

A Review on Production Status and Consumption Pattern of Vegetable in Ethiopia

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Abstract

Agriculture is the main stay of Ethiopian economy, contributing 50% share in the gross domestic product (GDP) vegetables and root crops generate foreign currency earnings in the country. A serious challenge to human survival, particularly in the developing world, is the ever growing gap between human population and food supply. The World Health Organization Estimate that low fruit and Vegetable intake contributes to approximately 2.7 million deaths a year from chronic disease and causes about 31% of ischaemic heart diseases and 11% of strokes worldwide In the overall, WHO places low fruit and vegetable consumption among its twenty risk factors in global mortality, just behind the better known killers such as tobacco use and high cholesterol levels. The status of vegetable production including indigenous one and consumption in the country yet need further improvement. According to the CSA (2008) 453,608.8 ha of land is under vegetable in Ethiopia, in general. Production of vegetables contributes 2.95% of the total crops production, conversely, of the total production of vegetables.). Large scale production and processing of fruits and vegetables is carried out only by state organizations. 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. This implies that the area cultivated to vegetables increased by 13% while the production increased by 103%, between 2010 and 2013. The proportion of households who did not produce/cultivate any vegetable was highest in Addis Ababa (99.7%), followed in Afar (94.9%), Dire Dawa (94.2%), Tigray (86.4%) and Harari (63.1%) regions. Recently, despite of the ups and downs observed, the demand for vegetables especially for export is increasing. Ethiopia mainly due to cereal based food habit is practicing and largely affect 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. A deficiency problem in Ethiopia especially for children's rest on increasing the availability of vitamin. 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 programme using vegetables.

Keywords: production, consumption, vegetable

1. Introduction

1.1. Back ground information

Vegetables are primarily produced by horticulture and only for human nutrition. A group of crops known as "vegetables" consists of more than 200 plant species all over the world as sited by Haile, 2014 (Sacks and Silk, 1987). A serious challenge to human survival, particularly in the developing world, is the ever growing gap between human population and food supply. Growing and using wild vegetables is an opportunity that has never been adequately prospected to alleviate malnutrition and ameliorate food insecurity. Hundreds of edibles including many vegetables of wild/semi-wild origin are known to be sporadically consumed by rural communities in Ethiopia (Getachew, *et al.*, 2013). Ethiopia is among the lowest income country in the world with an average per capita income of a merely USD 180(WDR, 2006). It is also much less than the average per capita income for Sub-Saharan Africa (i.e., USD 450). For decades both rural and urban poverty in Ethiopia has remained pervasive and ever deepening, despite of considerable macroeconomic stability achieved following the policy reforms of mid-1990s (Tadesse, 2009).

A vegetable is not a new sector in Ethiopia as the production of these crops has been undertaken for decades. The sector comprises large state farms supplying fruits and vegetables to the local market and for exports. There are few private companies involved in the production of vegetables mainly for the European market. In addition, there are numerous small producers growing a small range of vegetables for the local and regional export market. Apart from tropical fruits and few selected vegetables like onions, cabbage and tomatoes, local demand for horticultural produce is minimal (Ethiopian-Netherlands Horticulture Partnership, 2007). The World Health Organization Estimate that low fruit and Vegetable intake contributes to approximately 2.7 million deaths a year from chronic disease and causes about 31% of ischaemic heart diseases and 11% of strokes worldwide. It ranks low fruit and vegetable intake as the sixth main risk factor for mortality in the world (Marie, 2005). The currently population of 70 million people in Ethiopia is expected to double within thenext 30 years.

Almost 80% of the population lives in the country side while the rest situated in urban area. *An estimated five million people suffer from lack of vitamins and essential minerals, of which 80% are children (Fekadu and Dandena, 2006).* With a population of over 70 million people, 44% of whom fall under the basic needs poverty line (UNDP, 2002), and a GDP which is 1/5 of the sub-Saharan African average, Ethiopia is one of the poorest countries in the world (World Bank, 2005) cited by (Dereje et al., 2007).

In the overall, WHO places low fruit and vegetable consumption among its twenty risk factors in global mortality, just behind the better known killers such as tobacco use and high cholesterol levels (Tsegaye et al., 2009). Health workers often advise people to increase vegetable consumption, but many people cannot afford to buy vegetables or the inputs required to grow them. Whereas the role of wild leafy vegetables in food security is recognized in other African countries. However, rural Africans still hold indigenous knowledge about wild vegetables. Modern agricultural systems have succeeded in providing calories, but in the process, they have increased 'hidden hunger' (micronutrient malnutrition) by displacing edible local plants (Modi et al., 2006). The economy of the country predominantly depends on agriculture, which contributes about 50 percent to the total GDP and 90 percent of export items of which horticultural crops are the leading component. The country has favorable conditions for the production of a number of vegetable crops. The wide range of altitude, ranging from below sea level to over 3000m above sea level, gives it a wide range of agro ecological diversity ranging from humid tropics to alpine climates, where most types of vegetable crops can be successfully grown. Further, the abundant labor, vast land and water resources give her an opportunity and facilitation for the production of different types of vegetable crops (Fekadu and Dandena, 2006).

Ethiopia is among the lowest income countries in the world with an average per capita income of merely USD 180 (WB, 2006) cited by (EDRI, 2010). Moreover, for decades both rural and urban poverty in Ethiopia has remained pervasive and ever deepening, despite considerable macroeconomic stability achieved following the policy reforms of the mid- 1990s (EDRI, 2010). In Ethiopia, many urban people don't meet their basic needs. According to official statistics (FDRE 2002) cited by (EDRI, 2010), the proportion of the urban population under food poverty (those persons whose food expenditure per adult equivalent was less than the food poverty line) was estimated at 47 percent in 1999/00 compared to 41 percent in rural areas (EDRI, 2010). Moreover, vulnerability to shocks is more serious in urban areas than in rural areas. Rural people have more social and economic networks and traditional values to mitigate vulnerability compared to urban people. Understanding the impact of this national growth on urban consumption patterns provides valuable policy information on the effectiveness of policies designed to alleviate poverty (EDRI, 2010).

