

## Review on Contribution of Fruits and Vegetables on Food Security in Ethiopia

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### Abstract

Fruits and vegetables are providing an abundant, cheap source of fiber and several vitamins and minerals. In general, they have the highest nutritional value when eaten fresh, although an exception may be fermented foods, in which the process of fermentation can increase the content of B-vitamins. Fruit and vegetable (F&V) production, individual F&V intake, household food security, and anemia levels for individual women caregivers of childbearing age. The number of small-scale producers involved in horticulture is estimated at 5.7 million farmers. The area under vegetables increased from 350,600 ha with production of 2.36 million tons in 2010 to 396,510 ha with production of 4.48 million tons in 2013 for smallholder farmers. Ethiopia mainly due to cereal based food habit is practicing and largely affects children's in most part of the country. Many research reports indicated that an estimated five million people are suffering from lack of vitamins and essential minerals. In general 60 to 80 % of health problems in Ethiopia are due communicable diseases and nutritional problems. Ethiopia has got an immense potential to develop intensive vegetable production especially at commercial scale. In general, the drawback to this sector include social and cultural habits of the population like dietary preferences for meat and other animal products, and distaste for vegetable crops, lack of consumer awareness, economic reasons of the local consumers, absence of nutrition intervention program using vegetables. The use of a qualitative tool to measure household food insecurity is robust and applicable in other contexts. Furthermore, F&V-producer households are potentially more food secure, and women caregivers in producer households have significantly higher levels of hemoglobin, rendering the prevalence rates of anemia lower among F&V-producer households. We argue that these effects, modest as they are, could be further improved if there were deliberate efforts to promote the intensification of smallholder F&V production. This paper aims to review on Contribution of fruits and vegetables in food security in Ethiopia.

**Keywords:** Contribution; Fruits and vegetables; food security Introduction

Agriculture plays a central role in increasing food availability and incomes, supporting livelihoods and contributing to the overall economy (World Bank, 2008), and a key factor to improve food and nutrition security. The agricultural sector accounts for 55% to the Gross Domestic Product and provides 85% of employment. Ethiopia produces mainly a variety of cereals, pulses, oilseeds, and coffee. Grains are the most important field crops and the main element in the diet of most Ethiopians followed by pulses. Vegetable and fruit production and consumption is relatively limited. Small-scale farmers, who account for 90% of the agricultural output, cultivate an estimated 96% of total cropped land (Greenhalgh and Havis, 2005). The number of small-scale producers involved in horticulture is estimated at 5.7 million farmers (MoARD, 2007). Few smallholder farmers are engaged in out-growers arrangements. After the establishment of farmers association unions, like Mekibatu and Alemaya, in the rift valley and eastern part of the country respectively, approximately 600 farmers are supplying their products (tomato, onion, potatoes) to the unions under contractual agreements. The union supplies the out-growers with inputs like seed and fertilizer and sometimes pesticides (Woldsadiq, 2007). Ways in which agriculture can sustainably contribute to improving dietary diversity and nutrition outcomes include support for: agricultural extension services that offer communities information and improved inputs such as seed and cultivars for better crop diversity and biodiversity; integrated agro-forestry systems that reduce deforestation and promote harvesting of nutrient-rich forest products; aquaculture and small livestock ventures that include indigenous as well as farmed species; education and social marketing strategies that strengthen local food systems and promote cultivation and consumption of local micronutrient rich foods; bio fortification via research and development programs that breed plants and livestock selectively to enhance nutritional quality; and reduction of post-harvest losses via improved handling, preservation, storage, preparation and processing techniques. The rapid growth of the urban population and the low nutritional levels of the urban poor, the rise of cost for foods raised the development of urban agriculture in many countries of the developed and developing nations as one of the strategy to address the urban challenges because urban agriculture provides a substantial contribution to food security and enhance the nutritional level for the urban poor in many developing countries (FAO, 2014). Food security refers to the availability of food and one's access to it. A household is considered food secure when its occupants do not live in hunger or fear of starvation (FAO, 2001). Food security exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life (Idachaba, 2000).

