



Agriculture-nutrition linkages

Linking agriculture and food security to nutrition improvement

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Desk Review



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The literature review explores possibilities to include nutritional considerations into policies and programmes in the field of agriculture, value chain development and food security. Rationale for the literature review is the renewed attention for agriculture and nutrition on international agenda's and more specifically the renewed attention on linking the two: how can interventions in agriculture contribute to improvements in the nutritional situation, and under what conditions.

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Executive summary

This desk review aims to providing insights and evidence on the linkages between programmes and interventions in agricultural development and food security and nutrition improvement of vulnerable groups. The desk review was undertaken as a first step in an exercise in which in two pilot countries the possibilities for actually linking nutritional objectives to programmes in food security development were explored. The desk review provides examples on how organizations have tried and sometimes succeeded to achieve impacts on nutrition through agricultural development programmes. The field explorations have been carried out in collaboration with the Netherlands Embassies in Ethiopia and Bangladesh.

This initiative fits with the current Dutch policy on International Collaboration in which Food Security is a 'spearhead'. The policy indicated results to be achieved, including increased production of food, improved functioning of markets, etc. but also improved access to nutritious food.

Influencing nutrition through agriculture potentially occurs through 5 different pathways (World Bank, 2007; Hawkes and Ruel, 2006 and 2008; Haddad, 2010):

1. Increased (nutritious) food production for own consumption, especially for subsistence agriculture;
2. Increased income from the sale of agricultural commodities and greater farm productivity, on the condition that income is used to purchase nutritious foods;
3. Increased empowerment of women as key contributors to household food security and to the health and nutrition status of household members, through greater control and decision-making powers by women in both the productive and domestic domains;
4. Reduced food prices resulting from increases in food supply. leading to an increase in *de facto* income, which can be used to purchase a more diversified and more nutritious food basket;
5. Macroeconomic effects of agricultural growth (i.e. increased national income, macroeconomic growth and poverty reduction, employment creation), under the condition that enhanced income is used to obtain a balanced food basket. On the other hand, the impacts of growth can be distributed unevenly across households, with many poor not benefiting.

The options on how to include nutritional outcomes, on the basis of the literature review, are explored in the following 5 clusters:

1. Sustainable food production;
2. Value chain approaches;
3. Access to markets;
4. Public-private partnerships for nutritious foods;
5. Access to food through social programmes and safety nets.

The desk review supports the insight that the pathways from agriculture to nutrition are not linear and simple. On the somewhat more 'classical' interventions in agriculture (plant breeding, agronomy and production increase and diversifying cropping or farming systems), more information on actual impacts on food security and nutrition could be found. On interventions in agriculture of somewhat more recent date, such as access to markets for smallholder farmers, value chain approaches, strengthening farmers' organizations, the effects on household food security and nutrition improvement are less documented. The reason for this presumably is that only a very limited amount of programmes and projects in these areas have explicit food and nutrition security objectives. They thus lack indicators that explicitly monitor progress on nutrition. In addition, there is a lack of rigorous evaluations that sufficiently document evidence on nutrition improvement. The few programmes and projects that do specify improved nutritional outcomes as objectives (and indicators) are relatively new and their results cannot yet be assessed.

Assessing the impact of agricultural interventions on child nutritional status is complicated. Child nutritional status indicators do not react rapidly. Achieving impact on child nutritional status requires multiple actions (though not necessarily by one and the same actor), as is shown by the UNICEF framework. Intervention pathways up to reducing child malnutrition should be well thought-through, and monitoring of indicators along the 'pathway of change' are required in order to track improvements and assess (intermediary) results. In addition, programmes should be flexible and allow for learning and reflection so that programme interventions can be adapted if progress is lacking behind (Gaarder, 2011).

While (scientific) evidence is still lacking on linking agriculture and nutrition, the meta-review as performed by IFPRI and World Bank shows a number of valuable lessons learned that seem to make sense and can very well be applied in new or existing programmes and interventions (World Bank 2007):

1. Design agricultural interventions with an eye on the ultimately desired outcome (nutrition improvement) and include complementary processes and strategies that redirect the focus beyond agriculture for food production;
2. Design and implement agricultural programmes with an eye on the local food context (commodity selection);
3. Help smallholder farmers adapt to changing (global) circumstances and make use of emerging opportunities (link small farmers to agricultural commercialization);
4. Link agricultural interventions to nutritional knowledge and behaviour change programmes;
5. Link agricultural programmes to women's empowerment.

The results of the IFPRI conference 'Leveraging Agriculture for Improving Nutrition and Health' (Feb 2011) support the conclusions of this desk review and called for increased attention for 'nutrition sensitive agricultural development' and for explicitly outlining the 'pathways of change' from agricultural production to consumption and improved nutritional status, with indicators attached to the various steps so that the pathways of change can be monitored. It was also stated in the conference that up to now, this has not yet been done. On the other hand, in spite of the lack of scientific evidence, there seems to be sufficient 'ground' to start working along the lines indicated and not wait until the scientific evidence is collected.

List of abbreviations and acronyms

AIM	Amsterdam Initiative against Malnutrition
CDI	Wageningen UR Centre for Development Innovation
ICCO	Dutch Inter-Church Aid
IFPRI	International Food Policy Research Institute
Min EL&I	Ministry of Economic Affairs, Agriculture and Innovation
Min BuZa	Ministry of Foreign Affairs/ Directorate General for International Cooperation
NCRSP	Nutrition Collaborative Research Support Programme
REACH	Renewed Efforts Against Child Hunger and Undernutrition
SUN	Scaling Up Nutrition
UN SCN	United Nations Standing Committee on Nutrition
Wageningen UR	Wageningen University & Research centre

1 Rationale

Achieving sustainable food and nutrition security is the only viable and long-term solution for ending hunger and improving levels of nutrition. Although food and nutrition problems are complex and not the responsibility of agriculture alone, the sector plays a fundamental role in their solution. Nutrition-friendly, sustainable agricultural development is key to improving food and nutrition security.

UN SCN, 2010

This desk review provides background and evidence on the linkages between agricultural interventions and nutrition improvement. The information will be used in field level discussions on how to ensure that interventions in agriculture and food security result in improved household food security and in nutrition improvement. The desk review is part of an initiative taken by the Dutch Ministry of Economic Affairs, Agriculture and Innovation (EL&I) and the Ministry of Foreign Affairs/Directorate general for International Cooperation (Min BuZa/DGIS), the Dutch development NGOs ICCO and Plan Nederland, and the Wageningen UR Centre for Development Innovation (CDI). In line with the increasing international attention to agriculture as a driver for development, to nutrition as a development priority and to the linkages between agriculture and nutrition, the initiative aims to explore the potential of policies and programmes in agriculture and food security to contribute to improved nutritional outcomes for vulnerable groups. Exploring this potential and identifying possibilities for enhanced efforts will take place in two pilot countries (Ethiopia and Bangladesh), of which the Netherlands Embassies have indicated an interest to collaborate.

The first step in the initiative is a review of existing literature and policy documents on the links between agricultural interventions and nutritional outcomes for vulnerable groups. The aim of the desk review is to identify evidence and best practices for linking agricultural interventions to nutrition improvement. The literature review will form the basis for checklists guiding the country visits and the in-country stakeholder dialogues in Ethiopia and Bangladesh.

The expected readers of the desk review are policy makers in the Netherlands, staff members of the Embassies in the selected countries, NGOs in the Netherlands, partner NGOs in the selected countries, and other relevant stakeholders, both in the Netherlands and in the selected countries.

2 Increasing attention for agriculture and nutrition in development

Increasingly, it is realized that hunger and malnutrition is an economic burden to society. Hunger and malnutrition lead to reduced labour productivity and affect physical and mental capabilities of human resources. Hunger and malnutrition lead to higher morbidity and mortality. The damage done by malnutrition early in life is irreversible and malnutrition inherits from one generation to the other. In addition, malnutrition predisposes to higher rates of overweight and obesity and related non-communicable diseases in societies in (economic) transition.

Access to sufficient food of adequate quality is a basic human right, and the Right to Food an accepted concept (FAO, 2004).

