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WASHINGTON UNIVERSITY IN ST. LOUIS

University College
International Affairs

The International Footprint of Teff: Resurgence of an Ancient Ethiopian Grain

by
Annette R. Crymes

A thesis presented to the
Graduate School of Arts and Sciences
of Washington University in
partial fulfillment of the
requirements for the
degree of Master of Arts

May 2015
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List of Abbreviations

AMC	Agricultural Marketing Corporation
CSA	Central Statistical Agency of Ethiopia
DAG	Development and Assistance Group
EGS	Employment Generation Schemes
ECSA	Ethiopian Central Statistical Agency
EGC	Ethiopian Grain Council
EGTE	Ethiopian Grain Trade Enterprise
EDHS	Ethiopia Demographic Health Survey
ENA	Emergency Nurse Association
EPRDF	Ethiopian People's Revolutionary Democratic Front
ESD	Economic and Social Development
EWVG	Early Warning Working Group
FNI	Fridtjof Nansen Institute
FAO	Food and Agriculture Organization
GHI	Global Hunger Index
GTP	Growth and Transformation Plan
HABP	Household Asset Building Program
HICES	Household Income, Consumption and Expenditure Survey
IFPRI	International Food Policy Research Institute
NGO	Non Governmental Organization
NRC	National Research Council
PSNP	Productive Safety Net Program
RPP	Rural Poverty Portal

SDPRP	Sustainable Development and Poverty Reduction Program
UNDP	United Nations Development Programme
USAID	United States Agency for International Development
WFP	World Food Programme
WFS	World Food Summit
WHO	World Health Organization

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Annette R. Crymes

Washington University in St. Louis

May 2015

*I dedicate this thesis to my mother, Neva, who instilled in me the curiosity, love and knowledge about the nutritional and healing powers of plants, which was handed down to her from her mother, Ida, who learned from her mother, Deana, who learned from her mother, Mary, who learned from her mother, my great-great-great grandmother, **Since**, an American slave who hailed from somewhere in Africa.*

ABSTRACT OF THE THESIS

The International Footprint of Teff: Resurgence of an Ancient Ethiopian Grain

by

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Master of Arts in International Affairs

Washington University in St. Louis, 2015

Professor Andrew C. Sobel, Chair

I will examine the transformation of the Ethiopian staple of teff into the global economy as a highly sought after commodity. In doing so I consider the effect of this change on the local, regional and international communities and the consequences of the 2006 Ethiopian export ban on teff grain and teff flour as it relates to food and nutritional security and economic development in Ethiopia. To take advantage of the economic opportunities presented by the growing domestic and international demand of teff and to address domestic food and nutrition security, I conclude that Ethiopia should focus on improving methods of producing teff by promoting investment in the domestic teff industry, opening up and expanding its teff market internationally.

Chapter 1: General Framework and Motivations for the Research

1.1 Introduction

Ethiopia experiences high levels of both chronic and acute food and nutrition insecurity, particularly among rural and urban poor populations and smallholder farmers. According to the Ethiopian Central Statistical Agency (ECSA) and United States Agency for International Development (USAID), approximately 44 percent of children under the age of 5 years are chronically malnourished (ECSA, 2014; USAID, 2014). Ethiopia is considered a least developed country ranked 173 out of 187 countries in the UNDP Human Development Index for 2013 (UNDP, 2014). As of January 2014, the Government of Ethiopia reported that up to 2.7 million people in Ethiopia were acutely food insecure and required assistance to meet their basic nutritional needs (ECSA, 2014; USAID, 2014). “The long-term effects of chronic malnutrition are estimated to cost the Government of Ethiopia approximately 16.5 percent of its GDP every year” (USAID, 2014). The World Food Program (WFP) plans to help approximately 6.5 million vulnerable Ethiopians with food and nutritional aid needs in 2014 (WFP, 2013).

Teff, *Eragrostis tef*, Ethiopia’s most ancient indigenous staple food, is one of the most important crops for farm income, food and nutrition security in Ethiopia. Teff is highly nutritious and is an important part of Ethiopia’s cultural heritage and national identity. Being labeled as one of the latest *super foods* of the 21st century, like the ancient Andean grain quinoa, teff’s international popularity is rapidly growing (Collyns, 2013). This presents a growing economic opportunity for Ethiopia and its farmers. It also presents a challenge to Ethiopian food security and the correlating issue of reducing chronic malnutrition, poverty and hunger.

Seeking to ensure food security for the local population and to protect local markets, in January 2006, the Ethiopian government put a ban on teff grain and teff flour exports (FAO, 2013). This means that Ethiopian farmers are currently locked into the domestic teff grain market and its constraints, and conversely locked out of the global teff grain market and its opportunities. Paradoxically, the main value-added product of teff grain flour, *injera* (a spongy, sourdough flatbread), is not banned from exports, and this has created a global niche market for Ethiopian millers and bread-makers. This poses interesting issues and tensions for Ethiopian agricultural producers, consumers, business owners and policymakers.