In the World Bank Policy Study (2006) food security is defined as access by all people at all times to

enough food for an active healthy life. Food security involves not only food availability through storage, and trade but also more importantly food access through domestic or home production (Economic commission for Africa, 2009). It is the contentions of the sustainable food security, food supplies must keep pace with increase population and urbanization (FAO, 2010). As such, according to FAO, addressing agriculture and population growth is vital to achieving food security. Other organizations and people) have come to this same conclusion in agriculture and population control (Peter, 2008). However, research also suggests that certain forms of malnutrition are less responsive to both agricultural and economy-wide growth. In addition to inclusive economic growth additional measures are required to tackle the underlying causes of malnutrition, which may be health or diet related, or to several other factors. Beside policies that improve people's access to healthier foods and a more diversified diet, other measures have high potential to increase people's consumption of vegetables, fruits, and animal products directly and permanently, such as programs that promote home, school, and community gardens and small-scale livestock husbandry and aquaculture. The potential impact of growth and policies aimed at improving people's economic access to improved sources of nutrition (Ecker *et al.*, 2011).

Horticulture comprises diverse cropping systems in all agro-climatic zones, provides healthy and nutritious food, and generates employment and income for smallholder farmers, including women who are often the main primary producers. Benefits from horticultural development include improved nutrition for children and families, increased income from sale of horticulture products, and improved status and confidence of women farmers. In many cases, horticulture can generate substantial income from smallholdings that would not be profitable if planted only to cereal crop staples. In addition, women typically use the income generated from horticulture to invest in family health and education, which multiplies the benefits by increasing social capital.'

Fruit and vegetable availability and intake are well below WHO recommendations in most countries (WHO and FAO, 2004). Globally, insufficient intake of fruit and vegetables has been linked to 2.7 million deaths per year (WHO 2003), due to associations between fruit and vegetable intake and: micronutrient intake, risks of ischaemic heart disease and stroke as well as risk of type 2 diabetes mellitus (WHO and FAO, 2004). Vegetables and fruits contribute considerably to improving the quality of diet and human nutrition and income. These crops are excellent sources of Vitamins A and C, iron, calcium, carbohydrates and proteins. Some vegetables have a higher protein content than rice and legumes when expressed in dry matter content, as such nutrient deficiencies can be corrected using selected vegetables and fruits and may also be the means of ensuring food security for households. Production of horticultural crops for processing will stimulate rural industrialization and add value to these crops for local markets and for export. Household preferences, in particular, further depend on awareness of the importance and nutritional benefits of F&V consumption for household members. Fruits and vegetables also contribute to the income of both the rural and urban dwellers. Horticultural crop production creates jobs. On average it provides twice the amount of employment per hectare of production compared to cereal crop production (Ali *et al.*, 2002). The move from cereal production towards high-value horticulture crops is an important contributor to employment opportunities in developing countries (Joshi *et al.*, 2003).

Supply-side factors require an understanding of farming systems in Uganda and how F&V production is linked to F&V consumption, as it is unclear whether stable F&V prices alone can lead to increased consumption. Vegetables are largely produced for sales indicating that it is a means to access food security through market integration and value chain participation. Productivity of vegetable is lower than the potential due to different factors. Therefore, the objective of this paper is to review the contribution of fruits and vegetables in food security in Ethiopia.

## 2. Literature review

### 2.1 Overview of Importance of Fruits and Vegetables in Ethiopia

Fruits and vegetables play a number of important roles in human health. They provide antioxidants such as vitamin A, C and E that are important in neutralizing free radicals (oxidants) known to cause cancer, cataracts, heart disease, hypertension, stroke and diabetes (Wargovich, 2000). Vegetable production is an important economic activity in Ethiopia, ranging from gardening smallholder farming to commercial state and private farms (Zelleke and Gebremariam, 1991). According to (CSA, 2012), about 2,710 million tons of vegetables and root and tubers were produced on 541 thousand ha, creating means of livelihood for more than 1 million households in 2010/11. Commercial production of horticultural crops, including vegetables, has also been increasing in recent years because of expansion of state farms (e.g. Ethiopian Horticulture Development Corporation) and increasing private investment in the sector by national and international entrepreneurs (EHDA, 2012). The commercial production is concentrated in the Rift Valley areas of Ethiopia, due to availability of irrigation facility, accessibility and closeness to agro-processing industries. The Ethiopian Horticulture Development Corporation has been carrying out production and marketing activities of horticultural crops since its establishment in 1980 (Yohannes, 1992). The Ethiopian Fruit- and Vegetables Marketing Enterprise (ETFRUIT) is a parastatal trading organization established in April, 1980 under the Horticulture Development

