Improving nutrition outcomes in food systems and their benefits to climate action

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATIONS

CSA	Climate-smart agriculture
FAO	Food and Agriculture Organization
FLW	Food Loss and Waste
GHG	Greenhouse gas
HLPE	High Level Panel of Experts on Food Security and Nutrition
IPCC	Intergovernmental Panel on Climate Change
NDC	Nationally Determined Contribution (to the Paris Agreement)
SPA	Support Project for the Implementation of the Paris Agreement (GIZ)
UNSCN	United Nations System Standing Committee on Nutrition
WRI	World Resources Institute

GLOSSARY

A **food system** consists of all the elements (environment, people, inputs, processes, infrastructures, institutions, etc.) and activities that relate to the production, processing, distribution, preparation and consumption of food and the outcomes of these activities, namely, nutrition and health status, socio-economic growth and equity, and environmental sustainability (HLPE, 2014).

Climate smart agriculture (CSA) addresses food security and climate challenges by i) sustainably increasing agricultural productivity and incomes; ii) adapting and building resilience to climate change; and iii) reducing and/or removing greenhouse gasses emissions, where possible (FAO, 2013).

Food loss and waste (FLW) refers to a decrease, at all stages of the food chain from harvest to consumption, in mass of food that was originally intended for human consumption, regardless of the cause (HLPE, 2014).

Malnutrition is an abnormal physiological condition caused by inadequate, unbalanced or excessive consumption of macronutrients and/or micronutrients. Malnutrition includes undernutrition and overnutrition as well as micronutrient deficiencies (United Nations System Standing Committee on Nutrition, 2017).

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 (World Food Summit, 1996). This widely accepted definition points to the four dimensions of food security – food availability, access, utilization and stability (FAO, 2006).

Nutrition-sensitive agriculture is an approach that seeks to ensure the production of a variety of affordable, nutritious, culturally appropriate and safe foods in adequate quantity and quality to meet the dietary requirements of populations in a sustainable manner (FAO, 2017a).

Stunting refers to a child who is too short for his or her age. Stunting is the failure to grow both physically and cognitively and is the result of chronic or recurrent malnutrition. The devastating effects of stunting can last a lifetime (UNICEF, WHO and World Bank 2016).

Undernutrition exists when insufficient food intake, repeated infection and poor care practices result in one or more of the following: being underweight for age, short for age (stunted), thin for height (wasted) or functionally deficient in vitamins and/or minerals (micronutrient malnutrition) (United Nations System Standing Committee on Nutrition, 2017).

Wasting refers to a child who is too thin for his or her height. Wasting, or acute malnutrition, is the result of recent rapid weight loss or the failure to gain weight. A child who is moderately or severely wasted has an increased risk of death, but treatment is possible (UNICEF, WHO and World Bank 2016).

1 BACKGROUND

Integrating nutrition into climate change actions and climate change considerations into nutrition interventions opens opportunities to achieve several development goals and produces multiple co-benefits. Enabling wide access to healthy and nutritious food that is regionally produced, benefits rural producers and urban consumers, reduces greenhouse gas (GHG) emissions along the value chains and makes the entire food system more resilient to climate change. Set in the right framework, it is a development intervention that has both adaptation and mitigation benefits.

Global trends such as rapid urbanization, dietary changes and related health issues coupled with climate change are affecting nutrition outcomes that are manifested in various forms of malnutrition. Nutrition outcomes play a crucial role in mitigating climate change and increasing resilience of vulnerable people by decreasing consumption of GHG-intensive food, reducing food loss and waste, and ensuring access to (nutritious) food. Evidence from practice shows that nutrition-sensitive outcomes can be achieved through Climate-Smart Agriculture that encompasses addressing climate change and achieving food security.

In light of global challenges such as climate change and manifestation of various forms of malnutrition, there is an urgent need to integrate nutrition-sensitive and climate-smart objectives into policy and practice. At local, national and international level this can happen through linking agendas such as the 2030 Agenda for Sustainable Development and the Paris Agreement. In practice, the synergy of the global agendas can be summarized as climate-smart nutrition, which encompasses improved nutrition outcomes *and* climate action.

This brief presents the development challenges posed by climate change and malnutrition, links them together and delivers key messages regarding climate change and nutrition outcomes. Recommendations are made on how to promote these interlinkages for development cooperation across various sectors.

1.1 The Climate Challenge

The global concentration of carbon dioxide in the atmosphere hit the record high for the first time in 2013 and is still on the rise (NASA, 2018). Two years later, under the Paris Agreement, the Parties have agreed to keep global temperature rise below 2°C above pre-industrial levels and to pursue efforts to limit the increase even further, to 1.5°C. Achieving this target requires both reducing the emissions (mitigation) and adapting to a changing climate.