1.2 Objective

The objective of this research is to explore the intricate relationship between Ethiopia's food policies, famine, international food aid during the last quarter of the 20th century and the shift in health conscious Western dietary habits and how these factors contributed to the transformation of production, consumption and distribution patterns of teff. I will also study and understand the economic and agricultural potential of teff for Ethiopia. Specifically:

1. What were the elements contributing to the transformation of production, consumption and distribution patterns of teff during the last quarter of the 20th century to the present?
2. Does the Ethiopian government's decision to place a ban on the export of teff grain and teff flour have consequences for food and nutritional security in Ethiopia?

Teff provides an excellent example of three compelling discussions: First, teff's displacement as a staple during famine years by internationally donated crops such as corn or wheat. Second, the demand of teff by Ethiopian and Eritrean immigrants, students and diasporic communities. Third, its emergence on an international level as a healthy "super grain" alternative

crop marketed to Western countries. This transformation of teff production, consumption and distribution patterns following the famine years during the 1980's and the international target of teff by health conscious consumers (mainly in Europe and the United States) reveal interesting developments of this staple, which was once endemic to Ethiopia.

1.3 Rationale and Motivation for Study

Food and nutrition security are of paramount importance to Ethiopia, a country plagued by famine and poverty. Of equal importance to Ethiopia are the agricultural and economic developments of the country. In 2012 the Ethiopian government implemented a five-year Growth and Transformation Plan (GTP) to address development of the country's economic growth. This included a plan to improve and increase production of teff (Demeke and Marcantonio, 2013).

This study examines the Ethiopian trade policy that bans the export of teff grain and teff flour. This represents a challenge that promotes a continued debate among Ethiopian policymakers, business owners, producers, consumers, and the international community. Additionally, it takes into account the nutritional consequences of the displacement of teff, the highly nutritional, traditional and culturally preferred staple food of Ethiopians, by international food aid during the Ethiopian famine of 1984-1985, and the increasing international demand for teff.

Trade policy is currently a key component of the political and economic environment facing Ethiopia today. With well over 2.7 million Ethiopians facing hunger on daily basis (World Bank, 2014) and with any agricultural trade policy reform likely to directly impact the supply and access to food within Ethiopia, there is a clear need to understand how agricultural trade

policy will impact food and nutrition security. This issue will be specifically addressed in this paper.

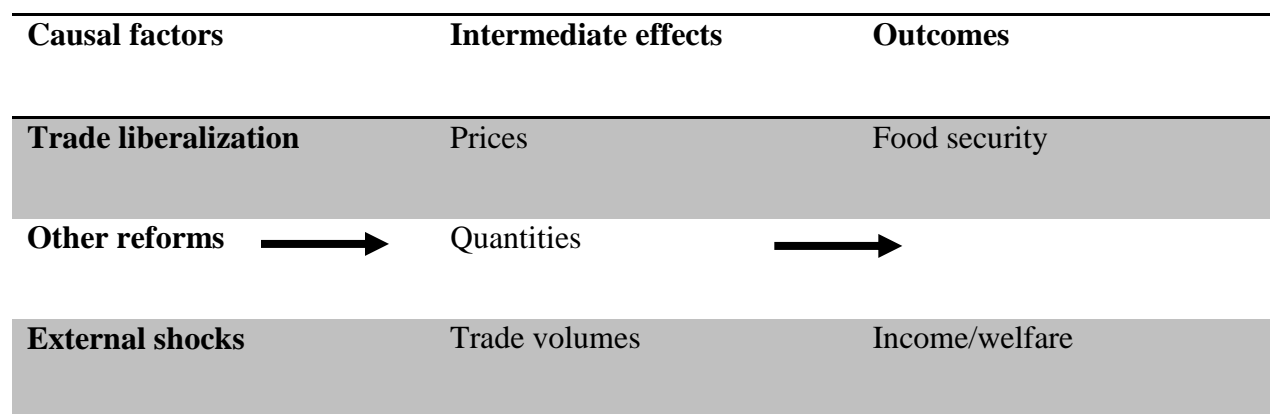
1.4 Methodology Overview

The research method will combine both qualitative and quantitative data retrieved from relative literature. Utilizing prior theory and research to inform the conceptual framework, I will use process tracing in the attempt to trace links between possible causes and observed outcomes. According to Falleti (2005), this approach is considered necessary in a policy research project in order to identify the factors that contribute to the policy outcome.

1.5 Conceptual Framework

For this study, the conceptual framework for research of trade policy reforms and food security developed by the Economic and Social Development (ESD) will be used as the basis of analysis. This framework is a two-stage relationship between trade reforms and food security that presents a set of causal components impacting a series of intermediate indicators that determine the final outcome in terms of changes in food security status (FAO, 2003).

Figure 1.1.1 Simple Analytical Framework for Linking Trade Reforms and Food Security



Source: FAO (2003)

According to the ESD conceptual framework model, due to modifying factors, an identical policy change in two different contexts, whether within a country at two separate points in time, or across a set of countries, can result in quite different outcomes (FAO, 2003). Therefore, assessment of the impact of trade reform on levels of food security must take into account the existing policy and institutional environment, the agro-climatic constraints, and the level of physical and human capital which will all influence the extent to which reform will cause a change in the intermediate effects (Henisz, 2000).