Corporation to deal with domestic and export trade of fresh fruits, vegetables, flowers, and processed horticultural products. Vegetable crops of economic importance that are largely produced in Ethiopia include pepper, kale (Ethiopian cabbage), onion, tomato, pepper, chilies, carrot, garlic and cabbages. Green beans and peas, okra, asparagus, cauliflower, broccoli, celery, eggplant, paprika and cucumbers have recently emerged as important export vegetables (Ethiopian Investment Agency, 2012). Recently crops like green peas, okra, celery and eggplant are also becoming important for private companies for the export market. Evidently, Ethiopia has favorable climate and edaphic conditions for the production of tropical, sub-tropical and temperate vegetables in the lowlands, midlands, and highlands, respectively (EHDA, 2011). The warm season vegetables such as tomato, onion, capsicum and snap beans are produced in hot semi-arid areas both under rain fed and irrigation (particularly in the Rift Valley), while the highland offers favorable growing conditions for the production of cool season vegetables like kale, cabbage, garlic, shallot, carrot, beetroot (Hussen and Muluneh, 2013). Vegetable production is practiced both under rain fed and irrigation systems. The irrigated vegetable production system is increasing because of increasing commercial farms and development of small scale irrigation schemes (Baredo, 2012). Ethiopia has a comparative advantage in a number of horticultural commodities due to its favorable climate, proximity to European and Middle Eastern markets and availability of land, water for irrigation and labor (Ethiopian Investment Agency, 2012). Hence, the Ethiopian Rural Development Strategy focuses on market-led agricultural development and the government pledges to support market integration and agro-enterprise development (DCG, 2007). Vegetable production and consumption is increasing in Ethiopia because of increasing export to Djibouti, Somalia, South Sudan, the Sudan, the Middle East and European markets and urbanization (Tabor and Yesuf, 2012). In these countries there is a sustained demand for products such as chillies, onions, and cabbages, resulting in export increase from 25,300 tons in 2002/03 to 63,140 tons in 2009/10 (EHDA, 2011). The nutritional and health value of vegetables is also well recognized in Ethiopia because vegetables play important roles in human health by way of providing antioxidants such as vitamin A, C and E that are important in neutralizing free radicals (oxidants) known to cause cancer, cataracts, heart disease, hypertension, stroke and diabetes (Demissie *et al.*, 2009; Tabor and Yesuf, 2012). Vegetables constitute also source of cash income for the households and an opportunity to increase smallholder farmers' participation in the market (Alemayehu *et al.*, 2010). Vegetables are also used as source of raw material for local processing industry. Products like tomato paste, tomato juice, oleoresin and ground spice of Capsicum are produced for exports making a significant contribution to the national economy (Baredo, 2013). The increasing development of the horticulture industry and the intensive production practices of horticultural crops are creating employment opportunity, especially for women and youth ((Ethiopian Investment Agency, 2012). It constitute source of cash income for the households and an opportunity to increase smallholder farmers' participation in the market (Alemayehu *et al.*, 2010). Fruits and vegetables for both fresh and processed have a huge domestic market in Ethiopia which is by far significant than that of the export volume (Yeabsira, 2014).

## **2.2. Agriculture's role in improving food and nutrition security**

Development of the agricultural sector is especially crucial to alleviating poverty in developing countries, where a large proportion of gross domestic product is generated within the primary sector by smallholders. For example, agricultural development has been shown to be up to four times more effective in reducing poverty relative to growth in other sectors, and growth in smallholder agricultural productivity has been shown to have a positive impact on both urban and rural populations in three key ways: lower food prices for consumers; higher incomes for producers; and growth multiplier effects through the rest of the economy as demand for other goods and services increases (Alston *et al.*, 2000).

Agriculture, which is the production of food and goods through farming, is central to sustainable development. The agriculture sector is critical for generating employment in rural areas, supporting the economy in farming communities, and providing food and nutritional security. Agriculture has a direct impact on deforestation, air and water pollution and zoonotic and foodborne diseases (FAO, 2004). The agriculture sector, therefore, also has an essential role in improving health outcomes. Good nutrition is key ensuring good health and wellbeing of populations, yet today, a lack of access to nutritious foods negatively impact the health of women and children. Cross sectorial planning between the health and agriculture sectors can promote maximum impact of agricultural policies on health and vice versa. This brief provides an overview of how the health and agricultural sectors can better collaborate to improve nutrition security for women and children and consequently their health outcomes (FAO, 2004).