At the center of the Paris Agreement are Nationally Determined Contributions (NDCs) that lay out national commitments to reduce GHG emissions and increase countries' resilience to climate change. In most of the NDCs, the agricultural sectors (crops, livestock, forestry, fisheries and aquaculture) are identified as foremost adaptation priorities (FAO, 2016). For 54 out of 162 countries, food insecurity and malnutrition are identified as the major risks they face under climate change. In most NDCs, the adaptation-mitigation synergies of the agricultural sectors are acknowledged, as well as socio-economic and environmental co-benefits such as rural development and health, poverty reduction and job creation, conservation of ecosystems and biodiversity, and promotion of gender equality (FAO, 2016).

Climate change impacts nutrition outcomes by affecting quantity and quality of food produced, as well as access to food. It is estimated that the growth rates of major crops will decrease

by eight to twelve percent and prices will increase by up to 90% until 2030 (Figure 1). Climate change is affecting the nutritional content of food as well: studies have shown that under elevated CO2 concentrations many food crops such as wheat, rice, barley, and soybean have much lower iron, zinc and protein concentrations (Smith, Thornton, & Myers, 2018). In addition, the higher temperatures and more extreme weather events associated with climate change create favorable conditions for food- and water-borne pathogens (IFPRI, 2015).

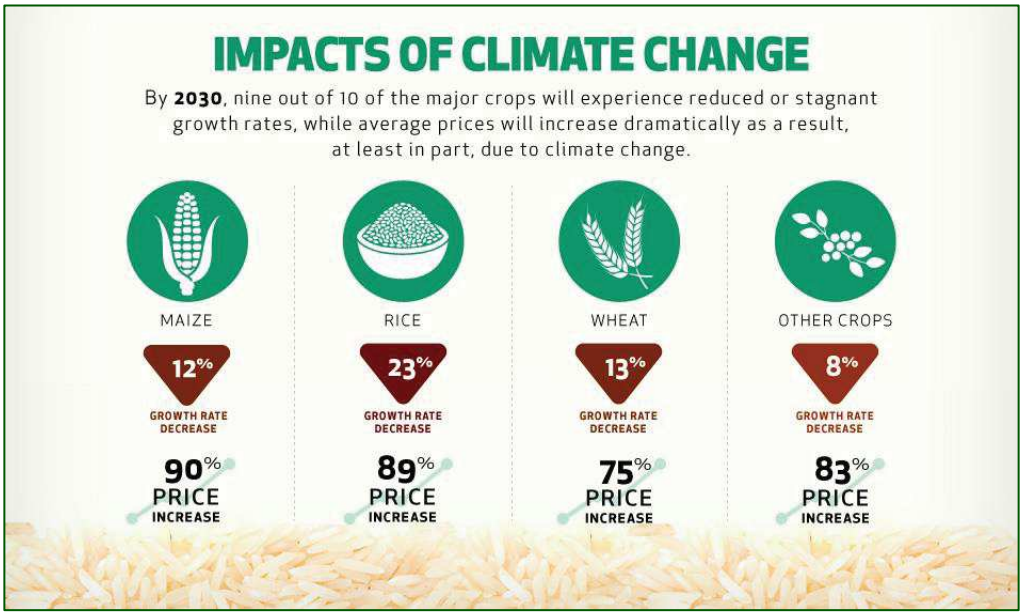


Figure 1: Impacts of climate change on major crops

Source: (Bailey et al., 2011) [1]

Food systems are one of the large GHG emitters on the planet, which means there is great potential to cut these emissions in various ways (GIZ, 2018). Currently, both food production and consumption are responsible for 19-29% of all anthropogenic GHG emissions, up to 70% of water usage and more than 60% of terrestrial biodiversity loss (United Nations System Standing Committee on Nutrition, 2017). Most emissions are caused by livestock in the form of methane (MH4) and nitrous oxide (N2O) and have been increasing 8% per year in the past decade due to increased production (GIZ, 2018).

Rapid urbanization, coupled with other factors such as rising incomes, is driving changes in what people consume. These changes in diets can have significant impacts on GHG emissions in agriculture. Consumption of animal-based foods, mostly meat, is a major contributor to agricultural GHG emissions (Bajželj et al., 2014; Campbell et al., 2016; Wilkes, Kiff, Wollenberg, & White, 2016). Shifts to more animal-based diets could raise agriculture and food GHG footprints by as much as 80% (United Nations System Standing Committee on Nutrition, 2017). In order not to further exacerbate the above-described two-way negative effects between climate change and

[1] Data visualization by https://farmingfirst.org/Post2015-Planet

the agri-food system, climate change adaptation and mitigation will have to go hand in hand in the land use sector.

Key Message: Climate Change negatively affects food and nutrition security while unsustainable food production and changing diets negatively affect the climate. Climate change adaptation and mitigation therefore must go hand in hand in the agriculture and nutrition space to break this negative feedback loop.