1.6 Population

Since this study focuses on the Ethiopian distribution and consumption patterns of teff and the related food and nutrition aspects in Ethiopia, my population of interest are the Ethiopians in Ethiopia.

1.7 Research Question

Specific

1. Does the current Ethiopian export ban on teff affect food and nutrition security of Ethiopians living in Ethiopia?

General

1. Do the cereal policies of the Ethiopian government have any impact on Ethiopian food and nutrition security?

1.8 Variables

Dependent variable

The food and nutrition security status in Ethiopia and consumption of teff and wheat

Independent variable

2006 export ban on teff

1.9 Hypothesis

The 2006 Ethiopian export ban did not have an impact on food and nutrition security in Ethiopia.

1.10 Significance of Key Events

Basically, January 6, 2006, is the date on which the Ethiopian government instituted the export ban on teff grain and teff flour.

Time frame

The time frame event begins on January 6, 2005, and ends on January 6, 2007, examining years before and after the 2006 teff export ban. In this way I ensure that no important data between January 6, 2006, and January 6, 2007, remains unexamined. By recording data from one year before and one year after the main event, I maintain consistency in my research.

1.11 Data Collection and its Analysis

For this study, I use secondary data collected from relevant sources. First, data on teff and wheat nutrition was collected. The nutritional data was normalized to 100 grams. Data was also

collected on the food and nutrition security status in Ethiopia. Data like caloric intake and factors affecting food and nutrition security were the major ones. The methods used were data from various sources which included published scholarly literature, online databases, Ethiopian government documents and other policy literature. Specifically, I used data collected from pertinent sources such as the EGTE, ECSA, USAID, FAO, HICES and WHO databases. I used a combination of quantitative and qualitative data. The technique of process tracing was employed to assess the impact of replacing the consumption of teff with wheat in the Ethiopian diet on food and nutrition security in Ethiopia.

1.12 Validity and Reliability of Data

Bryman (2012) explains the benefits of mixed method research, mainly that data research results are “more than the sum of the individual quantitative and qualitative parts” (p. 8). However, while combining different methods can be problematic and has limitations, specifically the challenge of converting results in order to effectively analyze everything within the same framework, Brannen (2005) points out that “mixed methods research is an opportunity that deflects attention away from theoretical work that is often specific to particular disciplines and may encourage thinking ‘outside the box’, a practice to be welcomed” (p.5). Although discrepancies can occur, yielding conclusions that may or may not be representative of the whole population, the validity and reliability of the results of this research comes from data triangulation, which aids in obtaining research results convergence and verification (Bryman, 2012). Through data cross verification from two or more sources, I expect to overcome the weakness or inherent biases and the problems that can come from single method and single-theory studies.

Chapter 2: Globalization of Ancient Grains and Food Security

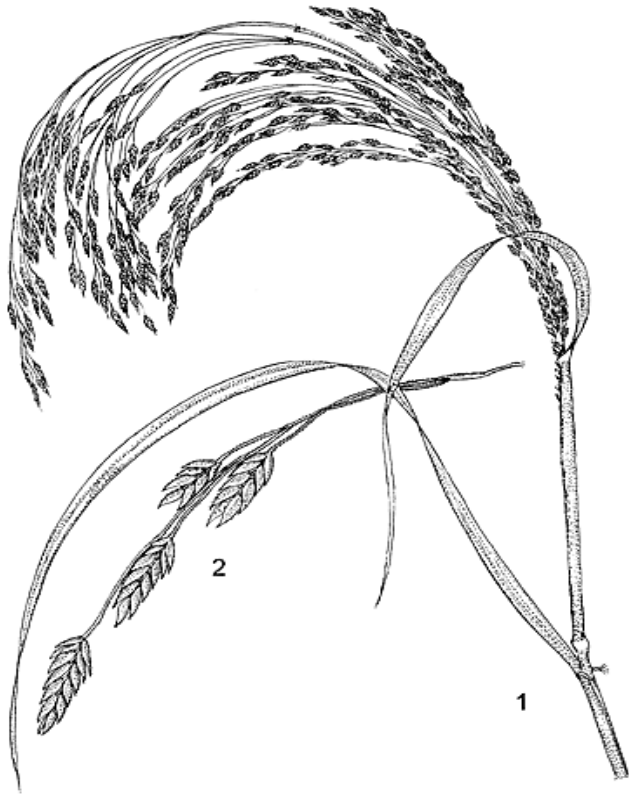
2.1 Teff and Ethiopia

Ethiopia is a landlocked country in the horn of Africa. The country occupies a total area of 1.2 million square kilometers (420,000 square miles). Its principal natural resource is its arable land of which 35.68 percent is farmed at present. In terms of production, teff is the dominant cereal crop by area planted (Trade Economics, 2011; Bekabil, Befikadu, Rupert and Tareke, 2011). Ethiopia is the second most populous country in Africa with a total population of 87 million and an annual growth rate of 2.9% (The World Bank, 2014). Its largest city and capital is Addis Ababa. Ethiopia was the only African country to defeat European colonial powers and maintain its sovereignty as an independent country. However, the country was briefly occupied by Italy for five years during 1936-1941 (Vaughan, 2003). Ethiopia generated international attention when it endured a series of famines in the 1980s, which were exacerbated by drought, adverse geopolitics and civil war.