Despite worldwide efforts, achieving Millennium Development Goal 1c (MDG 1c) of halving hunger by 2015 is still far away. The number of undernourished people remains high at 925 million (FAO, 2010). While the proportion of undernourished people is highest in Sub-Sahara Africa, and the numbers are increasing, the absolute number of undernourished people is highest in Asia (578 million people in Asia, and 239 million in Sub-Sahara Africa, FAO, 2010). 1 out of every 4 children is underweight (too low weight for age), amounting to a total of 146 million children (IFPRI 2010). Most of these children live in South Asia (UNICEF, 2009).

Micronutrient malnutrition affects even more people; over 2 billion people worldwide. Micronutrient malnutrition relates to insufficient dietary quality, and affects among others immune system responses and labour productivity and mental development in both children and adults.

Three more or less separate trends in development thinking influence the increased attention in development for agriculture, food security and nutrition improvement.

Agriculture as a driver for development

The World Development Report 2008, *Agriculture for Development* (World Bank, 2008), was one of the first international signs of a recurring interest for agriculture as a driver for development. The increasing food prices with the accompanying food riots of 2007/2008 and the increase of the number of undernourished people of over 1 billion further fuelled the interest for agriculture and world food security. IFPRI and the World Bank documented that 75% of the poor and food insecure live in rural areas and depend largely on agriculture for their livelihoods, calling for specific attention to agricultural development. It was also documented that investments in agriculture by governments of developing countries and donors alike had slowly declined over a longer period of time, while on the other hand, investments in agricultural R&D are highly cost-effective, and with a good pay-off in terms of enhancing food security (IFPRI).

Child health and nutrition

The persistent high figures of child malnutrition prompted a number of nutrition specialists to call for increased priority for reducing child under-nutrition. The World Bank published 'Repositioning Nutrition as Central to Development' in 2006 (World Bank, 2006). The Copenhagen Consensus (2008), combining the insights of a number of high ranking development economists, listed a number of highly cost-effective development interventions, among which nutrition and micronutrient-related interventions were ranked as the most cost-effective. In Jan-Feb 2008, the Lancet published a set of 5 articles that became known as the 'Lancet series'. The Lancet series focuses on nutrition-related interventions targeted to pregnant women and small children, with the aim of impacting on development. The interventions proposed in the

Lancet series are typically within the domain of the health sector, and include micronutrient supplementation for pregnant women (iron, foliate, iodine, and calcium), breastfeeding promotion, improved complementary feeding practices and micronutrient supplementation for infants and young children. They also include food fortification and thus link with the private sector.

The very early stages of life (pregnancy to first two years of life) are seen as the most vulnerable for malnutrition to occur. Malnutrition acquired in this period of life is irreversible and has a prolonged effect on productivity, mental development and health. In addition, malnutrition inherits from one generation to the other. The '1000 days' period was mentioned by Hillary Clinton in her speech for the Millennium Development Goal Summit (September 2010) an essential investment in the new generation, and is now recognized by an increasing number of organizations gathered in the 'Scaling Up Nutrition' platform (www.scalingupnutrition.org) and the 1000 days initiative (www.thousanddays.org). Ban Ki-moon, in his speech to the High level Event on Scaling Up Nutrition, September 20, 2011 in New York, further supported the importance of nutrition as a central issue in development (<http://www.un.org/issues/food/taskforce/>)

Agriculture-nutrition linkages

Of more recent date is the renewed attention for linkages between agriculture and nutrition. The earlier attention for agriculture-nutrition linkages dates back to the early 1980s with mainly IFPRI and World Bank publications (e.g. Per Pinstrup Andersen, Lawrence Haddad, Alan Berg). The subject disappeared from the agenda only to re-emerge recently due to the food crisis 2007/2008 and consequent reports on reduced food intake and dietary quality, and due to the limited progress on achieving MDG1c. Although the link between agricultural development and food security/nutrition is seemingly evident, the picture is far more complex and actual pathways from agriculture to nutrition are manifold and include various sectors. Research and meta-reviews show that increased food production does not automatically lead to improved food security for the poor and vulnerable, nor to improved nutrition security (among others as cited by Haddad, 2000). Increased food production might ensure a higher availability of energy (calories) but does not necessarily provide the quality of food that is needed. Increased farmers' incomes do not necessarily translate into increased food intake and/or to better quality diets for farming families. The persistence of malnutrition as a global public health concern, despite impressive increases in global agricultural production (IFPRI, 2009), makes clear that malnutrition and under-nutrition cannot be solved merely from the food production or supply side. Nutrition security is the result of food security combined with adequate health. Insights are increasing that combining interventions from both the agricultural and the health sector would provide the best potential for results in terms of alleviating hunger and reducing malnutrition. Recently a number of international initiatives indeed call for this combined action (e.g. the Comprehensive Framework for Action (2010) as developed by the High Level Task Force on Global Food Security, the 'Scaling Up Nutrition' initiative (2010), the inter-UN initiative Renewed Efforts Against Child Hunger and Undernutrition (REACH), combining efforts of FAO, WFP, UNICEF and WHO (2009/2010), the IFPRI conference 'Leveraging Agriculture for Improving Nutrition and Health', February 2011).

3 Definitions and conceptual frameworks for food security and nutrition

Agriculture, food security and nutrition seem to be linked in quite a straightforward way. Agriculture is the primary source of food and essential nutrients as well as an important source of income, especially for the rural poor. Around two-thirds of the world's food insecure live in rural areas and depend on agriculture for their livelihoods, directly or indirectly. Agricultural and rural development thus seem to have a role in reducing hunger and malnutrition. However, when taking a closer look, the linkages between agriculture and nutrition are far more complex. Translating increased agricultural productivity and/or rural incomes into improved (household) food security and nutritional status is not self-evident. Examples can be found on how agricultural development has impacted on reducing hunger. Other examples show that despite progress in agricultural development and food production, the levels of child malnutrition have remained high. At the global level, we can conclude that despite increases in agricultural productivity and absolute food production we remain living in a world with hunger, as is shown by the persistent number of undernourished people (around 840 million since 1990, peaking to over 1 billion in 2009, now estimated at 925 million).

The complex relations between food production and nutrition are illustrated with two definitions or theoretical frameworks.

The definition of Food Security

At the World Food Summit (1996) agreement was reached on the definition of food security:

'Food security is achieved when all people at all times have physical, social and economic access to sufficient, safe and nutritious food which meets their dietary needs and food preferences for an active and a healthy life'.

Three pillars of food security were recognized:

- Availability of food, related to the physical availability of food products;
- Accessibility of food, related to food prices in relation to incomes, or to other forms of access to food (barter, social networks etc.);
- Food quality, utilization or absorption; the actual use that the human body makes of the consumed food (absorption of nutrients), which is also a function of health;
- Stability; stable access to food in spite of potential shocks such as price hikes/price volatility, climate change etc.

In addition, it was recognized that food security can be defined at various levels ranging from the global level to the household level. The ultimate level of food security is the individual, where food consumption and absorption takes place.

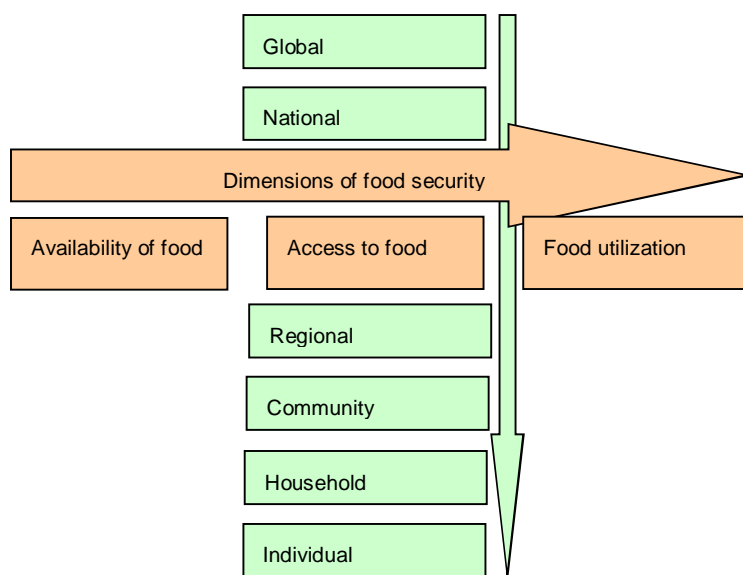


Figure 1. Dimensions and levels of food security

The UNICEF framework of nutrition security

The UNICEF framework for nutrition security defines the relation between household food security and child nutritional status (Fig 2). The UNICEF framework shows that insufficient household food security is just one of three underlying causes of (child) malnutrition. Or phrased in a positive way: household food security is just one of the factors contributing to a good nutritional status. Other factors contributing to healthy nutrition are access to health and sanitary services and adequate caring practices. Combinations of these factors lead to adequate dietary intake combined with good health (free from infections, that enhance dietary needs, free from diarrhoea and intestinal parasites that interfere with absorption of nutrients, etc.), that together translate in a good nutritional status.