Vegetable crops are valuable sources of vitamins, minerals and proteins especially to a country like Ethiopia where the people experience malnutrition due to heavy dependence on cereals such as tef (*Eragrostis tef*), maize (*Zeamais*), wheat and other cereals. Vegetable crops are also important for food security in times of drought, famine and food shortage. They provide a source of income for the farmers/producers; create employment opportunity and contribution to the national economy as export commodities. The current investment policy in the country are favorable for expansion and diversification of vegetable crops both in the production and marketing sectors for export and foreign exchange earnings (Fekadu and Dandena, 2006).

Several studies in the past and present have established that vitamin A deficiency is a major public health problem in Ethiopia, as elsewhere in developing countries. The fact that micronutrient status in general and vitamin A status in particular is strongly linked to vegetables/fruits availability and consumption in developing countries. It is estimated that over 80% of vitamin A in developing countries is supplied by fruits and vegetables (Tsegaye et al., 2009). These endeavors obviously require sound and up-to-date information on the extent of market availabilities, own production/cultivation and consumption of fruits and vegetables. Literature search revealed that such information is unavailable or scanty in Ethiopia. Enormous area under seasonal rain fed agriculture in the highland part of the country. up to 30% of vegetable harvests in Ethiopia is reported to be lost due to poor post-harvest handling (Tsegaye et al., 2009). The objective of this paper to Review consumption patterns and production status of vegetable in Ethiopia. therefore General objective to Show Production Status and Consumption Pattern of vegetable in Ethiopia

2. LITERATURE REVIEW

2.1. Definition and Concept of Vegetables

The term vegetable is used to describe the caring edible shoot, leaves, fruits and root of plants and spices that are consumed whole or in part, raw or cooked as a supplement to starchy foods and meats cited by Haile, 2014 (Williams et al, 1991). Vegetables are also described as those plants, which are consumed in relatively small quantities as a side dish with the staple food. However, Vegetables are important food varieties within the human diet because they provide nutrients like vitamins and minerals and also the bulk of roughage the body desires and which are usually lacking in most traditional staple foods (Williams et al, 1991).

2.2. Classification of Vegetables

Distinguishing vegetables in line with the part consumed is a method of classifying vegetables. According to the part consumed (character) vegetables can be described as follows as cited by (Haile, 2014)

Leafy vegetables: the leaves and juicy young shoots are picked for consumption. Examples are, lettuce, cabbage, bitter leaf, water leaf, jews mallow and fluted pumpkin, *Fruit vegetables*: this contains of young, immature unripe fruits or mature ripe fruits of plants grown as vegetables. Examples are tomato, pumpkin, watermelon and chilli pepper, *Seed vegetables*: this group is important for the seed produced. Examples are Egusi melon and Ito melon, *Root vegetables*: such as sweet potato, carrot, and radish are grouped in this area, and *Spices*: important for their flavor and color in foods such as chilli pepper, onion, garlic, and basil.

Principles and Practice of Vegetable productions According to Sacks and Silk, (1987), there are some principles needed in the production of vegetable crops, which are very important and well known to the producers. These principles are: Production of vegetables does not involve a long- time investment as does in the woods of citrus, mango, or cashew, Vegetable growers/farmers don't seem to be sure to produce the same crop every year like his counterparts, who grow fruit crops, Vegetable growing lacks the stability which is systematically developed over a period of years like an orchard thus, getting into vegetable production is a fast process and getting out may even be faster, Vegetables can be grown by people with limited experience. Only skillful farmers keep going their vegetable production, The land for production of vegetable crops is flexible and adjustable. It is much easier for vegetable growers/farmers to vary production from one crop to another than for fruit crop grower, Cooperative efforts and organizations are somewhat more difficult with vegetable crop producers than fruit growers are. Vegetable/grower/farmers have no long period for making plans. Vegetable production is seasonal, and Vegetable production requires more intensive production management per unit area and time. Therefore, having those advantages vegetable growing makes more beneficiaries to the urban growers as well as urban economy.

2.3. Importance of vegetable

In fact, vegetables can generate high income for the farmers because of high market value and profitability. They also have high nutritive value compared to cereals as cited by Kumilachew, et al., 2014 (EARO, 2000).

As urbanization increases, the need for sufficient food also increases. The opportunity to grow and/or acquire food produced locally, therefore, becomes a critical component in surviving in the city. It is well known that cultivating vegetable crops is the most common agricultural activity by the urban crop producers (Haile, 2014). It is well known that cultivating vegetable crops is the most common agricultural activity by the urban crop producers (Haile, 2014). Vegetables have lots of protective compounds like Chitin in bitter melon is effective against diabetes and most of the leafy vegetables and pumpkin are the rich source of beta carotene, Vegetables gave more yield than other traditional crops like wheat and rice. The yield of wheat is about 50-55 qtls per hectare and in vegetables like tomato it is about 250 qtl per hectare. Thus they provide higher quantity of food per unit area, Vegetables gave more farm income than other crops, The cropping intensity in vegetable growing is very high as compared to others. Normally 3-4 vegetable crops can be raised in one year. Vegetables have high export potential, The aesthetic worth of vegetables is quite higher than other field crops, and The vegetables have given a boon to processing industry as they can be processed to form diverse compounds like sauces, chutneys, pickles etc