Ethiopia is rich in cultural diversity, having more than 80 different ethnic groups. The food culture of teff in Ethiopia is both historical and a part of Ethiopian antiquity, being a significant part of the country's national identity. Teff, the grain used to make the Ethiopian staple bread *injera*, is an ancient, self-pollinated warm season annual grain (Ebba, 1975; Ketema, 1997; Stallknecht, 1997; Roseberg, Norberg, Smith, Charlton, Rykbost and Shock, 2005).

Figure 2.1.1 *Eragrostis tef* (Zuccagni) Trotter

1, upper part of flowering culm; 2, part of inflorescence with spikelets



Source: Protabase Record (2014)

According to Nicolai Vavilov, teff originated and was domesticated in Ethiopia between 4000 – 1000 BC (Simoons, 1965; Harlan, de Wet and Stemler, 1976). Teff is one of the African grain crops that made the transition from wild grasses to domesticated food at the hands of Africans, who collected the seed grains of local wild grasses as food and chose the characteristics best suited to their tastes, farming practices and growing conditions (National Research Council [NRC], 1996; Harlan, et al., 1976).

Teff grain is very tiny and comes in a variety of colors, from pale white to ivory white, light tan to dark brown to reddish-brown purple (Gamboa and Ekris, 2008; Tadasse, 1975; Roseberg, et al, 2005; Royal Botanic Garden, 1887). Depending on variety, teff is ready for harvest two to five months after sowing (Fufa, Bogale, Tefera, Assefa, Kefyalew, Debelo and Ketema, n.d). It is the smallest grain in the world, and it takes 150 grains of teff to equal the size of one kernel of wheat (Assefa, Tefera, Merker, Kefyalew and Hundera, 2001; Gamboa and van Ekris, 2008).

Figure 2.1.2 Teff Grain Characteristics

Thousand teff kernel weight (g) = 0.264

Average of 13 teff varieties:

Length (mm) =1.17

Width (mm) = 0.61

Percent of sample that passes through sieves of different mesh size:

710 microns – 1.1

600 microns – 52.7

300 microns – 45.3

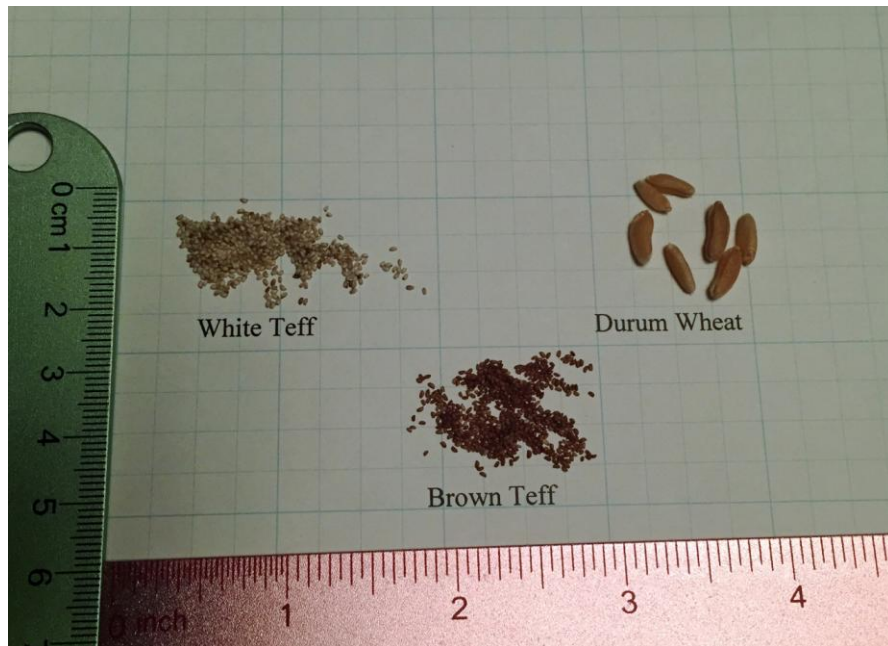
250 microns – 0.1

Source: Bultosa (2007)

Teff is often lost in the harvesting and threshing process because of its size (Tadasse, 1975). In their study on the teff value chain, Bekabil, et al., (2011) reported that teff yields are relatively low (around 1.2 t/ha) and high loss rates (25-30% both before and after harvest) reduce the quantity of grain available to consumers by up to 50% (Bekabil, et al., 2011). Lodging is also

another problem associated with teff. Teff is susceptible to lodging, and this could account for up to 30% of the potential loss of teff yields (Bekabil, et al., 2011).

Figure 2.1.3 Teff and Durum Wheat Grain Size



Source: Author (2015)

Growing teff is also labor intensive. Teff weeding is done mostly by hand, and in some areas, 18 to 40 person days of labor is needed to weed a hectare field of teff (Bekabil, et al., 2011). While some farmers use herbicides to kill broad leaf weeds, herbicide application does not eliminate the need for hand weeding to remove grass-like weeds which also pose serious problems to teff production (Bekabil, et al., 2011).