The UNICEF framework was developed in 1990, and is still widely used.

In addition to the underlying causes of malnutrition, the UNICEF framework also points to the need for adequate basic conditions in order to achieve food and nutrition security, such as an adequate institutional environment and governance, education, gender equality, etc. Research has indeed shown education, and especially of girls and women, is the best predicting factor for an improved nutritional situation of the next generation. Inadequate governance or worse, conflict, is one of the major causes for increasing hunger and malnutrition.

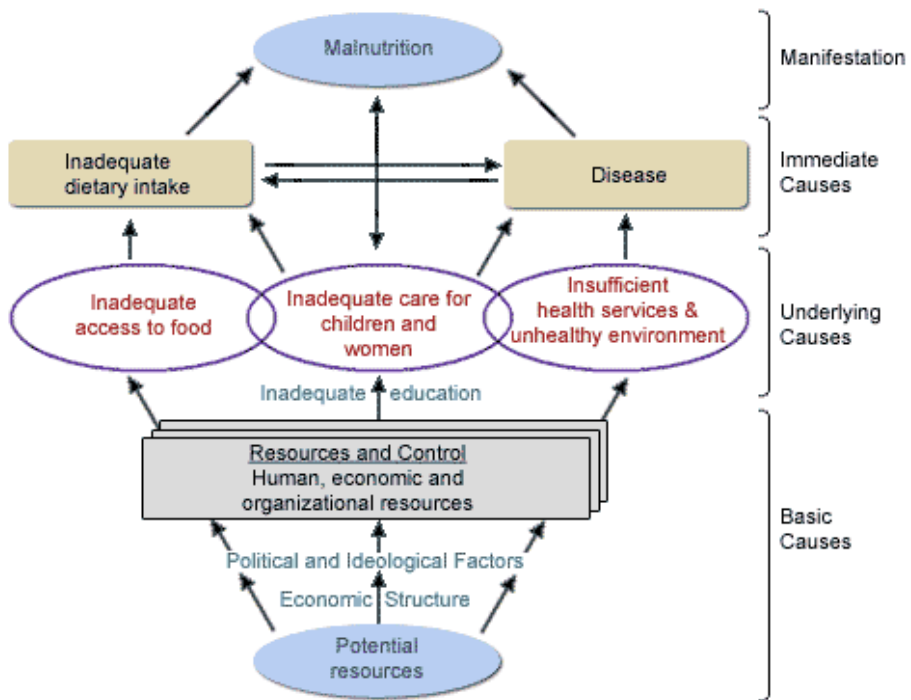


Figure 2. Nutrition security (UNICEF framework)

4 Linking agriculture to nutrition

Although linking agriculture to nutrition is not a completely new area, the context in which agriculture and nutrition are linked has changed (Hawkes and Ruel, 2006). Nutrition is now much more prominently seen as an essential element of human development (ACC SCN, 2002, World Bank, 2006, Benson, 2009). The nutrition agenda has broadened from merely engaging with the intake of energy and proteins (food quantity) to the intake of micronutrients (dietary quality), and is now including over-nutrition as well, including non-communicable diet related diseases such as high blood pressure, diabetes, cardiovascular diseases, also coming up in developing countries (World Bank, 2007). Also the context of agriculture has changed, with increasing globalization, an increasing market-orientation, focus on (small-holder) farmers as entrepreneurs and more attention for food supply chain or value chain approaches.

The linkages between agriculture and nutrition can be direct or indirect. More or better quality foods available and accessible (through increased production, diversification, plant breeding, post-harvest technologies) might lead to improved food consumption, either through subsistence level consumption or via income. Indirect effects might occur through the growth of the agricultural sector as a whole, through lowering food prices, freeing up labour forces for alternative economic activities or changing food policy at national level (influencing food prices), etc. (Haddad, 2000).

Current literature recognizes the following pathways through which agriculture and nutrition are linked (World Bank, 2007; Hawkes and Ruel, 2006 and 2008; Haddad, 2010):

1. Increased (nutritious) food production for own consumption. Food and (micro)nutrient consumption is directly affected by the types and quantities of foods that households produce, especially in the case of subsistence agriculture;
2. Increased income from the sale of agricultural commodities and greater farm productivity. This pathway only contributes to improved nutrition if the greater farm income is translated into adequately purchasing of nutritious foods;
3. Increased empowerment of women as key contributors to household food security and to the health and nutrition status of household members. Through greater control and decision-making powers by women in both the productive and domestic domains, women's preferences and priorities are more reflected in the agriculture-nutrition chain;
4. Lower food prices resulting from increases in food supply. A decrease in food prices leads to an increase in *de facto* income. This could lead to improvements in nutrition if this means households are actually purchasing more nutritious foods;
5. Macroeconomic effects of agricultural growth (i.e. increased national income, macroeconomic growth and poverty reduction). Economic growth might contribute to improvements in the food and nutrition status, however the impacts of growth can be distributed unevenly across households, with many poor not benefiting (Ahmed *et al.*, 2007);

These pathways generally overlap in time and are dynamic as a result of changes in agricultural policy, technologies, markets, and food consumption patterns (World Bank, 2007).

Many current development efforts focus on increasing (food) production and increasing farmers' incomes. The indirect effects on food security and nutrition potentially occur through the resulting lowering of food prices and/or farmers' income increase. Many food insecure farmers in rural areas are net food buyers

and thus benefit from lower food prices. The additional farm income might be spent on food purchases, differentiation of food purchase, or on education, clean water, hygiene and preventive and curative health care. In practice, however, many studies have shown that an increase in household income does not necessarily translate into increased household food security and/or nutritional wellbeing (Haddad, 2000, World Bank, 2007). Income controlled by women is more likely to be spent on feeding the family than income that is controlled by men (World Bank 2007).

Increasing farmers' incomes might even have negative effects on food and nutrition security if they are accompanied by additional labour needs, especially for women, and interfere with (child) care. Additional income might not be spent on food, but households might prefer non-food uses such as education, improved housing or productive assets. Additional labour needs and/or status might also lead to a different food basket, including food products that can be easier prepared, but are also of lower quality (fast food, noodles and white bread).

On the other hand, there are also documented examples that income increase food prices decrease does translate in improved food security and nutrition situation, as was the case in Bangladesh. However, caution is needed with this example, as Bangladesh is still one of the countries with the highest rates of child underweight (46%, UNICEF 2011).

Reducing child malnutrition through increasing rice production in Bangladesh

In Bangladesh, the prevalence of child underweight fell from 70.9% in 1990 to 45.7% in 2005. The success was claimed by the Bangladesh Integrated Nutrition Programme (BINP); a programme focusing on growth monitoring, supplementary feeding and increasing mothers' knowledge of child feeding practices. Because of the success, the BINP was scaled up and transformed into the National Nutrition Programme (NNP). Unfortunately, three years after its launch, NNP was closed down due to limited success. A study by Save the Children showed little difference in nutritional status between children involved in the programme and a control group. The study also showed that the nutritional status of children had improved by the end of the 1990's, early 2000's. Simultaneous developments included the increase in rice yields and the reduction of rice prices. At the national level, food availability increased from less than 2000 kcal per day in the early 1990's to 2200 kcal per day in the late 1990's, and price reductions were almost 30% in real prices in the same period, with simultaneous increases in incomes. Partly, these changes were brought about by Green Revolution type of interventions. Another issue was the liberalization of the agricultural inputs market, which accounted for 90% of the rice production increase (IFPRI, Millions Fed, 2009). The reduced prevalence of child malnutrition could be contributed to the increased availability and accessibility of rice rather than to nutrition programme interventions.