## **2.3 Assessing Food and Nutrition Security**

Food and Nutrition Security (FNS) is a central concept that is explored in this paper in the context of horticultural sector development and its impact on growers, workers and other stakeholder in the developing world. The World Food Summit in 1996 defined food security as a situation 'when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food to meet their dietary needs and food

preferences for an active and healthy life'. At the World Summit of Food Security in 2009, this definition was reconfirmed, and the concept was extended and specified by adding that the 'four pillars of food security are availability, access, utilization, and stability' and stated that 'the nutritional dimension is integral to the concept' (Ecker and Breisinger, 2012). The FAO Committee on World Food Security has combined these different elements and states. 'Food and nutrition security exists when all people at all times have physical, social and economic access to food, which is safe and consumed in sufficient quantity and quality to meet their dietary needs and food preferences, and is supported by an environment of adequate sanitation, health services and care, allowing for a healthy and active life' (CFS, 2012).

#### 2.4 Contributions of fruit and vegetable to Food Security

Fruits and vegetables are important sources of vitamin A, vitamin C, folate, and phytochemicals. Although minerals are less bioavailable in plant foods, vegetables provide a large proportion of minerals such as iron and calcium consumed in rural populations in developing countries. In the Mekong Delta of Vietnam wild vegetables contributed 38% of vitamin A, 35% of vitamin C, 30% of calcium and 17% of iron consumed by women (Ogle *et al.*, 2001a). In the same populations, all vegetable accounted for up to 33% of folate consumed (Ogle *et al.*, 2001b). The amount of vegetables consumed was found to be the best predictor of over-all nutrient adequacy across multiple nutrients (Powell *et al.*, 2012). Research undertaken by CIFOR found that across 21 African countries, there is a statistically significant and non-linear relationship between tree cover and fruit and vegetable consumption which peaks at around 53% tree cover (Ickowitz *et al.*, 2013). In the East Usambara Mountains, Tanzania, in the dry season, having tree cover within 2km from the home was associated with enhanced vegetable consumption (Powell *et al.*, 2012). Forests and areas with tree cover may enhance vegetable intake by providing vegetables in the form of leaves and fruit from trees, the ecosystem services provided by trees and forests within agricultural systems support availability of wild and cultivated vegetables by providing the microclimates needed for vegetables to grow and other ecosystem services (FAO, 2004).

Table 1 Fruit & Vegetable Cultivation in Ethiopia for Private peasant Holdings (2010/11)

Crop Type	Area (ha)	%	Production (Qtals)	%	Productivity t/Ha
Cereals	9,233,025.14	79.05	155,342,279.88	69.63	16.83
Oil seeds	780,915.89	6.69	6,436,143.98	2.89	8.24
Oil seeds	1,489,308.45	12.75	18,980,472.57	8.51	12.74
Cash Crops	159,287.98	12.75	39,226,177.5	17.58	246.26
Vegetable	7,309.16	1.36	1,403,234.19	0.63	192
Root Crops	4,419.64	0.06	996,331.80	0.45	225.4
Fruit Crops	5,266.91	0.04	706,119.18	0.32	134.07
TOTAL	11,679,533.17	0.05	223,090,759		

Source; Statistical Abstract CSA 2011.

Current estimates suggest a 100% increase in food production that will result in the conversion of roughly 1 billion ha of land by 2050 (Tilman *et al.*, 2011). Much of this agricultural expansion is speculated to come at the expense of natural systems, including forests and other tree-based systems, despite the current pervasive paradigm of intensification to "spare" land from conversion (Phelps *et al.*, 2013). Although other studies assert that agricultural production is already sufficient to achieve global food security and we grow enough food to provide for current and future populations at estimated human growth rates, thus there is little need to convert forests and other land for agriculture (Stringer, 2000). The view that increased food production should be pursued at all costs including at the expense of nature as the only means of achieving global food security seems to be accepted wisdom (Pinstrup-Andersen, 2013).

##### 2.4.1 Food availability

Global fruit and vegetable cultivation has experienced a remarkable increase in production. Output has been growing at an annual rate of about 3% over the last decade. In 2012, almost 637m tons of fruit and more than 1.1bn tons of vegetables were gathered throughout the world.