Culturally, teff is one of the most important parts of the Ethiopian diet. Teff grain is ground into flour and fermented to make *injera*, which is traditionally consumed with various meats and pulse sauces called *wot*, (Stewart and Getachew, 1962). Stallknecht, Gilbertson and

Eckhoff (1993) describe *injera* “as a soft, porous, thin pancake, which has a sour taste” (para. 6). They further note that in Ethiopia, teff flour is sometimes mixed with other flours, such as wheat or sorghum. But, by Ethiopian standards, “the flavor and quality of *injera* made from mixtures is considered less tasty” (para. 6). “People in Ethiopia have always been loyal to teff, Ethiopians eat teff at every meal” (Gamboa and van Ekris, 2008, p.329).

The Ethiopian preference is for *injera* made from pure teff flour; this view is consistent with earlier claims made by Tadasse (1975) and African food historian McCann (2005). Teff is the most nutritious of all grains grown in Ethiopia as shown in table 2.1.1.

Table 2.1.1 Nutritional Content of Teff (per 100 grams of grain)

Nutrient Content	White Tef f	Brown Teff	Mix Teff	Barley	Corn	Wheat	Sorghum
Energy (kcal)	339	336	367	334	86	339	338
Moisture (%)	10.4	11.1	10.7	11.3	76.1	10.9	12.1
Protein	11.1	10.5	13.3	9.3	3.3	13.5	7.1
Fat (g)	2.4	2.7	2.8	1.9	1.4	2.5	2.8
Carbohydrate (g)	73.6	73.1	73.1	75.4	18.7	71.1	76.8
Fiber (g)	3.0	3.1	8.0	3.7	2.2	3	2.3
Ash (g)	2.5	3.1	3.0	2.0	1.3	1.5	1.6
Calcium (mg)	156	157	180	47	2	34	30
Phosphorus (mg)	366	348	368	325	89	508	282
Iron (mg)	18.9	58.9	59	10.2	.5	.5	7.8

Source: Agren and Gibson (1968); USDA (2015)

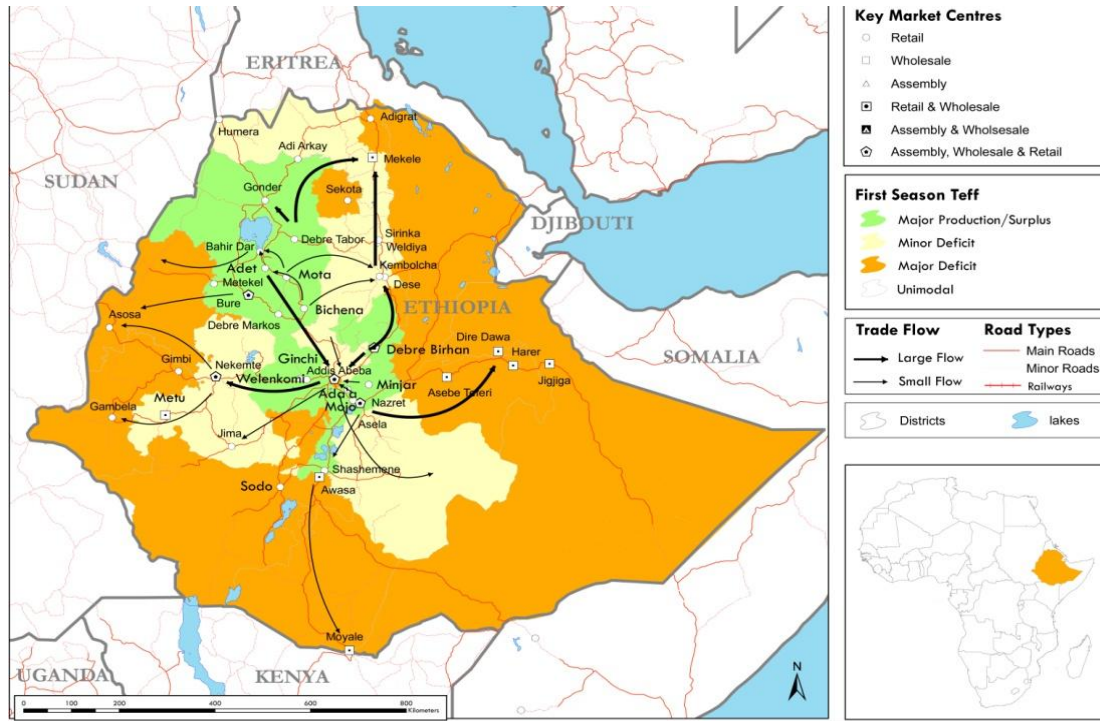
Yigzaw Gorton, Akalu and Solomon (2001) set up a study to evaluate the nutritional value of Ethiopian teff grain and fermented teff grain to see whether the processed teff would improve its nutritional value. According to their study, the fermentation process, which is the

traditional practice food preparation method used to make *injera* in Ethiopia, is important because it can improve the nutritional value of teff.