3. VEGETABLE PRODUCTION IN ETHIOPIA

3.1. Cultivation zones

In a country like Ethiopia, where the amount, timing and distribution of rain fall is irregular, use of irrigation would significantly improve and raise the level of production (Haile, 2014). Commercial horticultural crop production is carried out mainly in the central rift valley and eastern part of the country. Most of the vegetables and fruit produced in the eastern region are exported to Djibouti and small amounts of fruit and vegetables are also exported to Europe, Pakistan, Saudi Arabia and Yemen (FAO, 2014). Fruits and vegetables are grown in different parts of the country both in commercial quantity as well as small volumes by private farmers and other operators engaged in the business. Small scale production is concentrated in Harerghe (eastern high land parts) and the central high lands, whilst large commercialized cultivations are widely spread in the low land zones, mainly following the Awash and Gibe/Omo rivers. As cited by (Ethiopian-Netherlands Horticulture Partnership, 2007), According to a recent study made by Ethiopian Export Promotion Agency (Sisay Habte, April 2004), the major fruits and vegetables growing areas of the country are summarized as follows:- East Hararghe (eastern part of the country, i.e. Alemaya and Kombolcha districts in Oromia Regional State), with vegetables dominating, East Shewa (Central Ethiopia in Oromia Regional State) produces both fruits and vegetables including tomato, green beans, orange, mandarin, papaya, etc, Ethiopian-Netherlands Partnership: Agenda Fruits & Vegetables 10 West Shewa (central Ethiopia in Oromia Regional State) which is good for producing tomato and mango fruits, among others. Arsi (central Ethiopia in Oromia Regional State), particularly in the Awash River basin which is

known for its various types of fruits and vegetables, GamoGoffa (Southern Nations, Nationalities and Peoples Regional State), particularly Woliata and Sidama zones, are good producers of banana, avocado, pineapple, papaya and other types of fruits and vegetables in various districts. Dire Dawa and Harari (eastern Ethiopia) are also well known production and supply areas of both fruits and vegetables. Tigary and Amhara regions

3.2. Indigenous vegetables provide food security and sustainable food production

The status of vegetable production including indigenous one and consumption in the country yet need further improvement as cited by Dendana ,2010 (Fekadu and Dandena, 2006). On the other hand, Ethiopia is well known for its diversity of indigenous food plants, including vegetables. The cultivated vegetables are mainly grown by traditional farmers in home gardens, although some are grown in fields and along field margins. About 27% of the crop species cultivated in home gardens in Ethiopia, many of them indigenous, are used as vegetables as cited by Dendana ,2010 (Zemedu, 1997). Traditional vegetables do not figure very prominently in modern crop research and conservation programmes rather marginalized in modern agriculture and receive no special attention. The vegetable resources of Ethiopia can be developed through a strategy of complementing and augmenting traditional practices with modern scientific approaches (Dandena, 2010).

Ethiopia has vast genetic diversity of plant species including important indigenous vegetables (IVs) even though they are not consumed properly due to the reason that they are not exhaustively investigated so far. Ethiopia has vast genetic diversity of plant species including important indigenous vegetables (IVs) even though they are not consumed properly due to the reason that they are not exhaustively investigated so far. There has been no visible effort made to introduce/domesticate new food materials in our country. Potentially use of IVs by the community has been indicated among which *Corchorusolitorius* in Afar region, *Moringaoliferain* south nation nationality people region (SNNPR) and *Cocciniaabyssinica* in Wollega areas are a good examples. It has not planned to study the potential and possible opportunities of IVs as food source. Those IVs are usually referred to as “wild foods” or “famine foods” (Getachew, 2001). International Development Enterprise (IDE) has recently introduced vegetable production in some parts of the Ethiopian Highlands but these are on a small-scale mainly to promote increased household consumption due to the need for irrigation facilities as a pre-requisite for production in this agro-climatic zone. Similar to most other countries, two groups of vegetables could be distinguished in Ethiopia: Globally important vegetables. The major ones identified from both farms and the markets and discussions with stakeholders are: chilli, head cabbage, garlic (in the Highlands), onions, tomatoes, carrots, beetroot, lettuce, sweet pepper, cucumber, celery etc. Indigenous vegetables: The main indigenous vegetable identified was the local kale. Others such as African eggplant, African nightshade and amaranth are not grown in the country and may be difficult to promote as per existing import permit restrictions. Historically, leafy indigenous vegetables in Ethiopia are by perception a poor man’s food. This is however changing due to (i) increased awareness of the nutritional benefits of vegetables especially in urban areas, (ii) increased promotion of the health benefits of vegetables in controlling non-communicable diseases, and (iii) increased price of red meat which traditionally forms a major component of the Ethiopian diet (Abdou, 2012). Additional details of vegetable value chains in Ethiopia are available from value chain studies conducted by IDE and were shared with the team by the IDE Country Director for Ethiopia (Abdou, 2012).

3.3. World Vegetable Center and a Consultant

A fact finding mission to Ethiopia was undertaken by a representative of AVRDC-The World Vegetable Center and a Consultant of ACIAR from May 29-June 1, 2012 as part of a larger ACIAR sponsored scoping study entitled “A preliminary study to improve income and nutrition in Eastern and Southern Africa by enhancing vegetable based farming and food systems”. The aim of the mission was to get familiar with the stakeholders of the vegetable value chain in the region, identify the most important constraints that can be addressed/improved that contribute to food and nutritional security and economic growth by improving the income generation potential and welfare of vegetable value chain actors and to identify potential local partners to address the issues identified through action research (Abdou, 2012).

The mission findings are synthesized into a brief summary which describe the outcome of the discussions with the key identified institutions operating in the vegetable sector, the major activities of various value chain actors as per interviews conducted to explore their contribution towards the supply chain and identify key constraints to the growth of the industry in Ethiopia.

3.4. Share of Vegetable Production in Ethiopia

The agricultural sector accounts for 55% to the Gross Domestic Product and provides 85% of employment. Vegetable and fruit production and consumption is relatively limited. 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). In the country, vegetable crops are produced in different agro-ecological zones through commercial as well as small farmers both as a source of

income as well as food. However, the type is limited to few crops and production is concentrated to some pocket areas (Kumilachew, *et al.*,2014).