Haddad 2000, Save the Children 2003,
Hossain et al 2005, White 2005 and 2009,
HKI 2006, IFPRI 2009

The extent to which agriculture has contributed to improved nutrition and the exact pathways by which this has been achieved is difficult to measure (IFPRI, 2011). Only very few agricultural programmes have explicitly taken up nutrition-oriented objectives and if so, the generally assumed ‘pathways of change’ are that through increased availability of food products or through increased income, the nutrition improvement will occur ‘automatically’. Specific interventions to ensure that indeed additional food availability or access to food will translate into improved nutritional status are not included in the programme design. In addition, very few impact evaluations of agricultural interventions have explicitly included nutrition outcome indicators (World Bank, 2007; Haddad, 2010, Gaarder 2011). Existing literature reviews on agriculture and nutrition linkages have not been conducted in a systematic manner with clarity for inclusion and exclusion of interventions and with interventions organized in clearly defined outcome and intervention categories (Haddad, 2010, Gaarder, 2011). As a consequence, it is difficult to assess to what extent agricultural interventions have contributed to improved nutrition.

The 2007 World Bank review on the impact of agricultural programmes and projects on nutritional outcomes concluded that agricultural interventions are most likely to have an impact on nutrition outcomes when they move beyond a focus on agriculture for food production toward broader consideration of people’s livelihoods, gender equality, and investment in the livelihood assets of the poor (World Bank, 2007). The review identified a number of key lessons for agricultural interventions to better contribute to improved nutrition. These include the following:

1. **Take an integrative approach to planning and implementation of interventions, including multiple sectors (at least agriculture and health).** For agricultural interventions to improve nutritional outcomes, agricultural, nutrition and health considerations should be incorporated in the project planning phases and close collaboration is needed with health and other development actors during the implementation phase. Ideally, nutrition should become an intrinsic value of agricultural programmes, like for example the CGIAR HarvestPlus programme in which nutrient content is one of the criteria of plant breeding.
2. **Take local agricultural and nutrition contexts into account when planning the intervention and collaborate with local partners that know these contexts.** To better contribute to improved nutrition, the design of agricultural interventions should be based on a good understanding of the major nutritional problems experienced by the target communities and the cultural norms, motives and constraints that affect household consumption decisions.
3. **Empowering women should be central to agricultural programmes.** Since women’s status and decision-making power directly affect the nutritional and health status of their children, agricultural programmes that aim to empower women by increasing their knowledge, access to productive resources, income and negotiating powers within the household generally will increase the likelihood of positive nutritional outcomes.
4. **Incorporate nutrition education and communication strategies that target behaviour change in agricultural interventions.** Agricultural interventions that equip beneficiaries with knowledge and understanding about the nutritional significance of the foods they produce and eat are more likely to improve nutrition as they enable them to make better production and consumption decisions, especially when targeting women.
5. **Include adequate M&E in the programmes that allow monitoring progress on nutritional outcomes.** An explicitly laid out ‘chain of interventions’(explicit description of all the steps that will lead from the agricultural intervention to the ultimate nutrition outcome), including indicators at all or at least the crucial steps allows to monitor in how far the assumptions on agriculture-nutrition linkages are true. In addition, this allows the programme to be adapted in order to achieve improved results.

The need for an integrative approach

For a long time it has been assumed that agricultural programmes would address rural poverty and malnutrition through increasing food production, reducing food prices, and increasing the income of households. Despite increases in food production, household food availability, income, and in many cases also in food consumption and diet quality, childhood malnutrition persisted. Clearly, increased agricultural production and household income are not sufficient to reduce malnutrition. To achieve greater impacts on nutritional outcomes, agricultural programmes should incorporate a non-agriculture component like knowledge on maternal health-seeking and care-giving practices or collaborate closely with complementary non-agricultural interventions that provide nutrition education.

World Bank, 2007

The Women Empowerment Project, Nepal

The Women Empowerment Project is an example of an integrated food security project specifically oriented at women. The project started in 1999, and focused on poor, landless and marginalized ethnic women in Makwanpur district in Nepal. The major aim of the project was to improve women's livelihoods, productivity and income through organization and empowerment. Microfinance, capacity development in agriculture and other productive and business skills were at the heart of the project. In addition, life skills, gender, health and nutrition education and sanitation were integrated in the project area. By 2008, over 20.000 women were involved in the project. The project's evaluation in 2008 showed some remarkable effects on household food security. 47% of the surveyed households reported increases in crop production, among others leading to a higher proportion of households reporting food sufficiency for more than 9 months of the year (15% to 28%). 80% of the households reported improved food habits and a higher consumption of vegetables.

Plan Netherlands and Centre for Development and Governance, 2008

5 Exploring the linkages

In line with international thinking and policy trends, also the Netherlands Government has embarked on a policy of agricultural development and food security. The Dutch policy memorandum 'Agriculture, Rural Economic Development and Food Security' (MinBuZa/EL&I, 2008) outlined a strategy to contribute to international agricultural development. The 'Focusbrief Ontwikkelingssamenwerking' (MinBuZa, March 2011) indicated priority choices for the Netherlands development cooperation. Food Security was selected as one of 4 'spearheads'. The new policy on Food Security was designed in collaboration between the Ministries of Foreign Affairs (MinBuZa) and Economic Affairs, Agriculture and Innovation (EL&I). The 'Kamerbrief Voedselzekerheid' (MinBuZa, October 2011) further elaborated on the policy for food security, mentioning 4 pillars:

1. Increased sustainable food production;
2. Enhanced access to healthy/nutritious foods;
3. Improved functioning of markets;
4. Improved enabling environment for private sector development.

The Food security policy aims at increasing food security through collaboration between public and private actors and making use of Dutch knowledge and expertise. Next to objectives such as increased production, making more food available per person, enhanced access to food, etc. also results are defined to be achieved such as reducing child malnutrition in focus countries, and enhancing the consumption of nutritious foods/diversifying dietary intakes.

In this chapter, options for linking nutritional goals to agriculture-based interventions, in line with the newly developed Food security policy, are explored. Where possible, examples are mentioned of how agricultural interventions (ranging from increasing production to increasing access to markets for small holder farmers to food security safety nets) can have an impact on nutrition. Through this exercise, it will be shown that there are concrete options to achieve nutrition improvement objectives through agriculture and food security. A 'way of looking' at agricultural interventions in order to best ensure that nutritional goals will be achieved ('nutrition lens') will emerge.

Below, options and examples are organized in clusters, for which it should be noted that the clusters do not necessarily directly refer to the 4 pillars of the Netherlands Food security policy.

1. Sustainable food production

Interventions to enhance production or productivity of food are manifold. Countries with large numbers of food insecure people are not necessarily food insecure at the national level. That means that the average amount of food energy (kCal per person per day) available can suffice the average consumption of energy of the inhabitants. Distribution can be skewed geographically of socio-economic. Increasing food production can sometimes be an option, but is not necessarily the best option to reduce the number of undernourished in a country. Job creation might be a better opportunity.

Next to energy derived from food, quality of food is an issue, and instead of producing 'just' more calories, a different type of calories (those that come accompanied by bioavailable micronutrients) can be beneficial for the food security situation in a country.