1.2 The Nutrition Challenge

Continued population growth, urbanization, and increasing wealth have led to rapid growth in demand for food, both in quantity and quality. While industrialized countries have experienced these changes in their development path, most of these changes are also taking place in developing countries that are transitioning to middle-income status. These trends have serious implications for the use of natural resources within the safe operating space of the biosphere. Increasing demand for these resources can affect the social resilience of vulnerable groups by contributing to different forms of malnutrition.

The world population is projected to reach 9 billion by 2050 (UNDESA, 2017), creating additional 1.8 billion food consumers. By various estimates, in a scenario of modest economic growth until 2050, agricultural demand is expected to grow by 50 percent (FAO, 2017b). The food consumption is projected to increase from the current levels both for industrialized and developing countries (WRI, 2016; Alexandratos & Bruinsma, 2012).

Rapid urbanization and rising incomes are coupled with what is known as 'nutrition transition' to denote the shift in diets: from coarse grains, staple foods and cereals towards more animal based products, sugar, and processed foods (FAO, 2017a; Hawkes, Harris, & Gillespie, 2017; HLPE, 2017). These changes in diets are causing serious diet-related health conditions such as obesity, diabetes, and heart conditions when consumed in excess. Food environments in urban areas enable access to unhealthy diets through the availability of supermarkets, food vendors, and restaurants (although it can also facilitate access to healthy food) and unhealthy diets are mostly affordable for urban poor. While the nutrition transition is driven mainly by urbanization, it is taking place in rural areas as well (Hawkes et al., 2017). These challenges call for mainstreaming climate action into health sectors.

Currently, the global nutrition situation is not improving and the 'triple burden' of malnutrition persists (see Info Box below). With climate change, nutrition outcomes are going to be negatively affected and result in less availability of nutritious food.

Info Box: World Nutrition Situation in Numbers

- **2 billion** people lack key micronutrients like iron and Vitamin A,
- **155 million** children are stunted,
- **52 million** children are wasted,
- **2 billion** adults are overweight or obese,
- **41 million** children are overweight,

88% of countries face a serious burden of either two or three forms of malnutrition.

The triple burden of malnutrition:

- undernutrition (stunting and wasting in children),
- over-nutrition (obesity both in children and adults) and
- micronutrient deficiencies (lack of minerals and vitamins)

Source: Global Nutrition Report 2017

Latest estimates show that the number of undernourished people has been on the rise globally since 2014, reaching an estimated 812 million in 2017 from 804 million in 2016 (FAO, IFAD, UNICEF, WFP, & WHO, 2018). At the same time, malnutrition is no longer about not getting enough calories, but also taking in more calories than required. The global average caloric intake has increased in previous years to 2,270 kcal per person per day; with the significant proportion of global population consuming more than 3,000 kcal per person per day (Alexander & Moran, 2017; Table 1).

Table 1: Caloric consumption groups by global population

Caloric consumption groups (national averages) Kcal/person/day in 2005/2007	**Number of world population living in countries**
Less than 2,000 kcal	0.5 billion
Under 2,500 kcal	2.3 billion
Over 3,000 kcal	1.9 billion
2,770 kcal	***Global Average***

Source: adopted from (Alexandratos & Bruinsma, 2012)

These trends have serious implications for food production systems, especially if continued business as usual. Satisfying increased demand on food with existing food systems is likely to lead to more intense competition for natural resources, increased GHG emissions, and further deforestation and land degradation (FAO, 2017b).

Key Message: Rapid urbanization and changing diets are having massive impacts on consumption patterns globally. With increasing population, more demand for food is expected. At the same time, the consumption of less nutritious food is increasing, leading to the 'triple burden of malnutrition'. These trends increase the need for climate change adaptation and mitigation.

2 LINKING NUTRITION AND CLIMATE CHANGE

The Paris Agreement was the first climate agreement to put high priority on food security (Development Initiatives, 2017). The preamble of the agreement refers to "safeguarding food security and ending hunger, and the particular vulnerabilities of food production systems to the adverse impacts of climate change" (FAO, 2016). Article 2.1 of the Agreement stresses the importance of "increasing the ability to adapt to the adverse impacts of climate change and foster climate resilience and low greenhouse gas emissions development, in a manner that does not threaten food production" (ibid).

Shifting to healthy, low-emissions diets is associated with emission savings of up to 30% compared to business as usual continuation of current dietary trends. In aggregate, this consumption shift could dramatically reduce agricultural emissions on a global scale (CAT Decarbonisation Series, 2018). For example, reducing meat consumption in the developed countries and increasing it in countries with protein deficiency could bring about reductions in non-CO2 emissions (compared to a reference scenario without diet shift) of 1.5 GtCO2e/year by 2030. Moreover, a number of studies confirm that diet shifts can potentially have higher mitigation impacts than technological changes on the supply side (Bajželj et al., 2014; Campbell et al., 2016; CAT Decarbonisation Series, 2018). Studies also show that future pathways of human diets, including their content (i.e., meat) "are stronger determinants of whether world food demand by 2050 can be met without causing deforestation than e.g. assumptions on future cropland availability, yield, and livestock feeding practices"(CAT Decarbonisation Series, 2018).