As in alternative urban areas of the world happen, vegetable is produced in Ethiopian urban areas. In all cities of the nation, different types of vegetables for different purpose (either for commercial or direct consumption), are producing Vegetable producers living near to urban centers largely practice vegetable farming. As most vegetables are not commonly practiced by the rural private peasant growers, the small volume of production recorded as well evidenced by the results of agricultural sample survey, 2012. vol. I. (Haile,2014).Ethiopia has a variety of vegetable crops grown in different agro ecological zones produced through commercial as well as small farmers each as a source of financial gain as well as food.

However, the sort is restricted to few crops and production is concentrated to some pocket areas. In spite of this, the production of vegetables varies from cultivating a few plants in the backyards for home consumption up to a large-scale production for domestic and export markets as sited by Haile,2014 (Dawit, 2004). According to the CSA (2008) 453,608.8 ha of land is under vegetable in Ethiopia, in general. Accordingly the study (CSA, 2008), estimated that an annual production of 18,124,613.5 quintal was estimated from vegetable by the same year (Haile, 2014).Vegetables took up about 1.43 % of the area under all crops at national level(urbanand rural). However, Of the total estimated area under vegetables, the lion share which is about 70.89% and 18.07% was under Red peppers and Ethiopian Cabbage, respectively(ibid). Production of vegetables contribute 2.95% of the total crops production, conversely, of the total production of vegetables, the above mentioned crops have the lions share, i.e. about 37.14% and 43.53%, in that order all over the country. However, the nation doesn't have policy regarding urban agriculture (Performance Audit report, 2008 ;) (Haile, 2014).

3.5. Small-scale and large scale vegetable producers

The number of small-scale producers involved in horticulture is estimated at 5.7 million farmers (MoARD, 2007) as sited by (Ethiopian-Netherlands Horticulture Partnership, 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).

3.6. Area under vegetables production and market availability

3.6.1. Estimate of Area and Production

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 as cited by Amsalu, *et al.*, 2014 (CSA, 2010; 2011; 2012; 2013). This implies that the area cultivated to vegetables increased by 13% while the production increased by 103%, between 2010 and 2013. The area under vegetable production and the quantity produced by medium and large scale commercial state and private farms also showed an increasing trend during the reference period. Similarly, export of vegetables increased from 37,210 tons valued at USD163.86 million in 2003 to 220,210 tons valued at USD 437.5 million in 2013(Ethiopian Revenue and Customs Authority, 2013), representing 709% increase in export volume and 167% in revenue(Amsalu, *et al.*,2014)

Table 1: Estimate of Area and Production of Fruit and Vegetables in 2004/05 and 2005/06 (in Meher Season)

Crop	Area(100ha)			Production(1000 ton)		
	2004/05	2005/06	% change	2004/05	2005/06	% change
Vegetables						
Lettuce	0.2	0.3	14	0	0	
Head cabbage	2.1	1.7	-22	15	13	-15
Eth. Cabbage	27.1	23.0	-15	262	181	-31
Tomatoes	2.9	4.8	64	36	35	-2
Green pepper	4.8	6.3	31	4.5	40	-9
Red pepper	57.0	81.5	43	72	179	147
Beetroot	1.5	1.5	1	16	16	-1
Carrot	1.7	1.1	-38	18	6.9	-62
Onion	18.0	16.6	-8	229	176	-23
Potato	51.7	61.8	20	509	450	-12
Garlic	13.7	12.5	-9	196	107	-46

As sited by (Ethiopian-Netherlands Horticulture Partnership, 2007)Source: Central Statistics Agency, 2006. Data refer to 2000/01 from Fresh Fruits and Vegetables Production and Marketing Study, Ethiopian Export Promotion Agency, SisayHabte, April 2004.

3.6.2. Region Percentage of cultivation and Market availability of vegetable in Ethiopia

The proportion of households who did not produce/cultivate any vegetable was highest in Addis Ababa (99.7%), followed in Afar (94.9%), Dire Dawa (94.2%), Tigray (86.4%) and Harari (63.1%) regions (Table 2). In the overall, 41.5% did not produce any vegetable in nine regions studied. The proportion of households who did not produce any fruit over the year preceding the survey was highest in Addis Ababa (100%), followed in Dire Dawa (95.3%), Afar (92.9%), Tigray (92.2%), Harari (83.3%) and Oromiya (81.8%) regions. The weighted average for the nine regions was 75.5 % (Tsegaye *et al.*, 2009).

Table 2: Own production/cultivation and market availability situation of vegetables and fruits over the year preceding the survey by region, Ethiopia, 2006.

Region	N	Production/cultivation		Market availability		
		Not cultivated any Vegetable	Not cultivated any fruit	Not seen any Vegetable	Not seen any Fruit	any
Afar	254	94.9	92.9	82.3	79.5	
Tigray	295	86.4	92.2	15.6	67.0	
Amhara	267	29.2	75.3	3.4	18.0	
Addis Ababa	354	99.7	100	0.8	0.8	
Oromia	136	50.0	81.8	2.1	14.8	
SNNPR*	284	11.6	55.3	8.1	10.6	
BenishangulGumuz	300	25.3	55.0	1.7	7.3	
Harari	287	63.1	83.3	20.9	13.9	
Dire Dawa	275	94.2	95.3	11.3	11.3	
Nine Reions	2552	41.5**	75.5**	15.3**	24.0**	

* SNNPR = Southern Nations Nationalities and Peoples' Region; ** nine regions proportions are weighted proportions Source :- (Tsegaye *et al.*, 2009).