Plant breeding

Plant breeding lies at the heart of food production, be it through conventional breeding techniques or through biotechnology. Plant breeding can bring about higher yields, resistance to pests and diseases, breeding for unfavourable conditions (drought resistance, salt tolerance), and thus enhance the availability of food. Food shortage periods can be shortened for subsistence farmers, or more produce can potentially be sold on the market, thus potentially impacting on food security. Plant breeding can also be used to change the (nutrient) composition of varieties. A classic example is Quality Protein Maize (QPM), with enhanced levels of the essential amino acid lysine. The CGIAR programme Harvest Plus (www.harvestplus.org) is another example of breeding for improved nutritional quality takes place (iron, Vitamin A and zinc). Harvest Plus works from the assumption that a diversified diet for many (poor) people is still far away. Breeding varieties of staple food crops with sufficiently high levels of micronutrients enhances the dietary quality of also the poor, who usually merely consume staple foods. The Harvest Plus programme explicitly recognizes that due attention to consumer acceptance and well designed and innovative marketing strategies to create demand for the bio-fortified crops should accompany the plant breeding efforts.

Breeding for nutrition improvement in Mozambique

Orange fleshed sweet potato has the potential to increase the intake of pro-vitamin A. Orange fleshed sweet potato is already widely available in several countries. However, continued selection and breeding have further enhanced the carotenoids content. The CGIAR research programme Harvest Plus has managed to achieve this. In addition, sweet potato is a labour extensive crop, making it, together with the high pro-vitamin A level, especially suitable for labour constrained households, and/or households with members with specific nutritional needs such as the need for high Vitamin A intake (e.g. people living with HIV/AIDS). The orange fleshed sweet potato was introduced in Mozambique and Uganda in areas with a high prevalence of child malnutrition, high consumption of cassava and high prevalence of Vitamin A deficiency. White fleshed sweet potato was already cultivated and consumed in the areas. The intervention consisted of making available planting materials to the farmers, creating demand through nutrition education, and training in marketing and product development. In both countries, baseline surveys were held (resp. 2006 and 2007) and compared with end line data (2009). In both countries, a substantial increase in the consumption of orange fleshed sweet potato was found (around 50 g per day for children 6-35 months, corresponding with a resp. 78% of daily recommended intake of Vitamin A in Mozambique and 53% in Uganda).

World Bank 2007
West and Thompson 2010
Gilligan 2011

Cropping patterns/farming systems

Adapting cropping patterns or farming systems to include more nutritious foods is another way of increasing food security and/or diversifying the dietary intake. On the basis of an analysis of dietary intakes and nutritional status, a diversification of the cropping system or the farming system can be suggested for subsistence oriented farming households. A variation in staple food crops with varying growing periods could be suggested in order to enhance the availability of staple food throughout the year and shorten the lean period. Crops with higher nutritional values (high in protein, high in protein with complementary qualities, or fruits and vegetables with high levels of micronutrients) or animal food products (high in good quality protein, high in bio-available micronutrients) can be suggested to increase the nutritional quality of the diet. Differentiation in farming systems to include high value crops such as fruits and vegetables, (small) livestock or aquaculture potentially improves nutrition through direct own consumption or through increasing the household income which in turn is used for supplying the food basket.

Diversification of home-grown food in Bangladesh for diet improvement

The homestead food production program (HFP) in Bangladesh addresses poor diet quality and was introduced by Helen Keller International. It includes home gardening, small livestock production and nutrition education. The programme has contributed to improving micronutrient intake of women and children.

Household production of fruits and vegetables and of eggs increased. It was shown that participating families produced on average in a three months period 135 kg of fruits and vegetables compared to 46 kg for non-participating families. A small livestock pilot project showed an increase in egg production per household (21 eggs in 3 months in non-participating households compared to 200 eggs in participating households). The programme combines household food production and nutrition education, through which combination an impact on consumption was realized, leading to children consuming 60% more vegetables and almost 50% more eggs. Other important lessons learned included an open and flexible program attitude and interventions embedded in local structures and circumstances offer the best chance for success. The multi-sector approach, combining agriculture and health was a necessary condition for the programme's positive results.

IFPRI, HKI 2009

Also at the national level, such an analysis of 'food patterns', and the limitations can be made. FAO Food Stat data rapidly provide insight into the prevailing typical food consumption/composition of the diet, and can point to limitations. Most diets in countries with high levels of food insecurity and malnutrition are strongly based on starchy staples, limited in (bioavailable) micronutrients. This analysis can point to the need for cropping diversification at the national level.

Introducing mungbean in Asia

AVRDC recognized the potential of mungbean as early as the 1960's when mungbean was still a marginal crop in Asia. Mungbean has much potential to improve the Asian cereal based diet, and has the capacity to fix nitrogen to the soil. In close collaboration with national agricultural research partners in Asia, AVRDC orchestrated concerted efforts in mungbean breeding. Close collaboration was sought with national researchers and also with extension staff and farmers. Demonstration plots and farmers' field trials were to show farmers the results and economic calculations showed farmers the benefit of using the improved seeds. In addition, women were trained in the preparation of mungbean. The introduction of mungbean in Asian countries through this combined efforts was highly successful. The area planted with mungbean greatly expanded since the 1980's and mungbean consumption increased, with beneficial effects on nutrition (mungbean is especially rich in protein and in iron).

IFPRI, 2009

Women have a key role in agricultural production. In Sub-Sahara Africa, they produce and process up to 70% of the food their households consume and sell (FAO and ILO 2010). Yet, women's access to the results of agricultural research is limited. Only 15 % of agricultural extension workers are women, and agricultural extension messages do not take into account the specific needs for information of women nor the specific diffusion mechanisms that women use (Quisumbing and Pandolfelli, 2009) and women have less access to productive assets (land, fertilizer, improved seeds) and loans. A study calculated that agricultural productivity in Sub-Sahara Africa could increase by 20% if women would have equal access to land seeds and fertilizer (FAO, 2009). FAO's State of the world's Food and Agriculture 201 states that just giving women the same access as men to agricultural resources could increase production on women's farms in developing countries by 20 to 30 per cent. This could raise total agricultural production in

developing countries by 2.5 to 4 per cent, which could in turn reduce the number of hungry people in the world by 12 to 17 per cent (FAO 2011). In addition, women have a key role as caretakers and preparers of food for their families. The role of women in diversifying cropping patterns and farming systems should be well taken into account. It has been documented that additional income in the hands of women has a larger chance to be translated into improved food and nutrition security for their household members.

African Leafy Vegetables in Kenya

Since 1996, Bioversity International has, in close cooperation with local research centres and other partners, been involved in a program on re-introducing traditional green leafy vegetables in Kenya, with the dual objective of improving the intake vegetables and thus of Vitamin A, and of providing small scale (female) producers with an income. The project was successful in increasing farmers' production of traditional leafy vegetables, and in marketing these vegetables, especially in Nairobi. A study performed in 2007, pointed out the desirability for increased levels of farmer organization in order to have better linkages to the market (e.g. buy or rent a truck for transportation, negotiate for better prices). The same study, as did the impact assessment in 2010, pointed to the need for enhanced capacity development and empowerment of the women producers for them in order to remain leading in this sector. The impact on nutrition (of consumers and producers) was not included in the studies cited.

Shiundu and O'niango, 2007

Gotor and Irungu, 2010

Livestock and aquaculture

Nutrition literature shows that the consumption of only small amounts of animal based food products is beneficial for child health and nutritional status (NCRSP Studies, 1990s). Animal based food products are energy dense, contain good quality protein and micronutrients with higher levels of bioavailability than micronutrients in foods from plant sources (Latham, 1997). On the other hand, animal based food products are relatively expensive and out of reach for the poor. Several pathways can be imagined for foods from animal origin to contribute to improved nutrition (Kawarazuka, 2010):

- Direct through household production and consumption of animal foods (small livestock, eggs, fish from ponds or small scale fisheries, etc.);
- Indirect through income derived from the sale of animal source food products;
- Indirect through the involvement of women in the production and processing of (small scale) animal food products.

Projects and programmes stimulating the production of animal source foods differ in scale and (economic) ambition from homestead production (Helen Keller International Homestead Food Production a. o. in Bangladesh that was extended with a pilot on small-scale livestock, to large scale sector development such as Operation Flood in India (IFPRI, 2009). Household level interventions have been documented to influence the consumption of animal derived food products (World Bank, 2007a). The large scale dairy sector development in India was mainly designed to deliver more milk to the market. The programme was highly successful, making available around 250 grams of milk per capita per day in 2007/2008. Also documented are impacts on rural incomes and rural employment (IFPRI, 2009). The effect on nutritional status of vulnerable groups was not assessed, nor was a differentiation made per target group on increased milk consumption. This is not surprising as improving nutritional status through sector development was not the aim of the programme. Yet, there might well be reason to do include these nutrition improvement considerations into sector development, and the above suggested pathways could offer a framework for making large scale production efforts more nutrition sensitive.