Table 2 food and nutrition security

Food availability	Food access	Food utilization	Stability
Domestic food production	House hold income from land, labor and capital	Diet	Income fluctuation
Food producer prices	Consumer food prices	Nutrient consumption	Cultivation and marketing risks
importers			
Post-harvest loss			

Indicators of FNS at household level Source: (Achterbosch *et al.*, 2014)

World production growth has largely been driven by area expansion in Asia, especially China, which

has emerged as the world's largest fruit and vegetable producer, with global output shares of about 20% for fruit, and more than 50% for vegetables. Strong growth rates in fruit and vegetable cultivation have also been recorded in food-insecure and low-income regions such as Sub-Saharan Africa and Southern Asia. Especially countries like Kenya, Ethiopia, Ghana, Rwanda, Uganda, Indonesia and Viet Nam have expansion of fruit and vegetable production (Figure3.2). In particular high-value crops, like fruit and vegetables, have been identified as one of the fastest growing agricultural sub sectors in Sub-Saharan Africa in the past two decades (Afari-Sefa, 2014)

Table 3 Value of F&V imports, selected countries 2012-14 (in million USD) 2(Afari-Sefa, 2014)

Country	2012		2013		2014	
	Fruits imports	Vegetable imports	Fruits imports	Vegetable imports	Fruits imports	Vegetable imports
Vietnam	516	277	823	323	n.a.	n.a
Indonesia	849	504	667	641	789	644
Kenya	n.a.	n.a.	20	49	n.a.	n.a.
Rwanda	2	4	2	7	n.a.	n.a.
Uganda	3	3	4	3	5	9
Ethiopia	4	27	4	25	5	23
Ghana	13	21	13	19	n.a	n.a.

#### 2.4.2 Food access

Fruit and vegetable crops generate more income for farmers compared to traditional staple crops. In addition they generate employment for the rural workers, and therefore improve access to food (Weinberger and Lumpkin, 2007). This positive correlation between vegetable commercialization and household income is confirmed by various researchers. For example, (Muriithi and Matz, 2015) found a positive welfare effect for vegetable producers in Kenya. (Afari-Sefa, 2007) identified positive income effects for fruit producers in Ghana. Also (English *et al.*, 2004) indicate that vegetable production is more profitable for a smallholder than the traditional maize-bean intercropping system often found in Kenya. In Sub-Saharan Africa the share of the total budget allocated to fruit and vegetable consumption ranges from 3% to 13%, and the total food budget share ranges from 4.5% to 16% the demand and consumption of fruit and vegetables rises with increasing income level. However, income elasticity for vegetables is higher than for fruits also a more recent study by (Tschirley *et al.*, 2014) analyses the food consumption patterns of the increasing middle class in East and Southern Africa.

Table 4 proportions of children who did not ate any of common vegetables and fruits over the week preceding the survey by region Ethiopia 2006

Region	N	Vegetable	Fruits
Afar	254	85	83.5
Tigray	295	77.6	88.1
Amhara	267	61.8	30.3
Addis Ababa	354	59.3	33.9
Oromia	136	18.6	28.0
SNNPR	284	7.0	35.2
Benshangul-Gumuz	300	38.3	41.3
Harar	287	35.5	23.3
Dire Dawa	275	15.6	31.6
Nine regions	2552	38.1%	36.5

Source; Tsegaye *et al.*, 2009

#### 2.4.3 Food utilization

It is widely accepted that fruit and vegetables are important component of a healthy diet and that the consumption can help prevent a wide range of diseases. The WHO/FAO recommends a minimum of 400g of fruit and vegetables per day (excluding potatoes and other starchy tubers) for the prevention of chronic diseases such as heart disease, cancer, diabetes and obesity, as well as for the prevention and alleviation of several micronutrient deficiencies, especially in less developed countries. Despite the growth recorded in the global F&V production and trade, the food consumption per capita in Africa is still well below the recommended 400 gram of fruits and vegetables per day (= 146 kg per person per year). Combined the annual fruit and vegetable consumption in Africa is less than 100 kg per person, which equals around 250 gram per capita per day (FAO, 2013). However in general, girls and women consume larger amounts of fruit and vegetables than do boys and men (Rasmussen *et al.*, 2006). The substantial shortages in utilization are confirmed by the levels of fruits and vegetable consumption in Sub-Saharan African countries. Detail research by (Ruel *et al.*, 2005) in 10 different countries including Ethiopia, Kenya, Ghana, Rwanda and Uganda show that consumption ranges from 27 to 114 kg per person per year, which is far below the recommended amount. Except for Kenya, the majority of the households consume less than the minimum amount of fruits and vegetables recommended by the WHO and

FAO.

Table 5. Fruit and vegetable consumption patterns in Sub-Saharan Africa

	Ethiopia	Rwanda	Kenya	Uganda	Ghana
% of households consuming F&V	94%	94%	91%	89%	99%
Quantity (kg/person/yr)	26.7	62.8	114.0	64.2	73.7
% of households consuming less than 146 kg/person/yr	99%	90%	47%	88%	87%

Source: (Ruel *et al.*, 2005).