Teff is gluten-free, rich in phosphorous, copper, aluminum and thiamine and is an excellent source of protein, amino acids and carbohydrates. Teff is higher in calcium, iron and zinc content than corn, wheat, or rice (Baye, 2014). In Gamboa and van Ekris's (2008) study on the nutritional and health aspects of teff, it was found the small grain is too small to refine and teff flour includes the bran and germ, which are "the most nutritious parts of any grain" (p. 349). Another health related benefit of teff is the high in fiber content (Bay, 2014). According to Zung (2004), this is particularly important in dealing with diabetes and assisting with blood sugar control.

Teff is well adapted to the heavy, well-drained, clay soil (vertisol) areas of the Ethiopian highlands where most other cereal crops cannot be easily grown. Teff also thrives in both drought stressed and water logged soil conditions. Teff has a short growing season with rainfall needs of 450–550 mm, and temperature range of 10–27°C (Ebba, 1975; Ketema, 1997; Stallknecht, 1997; Roseberg, et al., 2005). Teff is day length sensitive and flowers best during 12 hours of daylight (Stallknecht, 1997; Roseberg et. al., 2005). Teff can grow at altitudes where many other crops can't and can be grown from sea level to as high as 3000 meters altitude, with maximum production occurring at about 1800-2100 meters (Ketema, 1997; Stallknecht, 1997).

Figure 2.1.4 Map of Ethiopian Teff Production and Market Flow



Source: USAID (2013)

Within Ethiopia, the regions of Gojam and Shewa (located in the central highlands), Gonder, Wello and Welega are the major teff production areas (Ketema, 1997). While teff is most commonly grown in the Ethiopian highlands, it is now being cultivated to grow in a wider range of conditions, from marginal soils to flood conditions. This versatility could explain why teff is now being cultivated in areas as diverse as the dry mountains of Idaho and the low wetlands of the Netherlands. According to the NRC, teff was first introduced to the United States by Wayne Carlson in the 1980's (NRC, 1996) and is currently being grown in Idaho, for use by the large Ethiopian Diasporan communities (Carlson, 2014; NRC, 1996). However, Streetman (1963) stated: "Species of *Eragrostis* were first introduced into the United States in the early 1930s and several of these have been used extensively for reseeding the arid and semi-arid range lands of the southwest" (as quoted in Costanza, 1974). Teff has been on the international radar

for some time. For example, Stewart and Getawa (1962) noted that teff *injera* was superior to wheat bread with potential international importance as a food source.

However, a number of sources differ about the date of teff's international footprint. In his monograph, Ketema (1997), reported that the Royal Botanic Gardens, Kew, imported seed from Ethiopia in 1866 and distributed it to the USA, India, Australia, and South Africa; Skyes introduced it to Zimbabwe, Mozambique, Kenya, Uganda, Tanzania in 1911; Horwitz to Palestine in 1940. Tadesse (1975) documented that Burt Davy introduced teff to California, Malawi, Zaire, India, Sri Lanka, Australia, New Zealand and Argentina in 1916. Currently, in the United States, the Kansas Black Farmers Association is experimenting with teff; intrigued by both its link to Africa and its market potential (KBFA, 2014). Teff is also being grown in South Africa, India, Australia, and Canada for both human consumption and animal feed (Ketema, 1997; Stallknecht, 1997; Roseberg et al., 2005).

There are several varieties of teff, each unique to specific growing conditions (Ketema, 1997). Teff grown in Ethiopia is represented by either landrace selections or developed varieties adapted to specific geographic regions (Ebba, 1975; Ketema, 1997). While it is not within the scope of this paper to discuss the details about all the different varieties of this grain, a detailed description of 34 named Ethiopian teff cultivars based on morphological characteristics was published in 1975 (Ebba, 1975).

Stallknecht (1997) describes three main types of teff grain, white, brown and mixed (brown and white) as follows:

- White teff is the preferred type but only grows in the highlands of Ethiopia. It requires the most rigorous growing conditions, has the mildest flavor, and is the most expensive form of teff. Just like white bread has been a status symbol in the

United States, white teff is usually reserved for the wealthiest and most prestigious families in Ethiopia.

- Brown teff, the least expensive form and the least preferred type, has the highest iron content. Brown teff has become more accepted in Ethiopian society due to an increased awareness of the health benefits of its high iron contents (decreased risk of anemia related to parasitic infection).
- Mixed teff has even higher iron content.

Traditionally, teff is grown in Ethiopia predominately for food, where it is primarily used to make the Ethiopian staple *injera*, which provides approximately two-thirds of the diet in Ethiopia (Gamboa and van Ekris, 2008). Other traditional Ethiopian preparations from teff flour include porridge and local alcoholic beverages called *tela* and *katikala*. Teff straw is used as animal feed, to plaster mud huts and to make local grain storage silos called *goteras* (Ketema, 1997).

According to Stallknecht (1997), published accounts on the use of teff in the late 1800s reported that upper class people consumed white teff grain, and dark grain teff was the food of soldiers and servants, while teff hay was consumed by animals.