2. Value chain approaches

Value chains are seen as vital for agriculture and rural economic development. Reducing transaction costs in food value chains reduces the price of food on the market. Value adding provides income generating possibilities to farmers and other actors in the value chain. Food processing extends shelf life of food products and reduces (the risk to) seasonal food gaps. Local, national or regional value chains often concern food crops and are thus important for food security. International value chains contribute to local food security through (farmers') incomes. Value chain approaches are mainstream in agriculture and rural development.

Value chain development

Well-functioning value chains generate income for food producers, transporters and processors as well as for suppliers of services. It is a major incentive in boosting agricultural productivity, and thus rural economic activity. Producers must remain competitive if they want to continue to function in local, regional or even international value chains and the power of purchasing agents (wholesale, retailers, and supermarkets) put margins under pressure. Specific attention to pro-poor economic development has led to applying value chain approaches to sectors where poor people are typically active (e.g. agriculture) and often involves linking informal to formal markets (Hawkes and Ruel, 2011). Nowadays, value chain approaches are the standard in many development oriented activities, and also target smallholders. Getting involved in value chains is getting involved in a monetary and commercial economy. A successful integration into the value chain translates into higher household incomes which might influence household food security and nutrition improvement, but not necessarily always do (Haddad 2000, World Bank 2007). In fact, value chain development and nutrition improvement might even seem incompatible. Value chain approaches by nature are commodity oriented and commercially driven. Food security and nutrition improvement by nature entail a variety of commodities (a diversified food pattern) and have less attention to increasing incomes but more to ensuring that the food insecure and nutritionally deprived benefit ('inclusiveness').

Questions that can guide checking whether household food security and/or nutrition improvement is enhanced by value chain development:

- Do poor households benefit economically from their involvement in the value chain, and to what extent (inclusive value chain development)?
- Do women have a role in the value chain, and what is their role?
- Do women earn an income from their involvement in the value chain?
- Do women have a say over the spending of the household income?
- Are women sufficiently aware of the need of a healthy food consumption pattern and what healthy food habits are?
- What is the effect of value chain development to food prices vis a vis the household income?
- Can an effect of integration in the value chain on household food security and/or on nutrition improvement be assessed?

Where nutritionists sometimes tend to address malnutrition through more health oriented interventions such as supplementary feeding, food fortification, specific (therapeutic) foods for vulnerable groups, value chain approaches have the potential to enhance the access to high quality foods (Hawkes and Ruel, 2011), which is an important contribution to improving the dietary diversification. Some argue that in this respect, value chain approaches more address the underlying determinants (re UNICEF framework) of malnutrition and are 'indirect' contributions to nutrition improvement; they contribute to the sustainability of the food system (Leroy, et al 2008).

Value chains are often supply chains. Value chains can also be oriented from the demand side, where consumer concerns and demand drive and direct production. Enhanced awareness of healthy diets potentially increases the demand for food products with increased nutritional values, ensuring the supply of nutritious foods at affordable prices to (poor) consumers all year round.

There is as yet limited evidence *that* and *how* value chain approaches affect food security and nutrition outcomes, nor at the level of smallholder farmers, nor for other actors in the value chain, nor for consumers. Only a very small number of value chain development interventions have taken up explicit nutrition goals. It is thus difficult to monitor and assess results. There is an explicit call for integrating nutrition outcomes in the objectives of value chain development and a need to monitor progress, in order to collect more evidence in this field (Hawkes and Ruel, 2011).

Food processing and post-harvest technology

Food processing and post-harvest technology are part of the value chain, and add value to (food) products and provide incomes to the value chain actors involved. Food processing is often done by women, who then earn a (small) income by selling processed foods. Food processing extends the shelf life of food products and thus food availability enhanced, in store or at the household level. An extended shelf life also enables farmers/ middlemen to sell the produce at later stages to command better prices. Food processing also can change the appearance of food products and potentially enhance consumer acceptability.

Food processing potentially changes the nutritional quality of food product. Food processing potentially affects the concentration of (micro-) nutrients and/or the bioavailability. Cooking may result in the loss of water-soluble vitamins (Vitamin C, B-vitamins). Cooking also frees up essential minerals and makes them more available for absorption by the human body (e.g. iron from the chlorophyll matrix). Foods may also contain anti-nutritional factors that inhibit the absorption of essential nutrients from food (e.g. tannins, phytate in sorghum, nuts, etc.). Anti-nutritional factors may be reduced or damaged by cooking, soaking, fermenting or sprouting.

Food processing and post-harvest processing importantly contribute to global food security as globally, post-harvest losses are estimated to be as high as 40% and even higher in developing countries with humid climates. Post-harvest losses are especially important for perishable products such as fruits and vegetables, and animal food products (meat, dairy products, fish). As these are food products with the highest nutritional value in terms of micronutrients, attention to post-harvest technologies (in the value chains), and preventing losses is highly important!

Post-harvest technology and food processing potentially contribute to food security, both in quantity and in quality; at the global, national and regional level, but also at the community and household level.

Support to farmers' organizations and cooperatives

Support to farmers' organizations and cooperatives aims at empowering smallholders in order to enhancing the productivity, efficiency of production and farmers' negotiating power to command higher prices in the market. Strengthening farmers' organizations is often linked to agricultural value chain development. Rarely, value chain projects and programmes are found that have explicit food security and nutrition objectives.

It is important to specifically support farmers' organizations that consist of female farmers. Often, as soon as farming becomes economically interesting, men take over. Income in the hands of women has a higher chance of translating into improved food and nutrition security for household members, especially if the programme also empowers the participants in other fields, such as economic and social skills, child caring practices, etc.

Women rice farmer groups in Mali

Women in Mali received support through the IFDC 1000+ programme for producing rice of improved quality. With microcredits they had access to good quality seed, and women were taught to dry the rice well and store it in order to sell later on at a better price. The women also learned to set up a cooperative in order to jointly sell, without the help of middlemen. According to the information available, both the cooperative as the women's households benefitted. Although this being a good example of support to women farmers, it could not be verified whether the income obtained remained in the hands of the women, whether the additional income was spend on food for the household, and whether a better nutritional situation for the women and their children was achieved.

www.ifdc.org

Farmers' Marketing Organizations Competitiveness on Agricultural Commodity Value Chains

ICCO has provides support (2008-2011) to farmers' organizations in Oromiya Regional State in Ethiopia, channelled through 6 different NGOs. Objective of the programme is to enhance the competitiveness of farming households in agricultural commodity chains. A baseline study done in 2009 included, next to information on household composition, incomes etc. also information on the household food security situation, using the Household Food Insecurity Access Scale (HFIAS); an indicator for the level of food insecurity at the household level. HFIAS reports the household's perception of their food security situation and is thus a subjective indicator.

The project intends to monitor the project's results on household food security.

ICCO, 2009

3. Access to markets

Value chain approaches and (improving) access to markets are highly intertwined. Adding value to products through a varying number of steps aims at selling products at a higher value in the market. Value chain approaches depart from the premises that farmers and other actors in the value chain can only generate income if access to markets (local, regional or international) is a given. Farmers and other actors in the value chain become increasingly involved into the monetary economy, and the accessibility-dimension of food security becomes more important. Increased access to markets stimulates production, and more production leads to lower food prices. In addition, increased access to markets leads to increased rural incomes. Combined with the fact that rural populations are often net food buyers, the net effect on food security is potentially beneficial. On the other hand, becoming more involved in commercial agriculture potentially also leads to becoming more or fully dependent on food purchases which is not always beneficial for household food security.