Survey Results from Uganda show that fruit and vegetable production is beneficial for food security and ultimately anemia status of individuals in particular, women of childbearing age (Kabunga *et al.*, 2014). These results are obtained from rural communities where no known interventions aimed at promoting F&V consumption or intensification of smallholder fruit and vegetable production systems existed. In a study in Uganda by Rubaihayo (2002) it was found that per capita F&V consumption falls short of daily recommended intake levels by 20 to 50%. It was found that women caregivers aged 15-49 years and living in fruit and vegetable producing households consume more F&V than those living in non-producer households. In the Ugandan survey it appeared that F&V production increased fruit and vegetable intake of caregivers by 12%. It was also shown that the share of food-secure households was comparatively higher among fruit and vegetable producers than among non-producers.

#### 2.4.4 Stability

The cultivation of fruits and vegetables is not without risks of crop failure. Drought and other adverse weather and pests and diseases are the most common production risks. Mitigation of these risks requires know how and access to improved inputs such as drought tolerant and resistant. Some high-value agricultural produce requires investment. Fruit production involves planting trees and waiting 3-5 years for them to begin producing. Farmers in developing countries, particularly poor farmers, often do not have the savings or access to credit needed to make these investments and purchase the inputs. In other words, the opportunity cost of capital is very high for many smallholders. For example (Minten *et al.*, 2005) found that smallholders in Madagascar are able to reduce the length of the ‘hungry season’ by producing and selling vegetables to an exporter during the off-season. Wachira, (2007) used survey data from 216 tomato producers in the Nakuru-North district in Kenya; in the study he compared the profitability of greenhouse and open-field tomato production systems. The study used gross margin and net Profit to determine and compare the profitability levels for both greenhouse and open-field tomato production systems. The results indicate that the mean net profit/m<sup>2</sup> for greenhouse tomato was more than 10 times higher than that of open-field tomato production system. In combination with adequate irrigation it is possible to produce good quantities of vegetables year-round and to provide a stable income for the farmer. However, the initial investments are high and various development projects have tried to provide solutions with grants or soft loans in order to create access to greenhouse technologies. USAID constructed 81 greenhouses in three districts of Herat Province in Afghanistan. Lead farmers were appointed to test greenhouses and train other farmers in their communities. Farmers participating in the greenhouse demonstration project nearly doubled their annual income (USAID, 2015).

#### 2.4.5 Sustainable Diets

The concept of a sustainable diet is complex and comprises multiple dimensions. The FAO defined sustainable diets as “diets with low environmental impacts which contribute to food and nutrition security and to healthy life for present and future generations. Sustainable diets are protective and respectful of biodiversity and ecosystems, culturally acceptable, accessible, economically fair and affordable; nutritionally adequate, safe and healthy; while optimizing natural and human resources” (FAO 2012). This all-encompassing definition is ambitious but it is essential to set a target to strive towards. The basic elements of a sustainable diet are captured within the Sustainable Development Goals set in 2015 and if these goals can be achieved it will make a significant step towards having sustainable dietary intakes (UN, 2015).

Average dietary intakes today are typically unhealthy, failing to meet basic dietary requirements for health. In high income countries diet-related disease tend to be associated with overconsumption and high intakes of saturated fats, sugars and salt, and low intakes of fiber. In low income countries micronutrient deficiencies, especially vitamin A, iodine and iron, are more prevalent. Changes in dietary intakes are being observed in countries where there is economic development, which is described as the nutrition transition (Popkin, 2003). The environmental impact of food production and dietary habits is enormous. It is estimated that a third of global greenhouse gas (GHG) emissions are generated by the food system from primary production through processing, retail and preparation to waste disposal. Transformation of the food system is needed from both the supply and demand sides to reduce waste, environmental damage and the use of limited natural resources and to improve the nutritional quality of dietary intake. Focusing on reducing greenhouse gas emissions (GHG), (Bajzelj *et al.*, 2014) recently showed that significant reductions in these emissions could not

be achieved through efficiency savings in the supply side alone and concluded that demand side changes were also needed through changing dietary intakes.

Research has shown that it is possible to construct sustainable diets that meet nutrient requirements for health and reduced the environmental impact, in particular lower GHG emissions (Hallström *et al.*, 2015). This can give rise to the assumption that healthy diets will have a lower environmental impact, but it is not necessarily the case because it is equally possible to have a healthy diet with a high environmental impact or an unhealthy diet with a low environmental impact (Macdiarmid 2013).