Food loss and waste (FLW) is another large area with mitigation potential. A FAO study on global food supply chain found that one third of the food, produced for human consumption does not reach consumers and gets lost and wasted along the supply chain representing also loss of inputs used to produce this FLW (FAO, 2011; HLPE, 2014).

Nutrition and adaptation outcomes are also strongly interlinked (more in chapter 2.2). The nutrition status and overall health of (smallholder) producers is a main determining factor of climate vulnerability. Poor nutrition can result in diminished productivity, which in turn lowers the adaptive capacity of entire communities. Diversified local production of a variety of crops and livestock, coupled with storage and value-addition, on the other hand incentivizes a healthy, diverse and nutritious diet, which increases the adaptive capacity.

Continuing to increase agricultural yields to meet the growing food demand in a business-as-usual manner is not an option if the world community wants to stay below the 2-degree emissions scenario. Instead, a combination of pathways is available to reduce the GHG footprint as illustrated in Figure 2:

- cutting food waste,
- introducing diet changes towards less emission intensive foods, and
- sustainable intensification.

Figure 2 shows that if food production continues like today, focusing on increasing yields until 2050, the allowable GHG emissions cap for the 2-degree scenario for all sectors (red line) would be reached by the agriculture and land use sector alone (scenario on the very left).

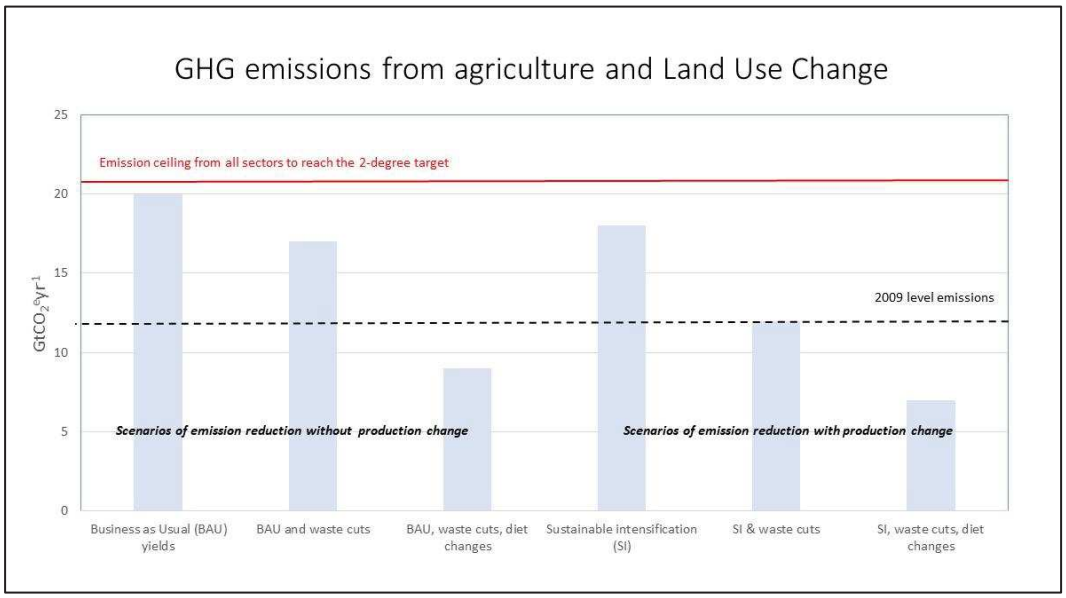


Figure 2: GHG emissions from agriculture and land use change in relation to the 2-degree target

Source: Adapted from (Bajželj et al., 2014); Only agriculture emissions, excluding other sectors such as energy and transportation.

Production change in the form of sustainable intensification (SI) is necessary but not enough. Reducing food waste by 50% and changing diets towards healthy diets – so called demand side measures – offer enormous mitigation potential from the agri-food system (see Info Box: Demand Side Measures).

Info Box: Demand Side Measures

Demand side measures are defined by the IPCC as value chain interventions from farm gate to fork. Measures include:

- Food Loss and Waste reduction
- Changes in human diets towards products that are less GHG intensive.

Food loss and waste (FLW) refers to a decrease, at all stages of the food chain from harvest to consumption, in mass of food that was originally intended for human consumption, regardless of the cause (HLPE, 2014). In developing countries, the bulk of loss happens at production and post-harvest stage, as opposed to industrialized countries, where a large amount of food is wasted at the retail and consumption end. Importantly for the nutrition-climate change nexus, over-consumption, i.e., intake of more calories than required, is recognized as a food waste or inefficiency of the food system as well (Alexander et al., 2017; Bajželj et al., 2014; Segrè et al., 2014) and as a public health concern (Kiff et al., 2016; Lipinski et al., 2013).