Many 'improving access to markets'-interventions have their implications at the local, national and/or regional level, where most food crops find their way. Smallholder farmers, traders and food processors benefit best from market access if these markets are transparent and efficient. Proven effective interventions include investments in rural infrastructure, electrification, tele-communication services providing market information, smoothening the functioning of regional markets through the abolishment of regional trade barriers, capacity development for improved customs services, etc. The negotiating position of farmers can be strengthened through associating in farmers' or producers' organizations.

Food security interventions might also link local (food) producers to international markets. Farmers and other actors in the value chain potentially can earn a good income if they are able to sell their produce on

international markets. Instruments to enable small producers to do so include strengthening the capacity to comply with international food safety norms, enhance bargaining power on international markets, build organizations and capacities to enter international markets, etc. Increased income can translate into increased food and nutrition security, but often does not automatically do so. Combining interventions in this direction with empowerment of women, with creating awareness on nutritional needs and healthy food habits and with the simultaneous development of smaller scale value chains that make healthy food products available at the local markets enhances the chance for good nutritional outcomes. Another aspect is that the vulnerability of farmers might be affected when linked to the global market, as is shown by the example of Uganda.

Cotton or food crops for Ugandan farmers

A study by the ICCO/Wemos Food Trade and Nutrition Coalition (FTN) documented the impact on food security of linking smallholder farmers to international markets in 5 countries (India, Bolivia, Kenya, Uganda and Zambia). The example of the Ugandan farmers showed that when the possibility occurred, Ugandan farmers in the two study districts shifted from food crop cultivation (semi-subsistence) to commercial cotton farming. Several years later, due to changing global cotton prices, cotton growing was not profitable anymore, and most farmers went back to food crop cultivation, however, now with the loss of their earlier marketing channels for food crops. When asked to compare their food security situation now and before the change to cotton, most families reported a deterioration. Currently, farmers in one of the districts are experimenting with sunflower cultivation.

FTN 2009

4. Public private partnerships for nutritious foods

Private sector involvement is seen as essential for sustainable agricultural development and food security, and the self-reliance that is seen as core to the current development policy thinking. Providing (rural) people with employment and incomes is a key element of current development thinking, and full integration of the private sector in development is becoming mainstream. Local private sector development is essential, but also a role is foreseen for private sector players from the North. Public-private partnerships can play a role in the enhanced availability (at reasonable prices) of high quality nutritious food products, either or not fortified with micronutrients. Corporate social responsibility, social business or opening future markets can all be considerations for public sector to contribute to reducing hunger and malnutrition. Another important consideration is that reducing hunger and malnutrition has an economic rationale in terms of increasing the labour productivity of the future generation. The World Bank has estimated that malnutrition reduces GDP with 3-5%.

Various PPPs already operate in the field of increasing access to nutritious foods. However, it should be noted that collaborating in PPPs is not easy. It requires specific and explicit efforts, it is often a lengthy process, collaboration is sometimes skewed towards either the public or the private sector, in-country business conditions should enable private sector to invest, etc.

**Amsterdam Initiative against Malnutrition;
a public private partnership fighting micronutrient malnutrition**

Micronutrient malnutrition is a worldwide problem, affecting 2 billion people. Fortification of food products is a highly efficient and cost-effective intervention and evidence of improved micronutrient status of targeted population groups have prompted food industry to further invest in this. However, food fortification requires close collaboration with the public sector, ensuring legal aspects, consumer and health organizations to ensure consumer sensitization and acceptance of fortified foods, other private partners to ensure efficient distribution, etc. The Amsterdam Initiative against Malnutrition (AIM) is a collaborative effort of Unilever, DSM, Akzo Nobel, the Ministry of Foreign Affairs of the Netherlands, GAIN, ICCO and Wageningen UR to contribute to an improved micronutrient nutrition in 6 countries in Africa. The programme is relatively new, but interesting in that it combines public private collaboration with an explicit nutritional goal.

<http://www.gainhealth.org/partnerships/amsterdam-initiative-against-malnutrition-aim>

Danone-Grameen yoghurt production in Bangladesh

Yoghurt-producing multinational Danone started in 2007 with the establishment of a yoghurt factory in a milk producing area in Bangladesh. Danone aims at producing healthy food products directed at Bottom of the Pyramid-consumers. Products should be nutritious and affordable. Danone came up with yoghurt based products, including a products aimed at children 3-12 years, fortified and stabilized to be kept outside a cold chain, sold in small packages with locally made packaging material and sold at prices affordable for (school) children. Yoghurt production also contributes to creating local employment. Milk is locally sourced from small farmers, and the food products are sold by local women, who earn a small income, but also gain empowerment and esteem in the community. Danone currently sells 80.000 units of the product a day, and is planning to establish a second factory in the country. Danone's runs the factory as a 'social business enterprise'; no need to make profit, but an explicit aim to run the business at break-even conditions to ensure the sustainability of the business.

This is an interesting example of how, with specific targeting, a food product can be made available to a group that potentially benefits from enhanced nutritional intakes. In addition, the business contributes to employment creation in the area.

Danone, 2011

5. Access to food through social programmes and safety nets

Specific food security requirements might call for social programmes or social safety nets. The poorest, or people living in fragile environments etc. might need support through social safety nets. Specific nutritional or food security needs for children might call for large scale school feeding programmes. In both cases there is or can be a strong link with agricultural development. Sourcing the food needed for social programmes from local farmers can be a strong boost to the agricultural economy, provided it is well organized. Social safety nets can also take the form of cash transfers. These 'cash for work' programmes often entail construction of rural infrastructure. Next to being a 'safety net' or last resort to households, safety net programmes often have the objective of maintaining the household asset basis, despite the (acute) food shortage, and thus build/maintain household resilience.

School feeding programmes

Although often considered different, the actual impact of school feeding programmes on the nutritional situation of school children is either weak, difficult to show, or even absent (Nubé, 2005, World Bank 2009). School children are not among the nutritionally most vulnerable and malnutrition (which are children under two years old). In addition, school feeding often leads to 'substitution effects': children receiving a meal at school get a smaller share out of the family cooking pot. Providing children with take home rations (which are intended to be shared with the family) is one mechanism to compensate for these substitution effects. In some cases these take home rations have even shown to benefit the nutritional status of younger siblings (12-60 months old) in the household (e.g. Burbano and Gelli, 2009) Mid-morning snack (e.g. fortified biscuits) have less chance to interfere with meals in the family. On the other hand, school feeding programmes do have other positive effects: increased school attendance and increased school performance. The positive effects, especially on girls' education have an indirect effect on nutrition of the next generation: women's educational status is the best predicting factor for the nutritional situation of their children. Women who can read and write are more prone to accept nutrition education messages and more willing to seek medical assistance for their children.

Several school feeding programmes, including programmes of WFP, now intend to combine school feeding with creating a demand for food through local procurement of the ingredients for the school meals (Home Grown School feeding Programmes). The programmes thereby potentially contribute to food security objectives for smallholder farmers. However, little evidence is yet available on how these programmes actually work out. Modelling has indicated a potential positive effect on the incomes of small holder maize farmers in Kenya (World Bank, 2009). In reality, it is not easy to use school feeding programmes as a flywheel for the local agricultural economy: international procurement of food might be cheaper than local procurement; administration costs might be high; inadequate market functioning limits local procurement; food quantities locally produced are insufficient to meet demand, the quality of locally produced food is not always adequate and programmes assisting farmers to increase the quality are needed, etc. (World Bank, 2009; USDA, 2009).

Ghana School Feeding Program

The Ghana School Feeding Program started in 2005 with three objectives: 1) reduce hunger and malnutrition by providing a nutritious meal each school day 2) increase school enrollment, attendance, and retention and 3) boost domestic food production. By 2009, the program reached 635.000 students in 1000 schools across the country. The program is increasingly acquiring locally produced foods. Food caterers operate locally and procure food products from local markets. However, when looking at the national level, a number of challenges are indicated for increasing the amount. For staple food crops and for high value crops, domestic production currently is not enough to meet the demand. The functioning of rural markets is insufficient and farmers face several challenges on actually selling their produce to the Ghana School Feeding Program, including levels of production, post-harvest losses, administrative and financial hurdles and lack of information and support to farmers.