#### **2.4.6 Nutrition**

The impact of the fruit and vegetables consumption levels described above on people's nutritional status is influenced by multiple factors. An individual's health status is among the key factors of influence on the proper utilization of the nutrients consumed. Some household-level studies have looked at the relationship between changes in household incomes and calorie and micronutrient deficiency (Abdulai and Aubert, 2004, Skoufias *et al.*, 2009). Other studies (e.g. Haddad *et al.* (2003) have analyzed the effects of changes in incomes on child nutrition. Results of these studies show a positive relationship between growing incomes and nutrition outcomes. Fewer studies exist on the relationship between (agriculture) economic growth and nutrition improvement. However studies by Ecker *et al.* (2011) indicate that economic growth can contribute to a reduction of undernourishment. Improving access to vegetables and fruits in their diets reduces mortality and morbidity of infants and children under five years old, particularly in rural areas (von Braun *et al.*, 2004). Maternal health depends on having achieved food security during girlhood as well as a diet rich in micronutrients during conception, pregnancy and the first few months after childbirth. The health of women before conception directly impacts their health during pregnancy and child birth. The majority of pregnant women in developing countries suffer from anemia and other micronutrient deficiencies. Horticulture can benefit maternal health directly by improving the quality of women's diets. Vegetables and fruits are the most appropriate sources of micronutrients in the diets of these women, and are critical in regions where vegetarian diets predominate (von Braun *et al.*, 2004).

#### **2.4.7 Direct Provisioning for Food and Nutrition Security among the Rural Poor**

Earlier works on direct benefits of forests to food security were coined in physical and economic terms (Hoskins, 1990). Physical benefits were focused on the provision of fruits, vegetables, and bush meat whereas economic benefits included fuel wood. Obviously the boundaries of these categorizations continue to be debated (de Merode *et al.*, 2004). The direct contribution of forests to diets is considerable and often crucial, if often overlooked. For instance, data show that approximately 4.5 million tons of bush meat is extracted annually from the Congo Basin forests alone (Nasi *et al.*, 2011). The use of wild fruit and vegetables is also widespread around the world, particularly in complex landscape mosaics that include significant forest cover (Jamnadass *et al.* 2011).

#### **2.4.8 Uplifting the status of women**

Women play an important role in food production but at times their worth is somewhat undermined. Women's participation and responsibilities in home gardening varies across cultures, including land preparation, planting, weeding, harvesting, and marketing. As a result female-headed households appear to spend more on fruit and particularly vegetables than male-headed households (Ruel *et al.*, 2005). They found that in Rwanda, female-headed households allocated a large share of their budget to fruit and vegetable consumption. In Kenya more female-headed households found in the highest fruit and vegetables expenditure quintile for the consumption food (Ayieko *et al.*, 2005). A Kenyan survey provides detailed information on the incomes of a sample of workers in the fruit and vegetable sector and comparative data for a control group of people not involved (McCulloch and Ota, 2002). Information was collected from pack house workers and non-pack house workers living in the same residential areas of Nairobi, workers on farms owned by exporters, workers on large commercial farms, smallholders engaged in fruit and vegetable production, and no horticulture smallholders farming in the same region. In Africa, Asia, and Latin America, high-value crop exports are female intensive industries, with women dominating most aspects of production and processing. Evidence suggests that women occupy at least 50% or more of the employment in these industries (Dolan and Sorby, 2003). Often these farm workers are landless women who have few other opportunities for earning an income (McCulloch and Ota, 2002). In Ethiopia we found that a medium-scale farm of about 10 ha can employ 38–50 women a day to weed, pick, and grade. In addition about 17 men are employed to spray and irrigate the fields, transporting and loading.

#### **2.4.9 New Jobs and Economic Opportunities**

Horticultural crop production creates jobs it provides twice the amount of employment per hectare of production compared to cereal crop production (Ali *et al.*, 2002). The move from cereal production towards high-value horticulture crops is an important contributor to employment opportunities in developing countries (Joshi *et al.*, 2003). The horticultural commodity chain is also longer and more complex than the cereal crop one and as a result job opportunities are more abundant (Temple, 2001). Women have the most to benefit from the increasing importance of horticulture in rural economies. Women, in general, play a much more significant role in

horticultural crop production compared to starchy staple crops. Throughout the developing countries of Africa, women play a dominant role in the production of horticultural crops and cultivate more than half of the total smallholdings. Besides creating jobs on the farm, the horticultural sector also generates off-farm employment, especially for women. This is the case for export and value-added processing industries, which are important sectors of the economy of Nigeria. Since horticultural production is very labor-intensive, landless laborers also benefit from the new employment opportunities created by horticultural crop production. These jobs usually provide more income than jobs obtained by the laborers in most other sectors (Weinberger and Genova, 2005).

