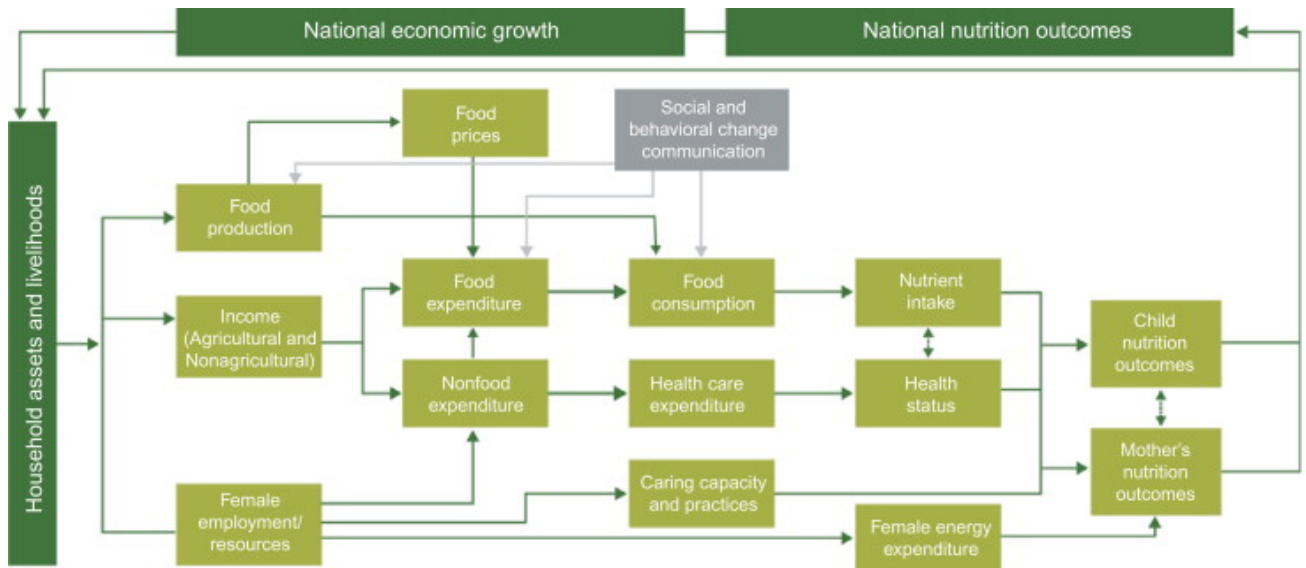
Framework of the relations between poverty, food insecurity, and other underlying and immediate causes to maternal and child undernutrition and its short-term and long-term consequences; the Lancet 2008 (Black et al., 2008)



Lancet Framework for Maternal and child undernutrition and overweight in low-income and middle-income countries (Black et al., 2013)