Several recipes that fit Western palates have been developed from teff flour, particularly in the United States and Europe, where it has found niches in the health food market as a gourmet food. Teff flour is used as a thickening agent in a range of products, including gravies, casseroles, soups and stews. It is also used as an ingredient in puddings, smoothie drinks and in baked goods such as cookies, muffins and crackers. Teff grain, owing to its high mineral content, is now being used in mixtures with soybean, chickpea and other grains in the baby food industry (Ketema, 1997).

Teff is a very important crop in Ethiopia, both in terms of production and consumption. In a country of nearly 90 million people, approximately 6 million households grow teff. As

shown in table 2.1.2, teff is the dominant cereal by area planted and second only to corn in production and consumption (Berhane, Paulos, Tafere and Tamru, 2011; Ethiopian Agricultural Transformation Agency [EATA], 2013).

Table 2.1.2 Area and Production of Main Cereals in Ethiopia 2012-2013

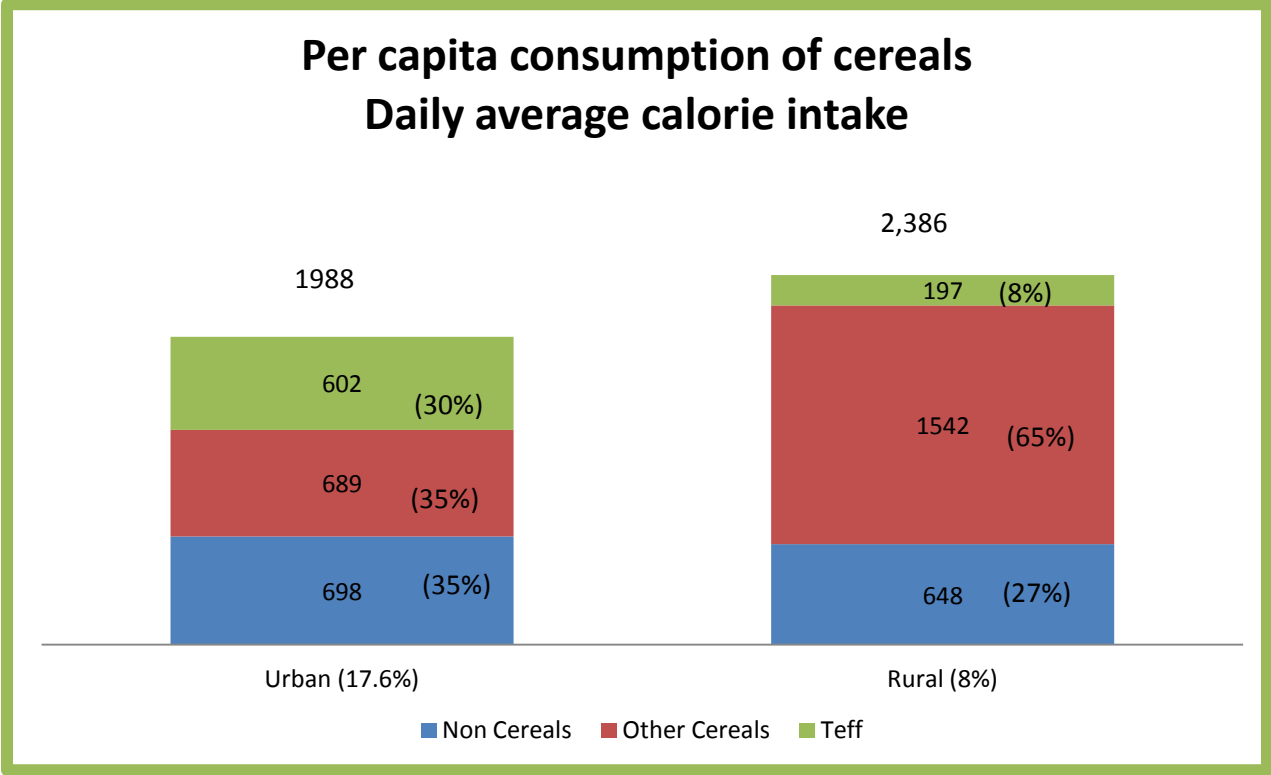
Crop	Area (1000/hectares)	Production (1000/MT)
Teff	3760	3769
Corn	2150	5500
Sorghum	1780	3570
Wheat	1510	3200
Barley	1015	1620
Total:	10,215	17,659

Source: FAS Addis Abba Foreign Agricultural Services (2014)

As illustrated in figure 2.1.5, teff consumption is severely split between urban (30%) and rural (8%) populations in Ethiopia, and is now considered a luxury cereal and its consumption is mostly an urban experience (Berhane, et al., 2011). Most people in rural areas are unable to afford teff and rely mostly on less expensive and less nutritional corn, sorghum, wheat, and barley to make *injera* and other staple foods (EATA, 2013). It is ironic that the primary victims of food and nutrition insecurity in Ethiopia are the rural farmers, the very producers of food. Each year, regardless of weather conditions, hundreds of thousands of Ethiopian rural

households suffer food insecurity and associated malnutrition and are basically dependent on food-aid for their survival (ECSA, 2014; USAID, 2014).