From a GHG intensity point of view, the most effective **dietary change** is consuming less animal products (Kiff et al. 2016). From a nutrition point of view, the situation is much more complex. Avoiding diets low in fruit and vegetables, low in whole grains, nuts and omega 3 fatty acids but high in salt, could help avoid millions of deaths and lost disability-adjusted life-years,

including in developing countries (Wiggins & Keats 2017). Dietary measures are ones that "encourage people to consume diets that contain the energy, protein, vitamins and minerals they need, without excess consumption (ibid.)". Policies for diets can be categorized into:

- information to influence individual choices;
- price incentives, income measures such as subsidies for healthy foods and food stamps; and
- restrictions and rules on food processing, advertising and retail.

Concrete initiatives in developing countries are very few so far. Examples from industrialized countries can offer lessons that may be relevant to middle classes in emerging economies. Some cases and best practice examples will be highlighted in the next three sections.

2.1 Strengthening urban-rural food linkages

Info Box: Landscape Approach

Despite lack of official definition, there is a general understanding that the 'landscape approach' involves integrating agricultural production and environmental protection at the landscape level. This type of approach "provides a broad framework that can fully integrate agriculture, the natural environment, different livelihood systems and social interactions towards a sustainable development agenda." (CGIAR, n/a)

The landscape approach could address many of the issues mentioned above such as changing diets, rapid urbanization, food security and nutrition in a holistic and sustainable manner (Dubbeling, Bucatariu, Santini, Vogt, & Eisenbeiß, 2016). Urban-rural food systems consist not only of physical attributes but also of many other socio-ecological flows such as market connections and exchange of goods and services. There are several ways in which urban and rural areas are connected and form one food system (Dubbeling et al., 2016):

- Agricultural production in rural and peri-urban areas is linked through markets to urban food distributors and end consumers. This linkage can be enhanced by enabling more direct interaction between producers and consumers.

Business case example: School-feeding program incorporating regional produce in Brazil

Brazil's national school feeding program, launched in 1955 and covering nearly 47 million children, aims to contribute to the growth, development, and learning capabilities of students, as well as supporting healthy habits through education and promoting local farms by directly purchasing from them. With the help of this program, school meals meet national nutrition standards, since Brazilian law requires that 70% of the food served to children in school meal programs be unprocessed (e.g. rice, beans, meat, fish, fruits or vegetables) and 30% be locally sourced. (Wiggins & Keats 2017).

- Rural watersheds provide ecosystem services such as potable water necessary for agricultural production in rural, peri-urban and urban areas. Sustainable forms of urban water management can provide financial incentives for the preservation of such agricultural watersheds.

Business case example: Beverage bottling companies investing in watershed protection
Water and beverage bottling companies that are usually based in peri-urban production sites, have started investing in watershed protection in agricultural areas in order to improve water quality and reduce treatment costs caused mostly by nutrient runoff and erosion. A similar business case exists for hydropower plant operators such as Itaipu on the Brazil-Paraguay border. Itaipu is preparing an investment plan for the watershed. The objective is to reduce the sedimentation of the reserve and generate socio-environmental benefits such as carbon sequestration and forest conservation, and economic benefits for the landowners as well through sustainable land use models (UNIQUE forestry and land use, 2017).

- Food loss and waste can be prevented, reduced and managed, including through the recovery and redistribution of safe and nutritious food for human consumption along the food supply chain from production to consumption, spanning both rural and urban territory.

Business case example: Avoiding post-harvest, storage and transport spoilage in three business cases across Sub-Saharan Africa
A study by CCAFS (2018, forthcoming) describes low-tech business cases for private sector companies who have invested in minimizing food loss in the early post-production stages of the dairy, grains and tomato value chains. The two dairy measures in Kenya are larger scale and show significant potential to reduce national emissions considering GHG intensity of the dairy sector. Introducing crates in the tomato value chain in Nigeria illustrate food loss reduction potential during transportation between regions, which increases the availability of tomatoes for consumption. Also, introducing hermetic bags in the maize value chain in Tanzania has large potential to reduce post-harvest losses in maize production and improve livelihoods of many smallholder farmers (CCAFS & UNIQUE forestry and land use, 2018).

- Agricultural organic waste is a valuable resource for energy capture or as raw material for fertilizer production that can be used in both rural and urban areas.

Business case example: Organic fertilizer start-up entering a vast, empty market in Kenya
In Kenya, the organic fertilizer market is large and untapped, as most smallholders do not use any type of fertilizer and medium to large sized farms usually rely entirely on the conventional mineral products. Startup company Kofar Ltd. has identified this gap and has started sourcing organic waste from municipal open-air markets of Kitale in

North-Western Kenya. Together with separately packaged micro-nutrients and plant enzymes, they redistribute the organic fertilizer to SME farms.