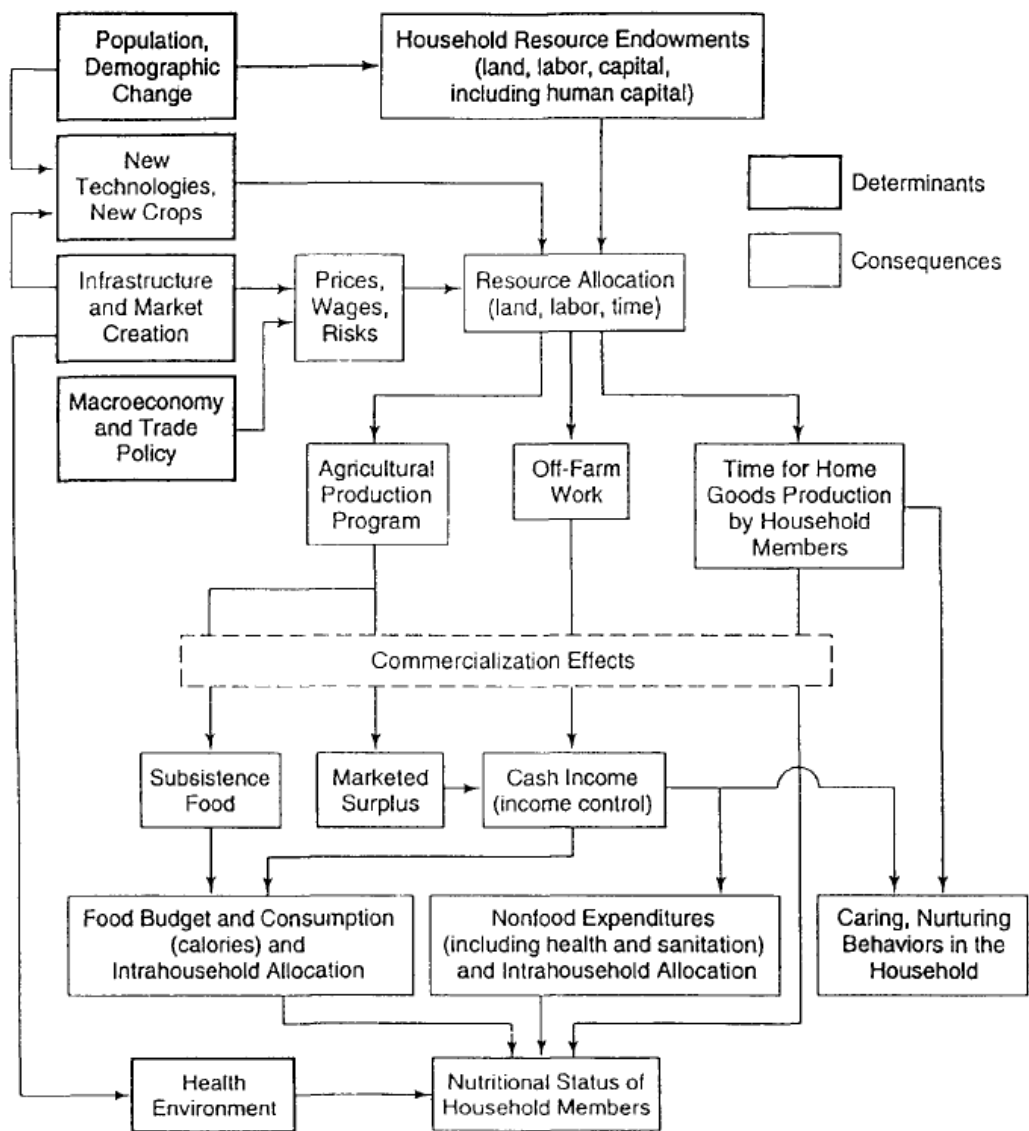


Sustainable livelihood framework; DFID (1999)

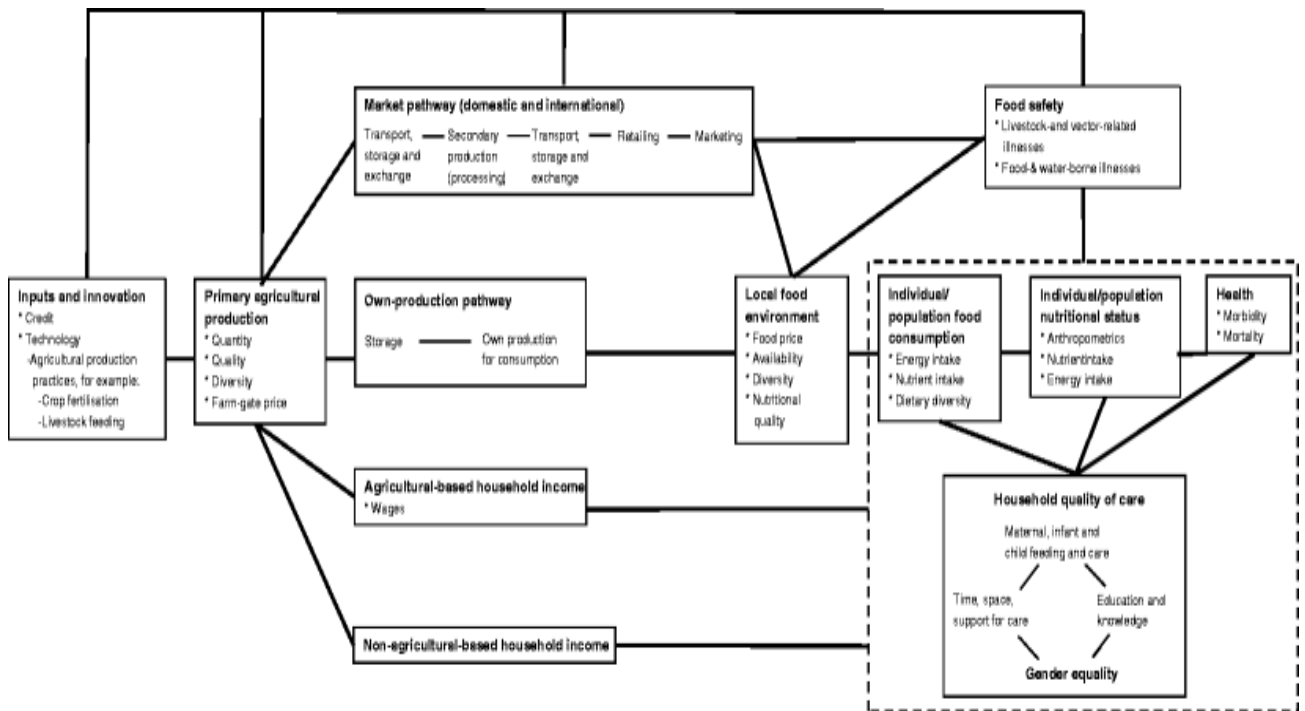


Conceptual pathways between agriculture and nutrition: Feed the Future (Du, Pinga, Klein, Danton, et al., 2015); adapted from (Gillespie et al., 2012)

III Commercialisation in Agriculture



Commercialisation at the household level: determinants and consequences for income and nutrition; (Von Braun, 1995)



Conceptual framework of the links between agriculture, the food system, nutrition and public health; (Kanter et al., 2015)

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Wageningen Centre for Development Innovation supports value creation by strengthening capacities for sustainable development. As the international expertise and capacity building institute of Wageningen University & Research we bring knowledge into action, with the aim to explore the potential of nature to improve the quality of life. With approximately 30 locations, 5,000 members of staff and 10,000 students, Wageningen University & Research is a world leader in its domain. An integral way of working, and cooperation between the exact sciences and the technological and social disciplines are key to its approach.



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