3.7. Urban agriculture mainly in the production of horticulture crops

The potential of UA to supply town dwellers with significant amounts of vegetables and livestock products, and as an income generation activity for low-income households, has only been recently recognized in the Tigray region (Dereje *et al.*, 2007). The Mekelle City Plan Preparation Project Office (MCPPO), which is mandated to assess the land use in Mekelle and review the economic situation (G. Yohannes, Pers. Comm.), is in the process of evaluating the potential of UA as a medium and small enterprise, estimating its capacity to absorb unemployment. Having evaluated the suitability of land resources, it reports that about 2250 ha of cultivable cropland are estimated to be available in the territory under the town's jurisdiction. 6628 households are engaged in urban agriculture mainly in the production of horticulture crops, supplying 27% of products traded in the town (another 25% of these products originate from the surrounding hinterland up to 50 km away) (MCPPO interim unpublished report, 2005).

A staple crop producing area for a long time, and this is reflected in the proportion of farmers growing staple crops, predominantly wheat, potato and maize. Vegetable production is a relatively new enterprise, which developed after 2000 following construction of the Gerebati dam, which has allowed irrigated cultivation. Tomato, onion, cabbage and pepper are the most widely cultivated vegetables. Overall, the most widely-cultivated crops (wheat, tomato, potato and maize) were also usually given the highest rankings by the farmers (data not shown). Production is dominated by lettuce, potato, tomato, beetroot, pepper, and Swiss chard, there is no correspondence between most widely grown crops and ranking given by farmers (Dereje *et al.*, 2007).

Table 3. Most widely grown crops and ranking given by farmers

Crop	% of Farmers	Crop	% of Farmers
Beetroot	7.4	Maize	74.1
Babbage	33.3	Potato	96.3
Carrot	11.1	Teff	7.4
Lettuce	11.1	Wheat	92.6
Onion	14.8	Chickpea	14.8
Pepper	37	Lentils	7.4
Pumpkin	22.2	Spices	3.7
Tomato	3.7	Guava	3.7

Source :- (Dereje *et al.*, 2007).

4. Vegetable Consumption patterns in Ethiopia

Recently, despite of the ups and downs observed, the demand for vegetables especially for export is increasing as cited by Kumilachew, et al., 2014 (Tsegay, 2010). In Ethiopia, there was no time when rural population has not been affected by drought, then food shortage which need alternative solution to overcome it (Dandena, 210). Many at risk populations in developing countries are deficient in iodine, iron, and vitamin A making them more vulnerable to illness, fatigue, blindness, and memory loss and increasing the possibility of mental retardation among their children. This is true also in the case of Ethiopia mainly due to cereal based food habit is practicing and largely affect children's in most part of the country. Supplementation, food fortification, dietary diversification, nutrition education and food production are strategies that have been developed to reduce these micronutrient deficiencies and have, for the most part, demonstrated positive, though uneven, results (Workneh *et al.*, 1999). On the other hand, it has been reported that IVs are the cheapest source of vitamin A, C, minerals and fiber still people fail to consume enough to meet their nutrient requirement due to lack of knowledge in the nutritional value and production of those vegetables in the easiest way (Dandena, 210).

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. Ethiopians consume on average 97g of fruit and vegetables per day. Cereals contribute about 75% of the Ethiopian diet (FAO, 2004). Fruit and vegetables are not common items in the Ethiopian diet. In contrary to fruits, vegetables are more common in the Ethiopian diet. However the quantity consumed per person is still one of the lowest compared to the other countries even though price per kilogram in Ethiopia is the lowest of all countries (Ethiopian-Netherlands Horticulture Partnership, 2007).

Table 4: Summary of fruit and vegetable consumption patterns

	Ethiopia	Burundi	Malawi	Mozambique	Tanzania	Rwanda	Kenya	Uganda	Ghana	Guinea
% consuming	93	72	93	93	98	91	90	88	90	95
Quantity (kg/person/yr)	25.4	20.8	45.8	61	38.6	47.5	88.2	53.8	51	31.2
Value (US\$/person/yr)	3.3	9.5	19.9	16.6	10.3	10.7	21.3	9.3	29.1	15.1
Price (US\$/kg)	0.13	0.46	0.43	0.27	0.27	0.23	0.25	0.17	0.57	0.48
% of food budget	4.1	4.1	12.2	13.9	9.4	11.6	7.9	8.1	9.2	6.9
% of total budget	2.5	2.9	8.6	9.3	6.7	9.3	5.6	4.6	5.7	3.6

As Sited by (Ethiopian-Netherlands Horticulture Partnership, 2007). Source: Workafes, 2007

The proportion of wild vegetables is known to be high and the degree of consumption varies from one socio-cultural setting to the other. Except in few cases of south Ethiopian communities and some others, consumption of underutilized edible plants, vegetables in particular, has often been looked upon as a sign of poverty; largely a reflection of lack of knowledge on their nutritional benefits. Fast regeneration of most vegetables under limited soil moisture and availability of the perennial species all year round makes them capable of bridging the gap during food shortages and famine situations experienced by rural communities (Getachew, et al., 2013). Based on the survey per capital consumption of the annual fresh production assorted vegetables is about 2.86 million tons. From the total volume of horticultural products 95% is fresh vegetable production. Overall, among all the index children studied in nine regions Ethiopia, 38.1% did not eat any of the common vegetables (kale, spinach, cabbage, carrot, tomato and pumpkin) over the week preceding the survey. The proportion of index children who did not eat any vegetable was high in Afar (85.0%), Tigray (77.6%), Amhara (61.8%) and Addis Ababa (59.3%) and relatively low in SNNPR 2 (7.0%), Dire Dawa (15.6%) and Oromiya (18.6%). Among all the children studied in nine regions, 36.5% did not eat any of the common fruits (mango, papaya, oranges, avocado and banana) over the week preceding the survey. The proportion of index children who did not eat fruits was high in Tigray (88.1%) and Afar (83.5%) and was relatively low in Harari (23.3%) (Tsegaye *et al.*, 2009).