- Preservation and sustainable management of agricultural lands in rural and peri-urban areas can help enhance flood retention or mitigate increasing temperatures, thus reducing the climate change vulnerability of both urban and rural areas.

Increasing the connectivity between urban and rural areas and shortening the food supply chain has various benefits. Food producers potentially earn higher incomes from more direct sales, consumers get access to fresher, less processed food, and the pressure on natural resources is reduced by decreasing food loss and waste in tighter logistics chains.

Key Message: Regarding urban-rural food systems as one ecosystem, where nutrition requirements and resource use are balanced, helps create and incentivize land use practices that are within the planetary boundary.

2.2 Linking nutrition outcomes to climate change outcomes

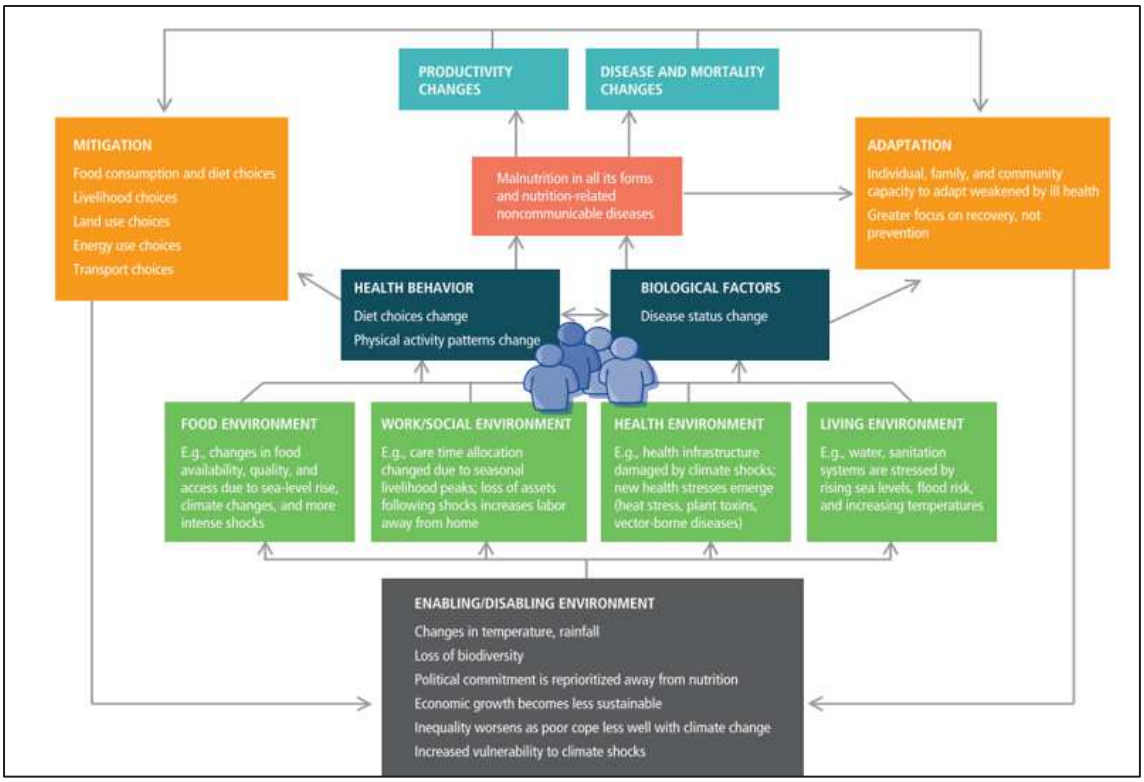
Changes in the nutrition status of producers can cause health problems, diminished productivity, and even mortality (TEEB, 2015). This, in turn, has implications on the ability of communities and individuals to adapt to the changing climate, often forcing them to make short-term coping decisions instead of investing in longer-term adaptation strategies. A typical example is a short-term decision of a smallholder farmer, usually a female responsible for household and children, to cook less nutritious and healthy foods which has long term health and development implications (IFPRI, 2015; TEEB, 2015). In a feedback loop, this further undermines the enabling environment for malnutrition reduction.

The conceptual framework developed in *the Global Nutrition Report 2015* (IFPRI, 2015) brings together two lines of narratives:

i) the impact of climate change on nutrition and the impact of nutrition on adaptive capacity; and
ii) the impacts of food production and diet choices on GHG emissions.

The conceptual model in Figure 3 is a human-centred model that includes the impacts of climate change on the drivers of nutrition (the four green boxes). Feedback loops left and right illustrate how adaptation and mitigation actions can strengthen nutrition outcomes and how the lack of climate action leads to a disabling environment for nutrition. The model illustrates how people's dietary choices, determined by various environments (climate, policies, institutions), contribute to GHG emissions (need for mitigation) and how their adaptive capacity is weakened by the impacts of malnutrition (need for adaptation).

Figure 3: Conceptual links between climate change and nutrition.