#### **2.4.10 Consumer food prices**

Income determines the purchasing power at household level, such that the higher the income, the higher the ability of the households to secure the food requirements of the households and the higher the income, the higher the ability of the households to access better medical and education services and to meet the requirements of the self and his/her households basic needs on a sustainable basis with dignity (FAO, 2015). As land, labor and other resources are shifted towards non-staple-food production, the supply of high-value products such as fruit and vegetables expands, while that of staple foods contracts. Some observers have expressed concerns that this may result in an increase in staple food prices, with negative consequences for the urban poor and other poor net-buyers of food. However this substitution effect mainly concerns industrial commodities that require large production areas like soy. In many African countries land for the production of a wide variety of crops is still sufficiently available. Average F&V prices may be low by international standards, but with an average of 10% of the food budget spent on fruits and vegetables, it becomes clear that the average prices of fresh fruit and vegetable produce are relatively high for the average African consumer. A reduction of F&V waste along the value chain, including in OECD countries, would theoretically result in an increased overall availability and reduced prices of food. Empirical studies that examine these effects are lacking, with the exception of a study performed by Rutten, (2013).

### **3. Summary and Conclusion**

Agriculture plays a central role in increasing food availability and incomes, supporting livelihoods and contributing to the overall economy. Vegetables and fruits contribute considerably to improving the quality of diet and human nutrition and income. These crops are excellent sources of Vitamins A and C, iron, calcium, carbohydrates and proteins. Some vegetables have a higher protein content than rice and legumes when expressed in dry matter content, as such nutrient deficiencies can be corrected using selected vegetables and fruits and may also be the means of ensuring food security for households. Although food security is dependent on issues of sustainability, availability, access and utilization, and not production alone, it is evident that a “new agriculture” (Steiner 2011) needs to be found to feed the world’s population both efficiently and equitably. Increases in food production over the past fifty years have been at the cost of biodiversity and ecosystem service provision, yet there is considerable evidence that diverse agro-ecological systems can be equally productive, if not more so in terms of actual yield outputs, notwithstanding the biodiversity benefits of such approaches. Food insecurity in Ethiopia is not only a rural problem. Urban food insecurity is a growing concern due to the toxic combination of high rates of urban poverty, high dependency of urban households on food supplied by the market, and fluctuating food prices. Households in Addis Ababa, not only do not have a sufficient amount of food to eat, their diets are largely cereal based, lacking an adequate diversity of food to yield good nutrition. Subsidization of common food commodities should be strengthened to improve access to the poor. Emphasis should be given to household heads engaged as daily wage earners, public employees, and to those who have little to no education. Finally, given the widespread nature of food insecurity and the volatility of global and local food markets, there is a need to undertake research that will inform best practices for increasing food security among urban populations.

### **4. Recommendation**

Ethiopia has highly-diversified agro-ecological conditions which are suitable for the production of various types of fruit and vegetables. As a result, vegetable and fruit production is being more widely adopted, primarily to ensure food security and to promote production of high-value crops for the market to improve living conditions of smallholders. With regard to horticultural production, 46% of the vegetable- producing area is planted with potato followed by pepper and sweet potato. Traditional varieties of vegetables such as taro, yam and enchote are also grown but their production and consumption is declining. Among fruits, avocado, banana, orange, papaya and guava are common. Commercial horticultural crop production is carried out mainly in the central rift valley and eastern part of the country. Cereals contribute about 75% of the Ethiopian diet. Pulses are a source of protein and widely consumed. The main constraint with regard to fruit and vegetable production is that, because of market and food security concerns, rural farmers prefer to produce cereals and pulses. Other constraining factors include low production and productivity, lack of adequate pest control, poor soil fertility management practices, lack of attention to product quality and prevention of physical damage, as well as the lack of storage and



packaging facilities.

Therefore, vegetable and fruit production is being more widely adopted, primarily to ensure food security and to promote production of high-value crops for the market to improve living conditions of smallholders and their food security.

Finally, the expert's, researchers, and other all concern stakeholders should participate in developing the systems of production of fruits and vegetables for the contribution of food security in specific location.

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