Eenhoorn and Becx, 2009
USDA, 2009

School feeding programmes do offer a number of other possibilities to enhance nutritional awareness and change food habits. Schools often have school gardens, mostly for educational purposes. Growing nutritious crops (fruits and vegetables) provides the potential to make children more aware of their beneficial nutritional effects. Including nutrition education in the school curriculum enhances knowledge of good nutritional habits in the young generation, which is an essential life skill (in the same way as hygiene). Children can be seen as 'agents of change' taking home their newly acquired skills and knowledge, and influencing their family members. Involving parents in school activities provides the opportunity of knowledge and skills transfer in nutrition and food habits, health and hygiene.

Cash transfer programmes

Cash transfer programmes are social development programmes that intend to prevent (ultra-)poor households from further sliding into poverty and breaking the intergenerational cycle of poverty. The conditionality refers to required investments into human capital such as school education and regular visits to health centres. Households receiving cash transfers are required to send their children to school, to adhere to preventive health care including vaccination programmes, attend health and nutrition education sessions, etc. Conditional Cash Transfer programmes have proven impact on school enrolment, household food consumption and preventive health care (Rawlings and Rubio, 2005). Up to now, most Conditional Cash Transfer programmes are implemented in Latin America and Asia. Programmes are targeted to poor households and often include specific additional criteria for targeting on pregnancy, children in specific age groups, etc.

Social Cash Transfer and Nutrition impact: Programa de Educación, Salud y Alimentación (PROGRESA)

In 1997, PROGRESA was launched and rapidly expanded over the years coming. By 2000, PROGRESA reached over 40 percent of the total rural population. The main objectives of the cash transfer program were to improve health and nutritional status of poor households, especially mothers and children, and to improve school enrolment, attendance and educational performance. PROGRESA assisted poor households through both supply- and demand-side interventions in education, health and nutrition. Large cash transfers (i.e. on average one-third of a household's income) were disbursed regularly through an electronic card given to the mother on the condition that targeted households fulfilled certain requirements related to health and education.

The first condition was that households would adhere to a health service provision, consisting of free prenatal check-ups for pregnant women, additional health checks for lactating women, regular visits of children under 5 years to health centres for growth monitoring and vaccination, and the provision of nutritional supplements to children aged 4–24 months and pregnant and lactating women. Other household members were required to receive annual health check-ups and all adult household members had to participate in regular meetings facilitated by medical staff to discuss health, hygiene, nutrition issues and best practices. The second condition concerned education and required targeted families to enrol their children in school and ensure regular school attendance.

Evaluations of PROGRESA showed significant increases in nutrition monitoring and vaccination rates, reduced prevalence of stunting and improved dietary diversity. The effects of PROGRESA tended to be larger in poorer households with more educated fathers.

Sridhar and Duffield (2006)

Evaluations of conditional cash transfers have shown significant results on school enrolment, on food consumption (calories, number of meals), especially when the programme includes nutrition education, and on growth performance of young children. An example of a successful conditional cash transfer programme is the PROGRESA programme in Mexico. PROGRESA was able to demonstrate results improved expenditures on food, mostly because of the purchase of fruits, vegetables and animal products, and resulting in higher food intakes and increased dietary diversity. In addition, the programme was able to show improved child growth in young children; children 1-3 years of age grew around 1 cm per year more than controls (Sirdhar and Duffield, 2006).

Local sourcing for food distribution programmes

Food aid/emergency assistance organizations increasingly intend to not only fulfil their role in delivering (quality) food in emergency situations, but also to contribute to local (agricultural) development through local sourcing of the food commodities they need for their food distribution programmes. Buying food locally and in the region is already done by most food assistance organisations. Buying food from small

holder producers is often regarded as difficult, because the quality of the produce often does not meet the required quality standards of the buying organisations and because the fear is that supply is not reliable. The Purchase for Progress (P4P) programme of the WFP attempts to source produce from local small holder farmers, from the rationale that local sourcing, potentially from small holder farmers, contributes to the local food economy. In order to ensure quality supply of food, often these large potential buyers collaborate with organizations that have a good insights into and links with farmers' communities and can provide technical support to farmers in order for them to deliver the required high quality products.

Locally sources school feeding programmes (as described above), are also an example of this way of thinking.

The WFP P4P programme

WFP usually buys food through large competitive tenders, at the global food market, but increasingly also at local markets. P4P is a logical next step in local sourcing, and apart from providing food assistance also having a developmental impact in countries. Through P4P, WFP tests innovative ways to buy staple food and promote marketing opportunities for smallholder farmers. WFP supports farmers in order to deliver the quality and quantity demanded by WFP by linking small holder farmers with the expertise and resources of partners who have a good outreach to smallholder farmers. They support them to achieve better yields, reduce their losses after the harvest and improve the quality of their staple crops. Under the P4P programme, WFP buys from small and medium traders, agro-dealers or NGOs who work with smallholder farmers. P4P currently works in 21 countries, and is a 5 years programme (2008-2013).

<http://www.wfp.org/purchase-progress/overview>

6 Concluding

This desk review documents promising potential pathways for 'nutrition-sensitive' agriculture and food security development. The review supports the insight that the pathways from agriculture to nutrition are not linear and simple.

On the somewhat more 'classical' interventions in agriculture (plant breeding, agronomy and production increase and diversifying cropping or farming systems), more information on actual impacts on food security and nutrition could be found. On interventions of somewhat more recent date, such as access to markets for smallholder farmers, value chain approaches, strengthening farmers' organizations, the effects on household food security and nutrition improvement are less documented. The reason for this presumably is that only a very limited amount of programmes and projects in these areas have explicit food and nutrition security objectives, and thus lack indicators that explicitly monitor progress in this area. In addition, there is a lack of rigorous evaluations that sufficiently document evidence on nutrition improvement. The programmes and projects that do specify improved nutritional outcomes as objectives (and indicators) are relatively new and impacts cannot yet be assessed.

Assessing the impact of agricultural interventions on child nutritional status is complicated. Child nutritional status indicators do not react rapidly. As is shown in the UNICEF framework, achieving impact on child nutritional status requires multiple actions (though not necessarily by one and the same actor). Intervention pathways up to reducing child malnutrition should be well thought-through, and indicators along the 'pathway of change' are required in order to track improvements and assess (intermediary) results. In addition, programmes should be flexible and allow for learning and reflection so that programme interventions can be adapted if progress is lacking behind (Gaarder, 2011).

While (scientific) evidence is still lacking on linking agriculture and nutrition, the meta-review as performed by IFPRI and World Bank shows a number of valuable lessons learned that seem to make sense and can very well be applied in new or existing programmes and interventions (World Bank 2007):

1. Design agricultural interventions with an eye on the ultimately desired outcome (nutrition improvement) and include complementary processes and strategies that redirect the focus beyond agriculture for food production;
2. Design and implement agricultural programmes with an eye on the local food context (commodity selection);
3. Help smallholder farmers adapt to changing (global) circumstances and make use of emerging opportunities (link small farmers to agricultural commercialization);
4. Link agricultural interventions to nutritional knowledge and behaviour change programmes;
5. Link agricultural programmes to women's empowerment.

The results of the IFPRI conference 'Leveraging Agriculture for Improving Nutrition and Health' (Feb 2011) support the conclusions of this desk review and called for increased attention for 'nutrition sensitive agricultural development' and for explicitly outlining the 'pathways of change' from agricultural production to consumption and improved nutritional status, with indicators attached to the various steps so that the pathways of change can be monitored. It was also stated in the conference that up to now, this has not yet been done. On the other hand, in spite of the lack of scientific evidence, there seems to be sufficient 'ground' to start working along the lines indicated and not wait until the scientific evidence is collected.

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The desk review explores possibilities to include nutritional considerations into policies and programmes in the field of agriculture, value chain development and food security. Rationale for the literature review is the renewed attention for agriculture and nutrition on international agenda's and more specifically the renewed attention on linking the two: how can interventions in agriculture contribute to improvements in the nutritional situation, and under what conditions. The desk review was carried out in preparation of field level explorations with Netherlands Embassies in Ethiopia and Bangladesh.

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