Source: Adapted from (IFPRI, 2015)

Several interventions can be introduced along the food supply chain to maximize nutrition outcomes, increase individual and community resilience and reduce GHG emissions. A number of interventions are possible at each stage of the food supply chain to ensure that nutrient-rich foods are accessible and the nutritional value of foods is maintained or increased. Examples of such interventions are crop diversification (both in species and varieties), utilization of local species, or the cultivation of bio-fortified crops (HLPE, 2017) that yield nutrition, adaptation and mitigation benefits. For example, biofortification involves developing new varieties of staple crops (such as cassava, sweet potatoes, wheat, rice, etc.) with the goal of enhancing levels of micronutrients such as pro-vitamin A, iron and zinc. The main target of such programs are subsistence and semi-subsistence farmers who grow crops for their own consumptions. Consumption of biofortified foods allows the farmers to increase micronutrient intake by substituting a micronutrient-poor staple with its micronutrient-rich counterpart (FAO, 2017a).

The two following examples show how climate-smart nutrition interventions are starting to happen in emerging economies.

Info Box: Achieving nutrition and adaptation outcomes through a project design aimed at climate change mitigation – the case of Livelihoods Fund and Naandi Foundation in the Araku Valley, India

In partnership with the Livelihoods Carbon Fund, local NGO Naandi Foundation decided to support local communities in the Araku Valley to rebuild their forests. Most of the health and nutrition issues of the Adivasi communities were linked to the fact they did not have access to forests anymore. Naandi developed a holistic approach, "the Araku Way", where farming is linked to education and community bonds. The activities of the NGO focused on land productivity, crop and

pest management as well as market connection. With the support of the Livelihoods Carbon Fund, the Naandi foundation was able to scale up its activities and co-build an agroforestry components to reach 100,000 people in 300 villages. The communities themselves have planted 3 million multi-purpose trees to restore the degraded land and an additional 3 million coffee plants for income generation. The communities made decisions regarding the plots, were involved in all the steps of the projects, and received training from Naandi on sustainable farming practices. The received training enabled them to take good care of their trees and soil while preserving their fragile ecosystem. These activities thus also increased the resilience of local communities in addition to climate mitigation. The previously degraded lands of the Adivasi communities are now transformed into functional forests and providing with food and income for local population, shelter and food for wildlife, and will sequester around 1 million tons of CO2e over 20 years (http://www.naandi.org/).

Info Box: Using persuasion to influence diets in South Korea

South Korea tries to preserve healthy elements of traditional diet in the face of a nutrition transition. Public campaigns and education, including the large-scale training of women in the preparation of traditional low-fat, high-vegetable meals, has seen less modification of Korean diets than might be predicted, given the country's relatively high average incomes. Korea has about half the level of overweight and obese people as some emerging economies (Wiggins & Keats 2017).

The (positive) GHG effects of consuming a traditional diet versus a "modernized" one in the South Korean context could be considerable, but has not been assessed so far. For the policy efforts of linking nutrition outcomes with climate change benefits, such analyses should be promising in different settings across global regions.

Key Message: Achieving nutrition outcomes along the agri-food value chain increases the adaptive capacity to climate change and can have mitigation co-benefits.

2.3 Mainstreaming nutrition outcomes across sectors

Nutrition outcomes have so far been addressed mainly from the perspectives of agricultural production and the health sector. However, in the face of climate change and the global malnutrition crisis, climate-smart nutrition outcomes should be integrated in other sectors as well, first and foremost by addressing consumption patterns.

- **Consumption**: consumption patterns and changing lifestyles determine dietary choices. Promoting nutrition-focused healthy diets, especially in the contexts where 'nutrition transition' is taking place can create demand for healthy foods and result in improved nutrition outcomes. Sustainable and healthy diets can bring benefits both to the environment and to people's wellbeing and nutrition status. Interventions addressing changes towards healthy diets through demand-side measures in the food system should be promoted across sectors.

- **Education**: it is generally accepted that nutritional education is an important element within a diverse policy package. Innovative education campaigns that target young consumers bring positive change in the variety and quality of diets (United Nations System Standing Committee on Nutrition, 2017). Despite "its ability to influence behavior change on its own is thought to be limited" (Kiff, Wilkes, & Tennigkeit, 2016), it can be applied in conjunction with other measures to promote nutrition-informed outcomes.
- **Environment/Natural resource use**: agricultural systems are associated with large environmental footprints in terms of GHG emissions, land and water use. The natural resource base determines the supply of the required calories within a food system. Integrating nutrition-outcomes into land use and other resource use planning processes can provide synergies between improved nutrition outcomes and sustainable natural resource use.
- **Climate change policy entry points**: dietary and nutrition focused outcomes should be integrated into climate-change agenda where these issues currently receive limited attention. The IPCC has highlighted the co-benefits of measures that reduce climate-related emissions and improve health at the same time, for example shifting away from overconsumption of meat in high-meat-consuming countries (United Nations System Standing Committee on Nutrition, 2017). In this context, it is of critical importance to promote demand-side climate mitigation options for the agriculture and food sector such as changes in dietary patters towards less emission-intensive diets and reducing food loss and waste (GIZ, 2018; Kiff et al., 2016; United Nations System Standing Committee on Nutrition, 2017).