5. Parasitic Contamination of Fruits and Vegetables Collected in Ethiopia (Jima)

Intestinal parasitic infections are widely distributed throughout the world causing substantial intimidation to the public health, economy, and physical and cognitive development particularly among children in developing countries like Ethiopia. The consumption of fruits and vegetables helps in protecting human body from a number of diseases. Eating unclean, raw, or undercooked fruits and vegetables is one of the means by which the transmission of intestinal parasitic infections is propagated. Despite the fact that intestinal parasitosis is common

in Jimma Town.

The studies conducted to assess the level of contamination of fruits and vegetables in jimma Town the Result Indicated that The samples were collected from four different local markets in Jimma Town. The results of the study showed that samples collected from “Hirmata Merkato” (29.8%) had high contamination rate followed by samples collected from “Bishishe” (28.4%), “Agip” (22.1%), and “Kochi” (19.7%) markets. The percentage contamination rate was significantly different among samples collected from the different markets ($P = 0.003$). The habit of eating raw vegetables like salad and tomato is commonly practiced in the study area. Hence, the findings of the present study are of public health importance, requiring an appropriate intervention to prevent transmission of parasitic diseases that can be acquired through consumption of contaminated fruits and vegetables (Tamrat, *et al.*, 2014). This variation among the produces might be due to the fact that salad, cabbage, carrot, and lettuce have uneven surfaces which make the parasitic stages attach more easily to the surface of these vegetables. The smooth surface of green pepper, tomato, and mango might reduce the rate of parasitic attachment hence had lower contamination rate (Tamrat, *et al.*, 2014)

6. Supply vitamins and micronutrient to the consumer in Ethiopia

Even though the farmers did not know the scientific justification regarding for eating Indigenous Vegetable (IVs), they related with health problems they face and relief they will get after consuming those vegetables. Among the micronutrient problem Ethiopia is facing now a day is vitamin A deficiency which can be related with poor nutrition problems as cited by Dendana, 2010 (Girma and Timotiows, 2002). Many research reports indicated that an estimated five million people are suffering from lack of vitamins and essential minerals. Lasting long solution to vitamin A deficiency problems in Ethiopia especially for children's rest on increasing the availability of vitamin. Rich foods to the most vulnerable groups which is a good opportunity to tack the problem and increase the production and consumption of potential IVs.

Lasting long solution to vitamin A deficiency problems in Ethiopia especially for children's rest on increasing the availability of vitamin A rich foods to the most vulnerable groups which is a good opportunity to tack the problem and increase the production and consumption of potential IVs. In line with this, IVs have the potential nutritional value and cheap source of vitamins like A, C and minerals such as iron, calcium and phosphorous (Figure 2). (Dendana, 2010).

Table 5: Proportion of children who did not eat any of the common vegetables and fruits Over the week preceding the survey by region, Ethiopia, 2006.

Region	N	Vegetable	Fruit
Afar	254	85.0	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
Benishangul Gumuz	300	38.3	41.3
Harari	287	35.5	23.3
Dire Dawa	275	15.6	31.6
Nine Reions	2552	38.1%*	36.5*

* SNNPR = Southern Nations Nationalities and Peoples' Region

** Nine regions proportions are weighted proportions

Source :- (Tsegaye *et al.*, 2009).

Comparative analysis of the situation regarding production, market availability and consumption of fruits and vegetables between predominantly urban areas (Dire Dawa, Addis Ababa and Harari) and predominantly rural areas (Amhara, SNNPR, Benishangul-Gumuz, Tigray, Oromiya and Afar) showed that significantly more rural households have produced/cultivated vegetables and fruits compared to urban households (Tsegaye *et al.*, 2009).

7. Contribution of vegetable production to sustainable livelihoods and Ethiopia Economy

Vegetable production is an important economic activity in Ethiopia. The development of the vegetable sub – sector is one of the priority areas in the agricultural development strategy of Ethiopia as cited by Amsalu *et al.*, 2014 (Ethiopian Investment Agency, 2008; 2012). The agricultural productivity is low due to use of low level of improved agricultural technologies, risks associated with weather conditions, diseases and pests, etc. Moreover, due to the ever increasing population pressure, the landholding per household is declining leading to low level of production to meet the consumption requirement of the households (Kumilachew, *et al.*, 2014). With regard to horticultural production, 46% of the vegetable producing area is planted with potato followed by pepper and

sweet potato (FAO, 2004) Vegetables can make a significant difference to smallholder livelihoods. Vegetable production needs only a small area of land, with minimal capital outlay and can provide access to a valuable food under subsistence conditions, but also has the potential to provide an initial step towards establishing an income base for poorer households. Vegetables form a large and diverse commodity group: although they do not have botanical features in common, they generally share similarities in cultivation methods. Usually smallholders intensively cultivate vegetables in gardens, and promoting vegetables in gardens can help smallholders in a number of ways: It provides vegetables at a low cost; It provides a regular supply of vegetables; It provides a more varied diet for the farm family; it can teach smallholders how to grow vegetables: test cultivation Practices carried out in a garden are less risky and less costly, than if vegetables were planted on a larger scale (Mike Nichols and Martin Hilmi, 2009). It allows for testing out vegetables that were never planted before; it can provide income from the sale of vegetables; It can provide gender employment and gender participation in economic activities; It can provide employment for the disabled and the elderly. However, even though home gardens provide advantages for smallholders, often they are seen as small and complicated for inclusion in development programmes. This requires appraising diverse and often location-specific economic, cultural and environmental conditions in traditional farming systems. However, policy-makers and advisors need to integrate vegetable gardens into development programmes and provide training and promotion for such initiatives (Mike Nichols and Martin Hilmi, 2009).