Key Message: A focus on climate-smart nutrition outcomes can be integrated in several sectors beyond health and agriculture and yield multiple co-benefits.

3 CONSIDERATIONS FOR POLICY MAKERS

International level: global policy framework and commitments on nutrition and climate change

The Paris Agreement is the first international climate agreement that prioritizes food security and nutrition on a global agenda. The Second International Conference on Nutrition (ICN2) Rome Declaration has also underlined the need to address the impact of climate change and other environmental factors on food security and nutrition. As the result, the UN General Assembly has adopted a Resolution proclaiming the UN Decade of Action on Nutrition from 2016 to 2025. One of the six action areas of the UN Decade of Action on Nutrition's Work Programme is "sustainable, resilient food systems for healthy diets" (United Nations System Standing Committee on Nutrition, 2017).

The global climate commitment under the Paris Agreement and the Nutrition Decade provide a time-specific window of opportunity to enhance cooperation and coordination among all actors and drive integrated action on human and planetary health across sectors. To accelerate the achievement of the SDGs, the nutrition focus of climate change commitments and agricultural targets expressed in NDCs should be further emphasized and implemented (United Nations System Standing Committee on Nutrition, 2017).

Identified entry points:

- **At the international level, nutrition does not have a stand-alone profile within the climate negotiations and is integrated under the broad umbrella of agriculture and land use (change). Policy makers should aim to highlight the potential for nutrition interventions in climate change using a landscape approach, along with other win-win interventions on the rural-urban spectrum such as climate-smart agriculture production (soil carbon), clean energy and resilient cities.**
- **Such an interdisciplinary approach and perspective is promoted by the International "4 per 1000" Initiative which focuses on the crucial role that soils can play when food security and climate change are concerned (https://www.4p1000.org/).**

National level: national policy processes under international agendas

Nutrition can be considered in national climate-action processes under the UNFCC such as NAPs, NDCs, and NAMAs (FAO, 2016). The agriculture sector plays a central role in many national level plans and commitments and is frequently expressed in NDCs: as a sector vulnerable to climate change and as a sector that offer climate change mitigation and adaptation co-benefits (FAO, 2016). Among the technical and financial support mechanisms provided by the UNFCCC for climate change capacities of countries, the NDC Partnership is a global initiative that can support national processes in integrating nutrition-outcomes in their national climate policies. Launched during the COP22 in 2016, the NDC Partnership provides tools and support to the countries climate and sustainable development targets. The NDC Partnership provides a platform through which the countries can be supported in transforming their agriculture sector climate commitments with the focus on nutrition.

Identified entry points:

- **The NDC Partnership can be used as a platform to support the UNFCCC Parties in elaborating their agriculture climate sector commitments and channel guidelines on linking nutrition and climate action.**
- **Collaboration with the GIZ ONE WORLD – No Hunger Global Initiative on synchronizing nutrition-oriented and climate change-oriented indicators should be sought and enhanced to deliver the adaptation-mitigation-nutrition triple win narrative.**

Local level: making the climate-nutrition linkage in projects

The synergies between food security, nutrition, and climate change can be promoted at the local level. Community-based planning processes (such as management and development plans) include participatory processes and tools that bring together all the relevant stakeholders and are especially suitable to design interventions at the level of urban-rural food systems. Climate risk and vulnerability analyses link climate change, livelihoods and food security together and could inform land use planning and other local interventions such as education for improved nutrition outcomes and climate change targets in the specific food system.

Identified entry points:

Nutrition projects have specific and short-term considerations whereas climate action projects by design take into account the longer term future. Projects can add value to both nutrition and land use projects, by integrating long-term climate projections and considerations into shorter-term nutrition initiatives and vice versa better integrating shorter term nutrition outcomes when designing land use projects with adaptation and mitigation benefits.

- **More systematically undertaken climate risk and vulnerability assessments could help better align nutrition projects with a long term planning framework based on climate risk management. Projects could additionally propose to estimate positive/negative adaptation and mitigation effects of nutrition interventions, comparing traditional nutrition projects with ones that include climate risk and vulnerability assessments as well as mitigation considerations.**
- **Training materials on food and nutrition security for national partners do exist[2] and could be used in future projects targeted at the land use sector.**
- **Over-nutrition is becoming a concern in international projects but is not taken up yet in project planning, design, implementation, and monitoring and evaluation of results. All forms of malnutrition, including their implications for climate change adaptation and mitigation outcomes, should be taken into account in future project design.**

[2] For example https://www.snrd-africa.net/new-training-materials-on-food-nutrition-security/

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