Specifically speaking, the fruit and vegetable sector has become crucial source of employment and specialization because the cultivation and gardening to a large extent is labor intensive than the cereal crops and gives more post-harvest chances to add value (Yeabsira, 2014). 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. The major export markets for fruits and vegetables for Ethiopia are the surrounding countries Djibouti, Sudan and Somalia and the main products exported to these countries is non-graded fresh fruits and vegetables (Yeabsira, 2014).

Vegetable crops make significant contributions to the Ethiopian household and national economy. Potato and sweet potato are valuable food security crops for densely populated highland regions and drought-prone areas respectively. Vegetables like hot pepper and onion are also used for flavouring local dishes and as well important as sources of vitamins and mineral. Root and tuber crops can yield as much as 40-60 tonnes per hectare and can provide food security especially in times of drought, famine and food shortages. Commonly the highest yield of commonly grown tef, the staple food of the country, is on average 1 tonnes per hectare which is sixty times less yield per hectare of potato (60 ton ha⁻¹). At present, different vegetable crops are produced in many home gardens and also commercially in different parts of the country (Fekadu and Dandena, 2006).

8. Contributing factors for Investment Expansion of Vegetable Crops of the Country

Ethiopia has got an immense potential to develop intensive vegetable production especially at commercial scale. Some of the favorable factors that contribute to an overall investment include proximity to profitable markets, agro-climatic suitability and rich water resources for irrigated vegetables, rise of demand for vegetable crops particularly in the urban areas, diversity of agro-climatic conditions that facilitate the diversification of the crops and the current malnutrition problem in the country that calls for an increased need for vegetables (Fekadu and Dandena, 2006).

Further, the high productivity of vegetable crops (root and tubers) compared to cereals can be the viable alternatives to supplement the good supply of farmers living at subsistence level. On the other hand, export possibilities for these crops are very encouraging and if fully exploited (Fekadu and Dandena, 2006).

9. Constraints to Vegetable Crops' Production of the Country

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 programme using vegetables and their processed products and certain environmental limitations. Heavy losses that are caused mainly due to price fluctuations, lack of guaranteed prices and unplanned planting patterns, This causes heavy post-harvest losses. Most vegetables are sold in unprocessed form (Fekadu and Dandena, 2006). Lack of storage facilities, poor traditional storage system, which are prone to storage pests and diseases, lack of on-farm storage system and absence of cool storage facilities are among the important limitation to the vegetable production sector of the country (Fekadu and Dandena, 2006).

10. Pattern of food expenditure and Market chain

10.1. Food expenditure

As several previous studies have shown, in Ethiopia expenditure on cereals on average account for more than 60 percent of the total household living expenditure. Figure 1 reports the share of total food expenditure spent on

each group in 1994 and 2004. Within food expenditure, Ethiopia's urban consumers in 1994 on average allocated the largest proportion to cereals (44.3%), followed by spices (13.3%), milk and milk products (8.4%), bread and others (8.5%), with the smallest proportions allocated to meat and other animal products (2.7%) and to fruits (1.4%). However this pattern changed considerably in 2004. For instance, cereals share of food budget dropped from 44.3 per cent to 32.9 percent while all of the rest except for pulses and stimulants have registered an increase in expenditure share. The increase in a share of high value food items is more visible compared to others. For instance, food budget share of meat increased from 2.7 percent in 1994 to 9.7 percent, milk and milk products from 8.4 to 9.6 percent, vegetable, fruits and sugar and honey each shown about one percent growth in 2004 compared to 1994 (EDRI, 2010).

Household size is positively related with demand for cereal, and negatively related with demand for milk, meat, vegetables and fruits. This is due to the fact that a major objective of larger households is to meet a minimum daily calorific requirement which is usually realized through consumption of basic staple food items (cereals) (EDRI, 2010). Consumption of high value foods (e.g., milk, meat, vegetables and fruits) is partly affected by family size; that is, when family size is large it is less likely to consume regularly high value foods mainly due to the implication on budget. The education of the household head is negatively and significantly associated with demand for cereals. This finding is somewhat surprising in light of the link between education and cereal consumption. It may partly be explained by the increasing education level of the household head leading to a shift/diversification in household consumption from cereals to high value foods (EDRI, 2010).

10.2. Supply chain structure

In addition to home consumption, vegetables have four routes to market: City markets, primarily Addis Ababa, but also Dire Dawa and Harer; Town markets within the region; Small local village markets Direct, farm-gate sales to immediate community. While about 75% of growers sell at the farm gate, the majority of volume goes to regional town markets via local traders. Village assemblers/agents of regional traders are buyers for 96% of tomato growers in Arbaminch Zuria, while village retailers are major buyers for 40% of Chenchu cabbage growers. The Gamo-Gofa fruits and Vegetables Marketing Cooperatives Union is rarely used by fruit growers and not at all by vegetable growers. Smallholders' reluctance due to: History of unreliable transports because cooperative does not own its own trucks (and is vulnerable to traders persuading truck rental companies not to rent to the union) (AbdouTenkouano ,2012). Lower price than private traders (though this is offset by weight cheating prevalent amongst traders, farmers are often unaware of this) , No credit arrangements Current arrangements disadvantage farmers because small number of wholesalers for city markets, who prevent competition by informally agreeing with regional traders not to deal with any new traders or wholesalers to prevent new entrants. Limited numbers of regional traders eliminate smallholders' choice over customers, and the traders jointly determine farm gate prices (AbdouTenkouano ,2012)

11. Opportunities and challenges

11.1. Opportunities

In the short term growing vegetables provides poor families with the opportunity to eat a much healthier diet than one based solely on cereals. A better diet also will enable a much healthier prospect for the family. Vegetable production on a small scale is accessible to many. The cost of entry is fairly low and typically the major input required is family labour. Surplus produce from a production cycle can be stored for family use or it can be sold providing a source of extra income throughout the year. The creation of vegetable trade in some localities represents an opportunity for the poorest members of a population to improve their livelihoods significantly (Mike Nichols and Martin Hilmi, 2009).

11.2. Challenges

In Ethiopia, vegetable crops are produced in different agro-ecological zones through commercial as well as smallholder farmers both as a source of income and food. However, due to perishable nature and biological nature of production process, vegetable production is a risky investment activity. In this context, risk perceptions play a key role in the production and investment behavior of farmers in vegetable production decisions (Kumilachew, et al., 2014). Vegetables are highly perishable, they start to lose their quality right after harvest and continued throughout the process until it is consumed (Kohl and Uhl, 1985). Hence, vegetable production is a risky investment activity. Riskiness of vegetable production may be attributed to several factors that are beyond the control of producers. (Kumilachew, et al., 2014). 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 (FAO, 2004).

12. SUMMARY AND CONCLUSIONS

This Review showed that wild vegetables could contribute significantly to the dietary requirements of rural households. Although factors such as malnutrition, illnesses and unavailability of fat in the diet, contribute towards vitamin A deficiency, inadequate intake of foods containing vitamin A appears to constitute the single most important risk factor to VAD in developing countries. Inadequate intake of foods containing vitamin A is basically due to lack of access to vitamin A rich foods, which is a function of inadequate production, inadequate availability in the market or inability to purchase the foods. about the importance of vegetables in the wellbeing of children and women. Overall, market availability of vegetables appear to be relatively good compared to own production, but there are gaps in some regions that might need interventions. For example, market availability of vegetables is worrisome in Afar and Tigray regions and deserve attention. With regards to the practice of own production/cultivation of common vegetables and fruits, the study showed a bleak picture in Ethiopia. When the fact that the proportion of households who reported to have cultivated/produced included those who had a single seedling/plant of a vegetable in their gardens even once over the year is considered, it is obvious that the proportion of households who produced adequate vegetables in their gardens/homesteads is negligible. Based on WHO recommendations suggesting unavailability of dark green leafy vegetables for more than six months in an area as indicative of increased risk to VAD (20), many regions in Ethiopia can be considered as VAD endemic. The situation in Afar, Addis Ababa, Harari, Tigray and Dire Dawa exhibits worst scenarios. Simultaneously, conducted survey on the magnitude and distribution of subclinical vitamin A deficiency indicated that the prevalence was high in these regions, suggesting a potential negative contribution of poor back yard gardening practice to vitamin A deficiency. Much of the soil and climate in many parts of the country is favorable for horticulture, as evidenced by a number of ongoing investments in the sector. Lessons learned from

Successful urban agricultural projects in many parts of the world indicated that even urban households can produce adequate vegetables for household consumption. Apparently, the major impediment to own production in Ethiopia appears to be lack of awareness about the importance of vegetables in the wellbeing of children and women. Overall, market availability of vegetables appear to be relatively good compared to own production, but there are gaps in some regions that might need interventions. For example, market availability of vegetables is worrisome in Afar and Tigray regions and deserve attention. The findings regarding consumption of vegetables and indicated that the practice is sub-optimal in Ethiopia. Majority of the children did not at all eat vegetable over the week preceding the survey and when the proportion of children who have eaten once or twice (inadequate consumption) is also considered, it is apparent that vegetable and fruit consumption is indeed extremely suboptimal in Ethiopia. WHO suggests that if less than 75% of preschool age children consume vitamin A rich foods at least three times a week the community/population should be considered as at risk community/population. Based on this suggestion, many communities in Ethiopia can be considered as 'at risk community'. The proportion of children who did not eat vegetables even once, let alone three times in a week is greater than 75% in Afar and Tigray regions. FAO estimates that Ethiopians eat less than 100 gram of fruits and vegetables/per day, a size of a medium carrot, which is less than a quarter of the recommended fruit and vegetable consumption. Although this study and other studies did not explore why vegetables and fruits are not widely consumed in Ethiopia, a few likely reasons can be forwarded based on the dietary habits in the country. In most parts of the country, the diets are monotonous, consisting of a cereal and legume, cereal or milk and roots/tubers with legumes/dairy products.

13. Recommendation

Agriculture is the main stay of Ethiopian economy, contributing 50% share in the gross domestic product (GDP) vegetables and root crops generate foreign currency earnings in the country. In Ethiopia, vegetable crops are produced in different agro-ecological zones through commercial as well as smallholder farmers both as a source of income and food. However, due to perishable nature and biological nature of production process, vegetables process, vegetables productions are risky investment activities. Vegetables productions are risky investment activities.

For the purpose of an introduction, sustainable Vegetable can be characterized as follows: Sustainable Vegetable is a goal rather than a specific set of farming practices. Progress or movement toward the goal may be viewed as a continuum. A sustainable farming system strives to be productive and profitable, while at the same time preserving environmental quality and making efficient use of nonrenewable resources. Sustainable Vegetable is concerned about the well-being of rural communities and the quality of life for families and farm workers. Though biological practices and products are favored over chemical inputs, pesticides and fertilizers may be used within an Integrated Pest Management framework. Alternative for farmers: to use of low cost or high cost technologies Improved vegetable cultivation technologies (drip irrigation, mulching, IPM and etc.) Resource save vegetable cultivation technologies. Safe vegetable production. Supplying with a high quality seeds. Infrastructure development for production, processing and marketing. Increase Vegetables export potential. Increase Business development. Farmers' interest in indigenous varieties' cultivation can be improved

through their provision with high-grade seeds and production technologies for the important indigenous vegetable crops, as well as via establishment of the output markets. Vegetable crop cultivation will facilitate additional jobs creating and women involvement in the output cultivation and marketing. Joint research with farmers on various directions, pilot field establishment, workshop arrangement and guideline dissemination. Development of vegetable research on various directions is very important: PGR, breeding, IPM, seed production, improved cultivation technologies, diversification, economic assessment, marketing, and etc. Development of material and technical basis in research institutes, universities and farms

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