Figure 2.1.5 Urban and Rural Consumption of Teff and other Cereals in Ethiopia



Source: Berhane, et al., 2011

According to Berhane, et al., (2011), in 2001-2007, teff accounted for approximately 11 percent of the per capita caloric intake. Their research relied on national data from the Household Income, Consumption and Expenditure Survey (HICES, 2011) to show that urban consumption of teff per capita is as high as 61kilograms per year with only 20 kilograms per capita per year for rural areas. The average urban Ethiopian derives a little over 600 calories per day from teff (around 30% of total daily caloric intake), whereas for rural residents this figure is only around

200 calories per day (HICES, 2010; USDA FAS, 2013). This disparity has both nutritional and preferential consequences, as teff is the *most nutritional* and the *most culturally* preferred grain in Ethiopia (HICES, 2010; USDA FAS, 2013).

Trends are showing that because of the increasing price of teff compared to wheat and corn and the ease of preparing these two latter staples, many Ethiopian middle and lower class populations are shifting to greater consumption of wheat and corn (USDA FAS, 2013; Berhane, et al., 2011; Bekabil, et al., 2011; Demeke, et al., 2013). Most of the Ethiopian flour mills in the rural areas mix corn and wheat with teff to lower the price of flour. This helps Ethiopian bakeries to lower the price of bread and increase their profits while attempting to meet the ever increasing demands of Ethiopia's growing population (USDA FAS, 2013).

As Ethiopia's population has increased, so has the domestic demand for teff. Given the increasing global popularity of teff, the international demand for this grain has also increased. However, Ethiopian teff yields have not met the increased demands, thus leading to ever increasing prices. According to the Ethiopian Grain Trade Enterprise (EGTE), from 2007-2008, the price of teff skyrocketed above the 1,000 USD/metric ton mark, which is four times the 2000-2008 average of 250 USD/metric ton (USDA FAS, 2013). In 2010, the price of teff fell but was still above 700 USD/metric ton (USDA FAS, 2013). This created hardships for many Ethiopian families who switched to other cereals as substitutes (Demeke, et al., 2013).

By the end of 2012, retail teff prices in Addis Ababa had reached over 800 USD/ metric ton (USDA FAS, 2013). Still, teff remains the preferred staple cereal for Ethiopians, as evidenced by demand reflected in the persistently high prices in recent years (table 2.1.3).

Table 2.1.3 Area Wholesale Prices of Cereals in Addis Abba for 2012: USD/MT

Commodities					
Month	Teff	Corn	Sorghum	Wheat	Barley
January	567	249	400	348	370
February	547	283	445	396	410
March	504	273	448	387	408
April	636	276	444	420	421
May	652	270	463	407	421
June	648	294	483	406	428
July	671	380	539	541	450
August	780	375	558	534	445
September	812	378	570	535	520
October	812	378	589	524	507
November	818	371	584	514	613
December	766	357	603	491	502

Source: Ethiopian Grain Trade Enterprises (2013)

Demands for teff grain by African Diasporan communities, health conscious and gluten intolerant individuals in the west are driving increased production of teff internationally. In the United States, due to increasing demands for teff, the acreage devoted to teff production has

exploded and teff is currently grown in at least 25 states across the nation (Davidson and Laca, 2010).

2.2 Ethiopia's Great Famine: 1984-1985

Ethiopia is historically associated with famine. The 1984-1985 famine in Ethiopia was a significant famine in the history of Ethiopia. The inducement of food shortages and heightened famine risk in Ethiopia that resulted in widespread famine during this period was the combined consequence of conflict, internal food policy decisions, and drought conditions. These all contributed to the severity of the famine, which is estimated to have killed over one million people and displaced many more (Dorosh and Rashid, 2012; Webb and von Braun, 1994). Prior to the famine, two decades of wars of national liberation and other anti-government conflict raged throughout Ethiopia (Webb and von Braun, 1994).

Many of the socio-political sources of the famine may be traced to the origins of the revolutionary government that controlled grain trade and tended to favor the military and urban sectors over the rural population (de Waal, 1991). The Ethiopian government deprived local people of both locally grown food and international food aid (de Waal, 1991). Drought conditions heightened a food and nutrition security crisis already in the making.

International relief organizations made major efforts to provide food to the affected areas. However, the persistence of drought and poor security conditions in the country resulted in continued need as well as hazards for famine relief workers. In late 1985, another year of drought was forecast, and by early 1986 the famine had spread to parts of the southern highlands, with an estimated 5.8 million food insecure Ethiopians dependent on international food aid (de Waal, 1991).

Ethiopian Derg regime policies, coupled with warring factions and the drought, generated food shortages and long-term obstacles to food security. Per capita food production fell from 154kg in 1975-1976 to 135kg in 1983-1984, a 12 percent decrease (de Waal, 1991). Rural farmers were unable to meet ordinary consumption needs, fulfill procurement quotas along with increased demand resulting from population increases. Declines were experienced in the war zones and marginal regions, the typically food deficit regions, and even in the typically food surplus regions (de Waal, 2002).

According to Kirwan and McMillan (2007), food aid did not play a significant role in food security in Ethiopia prior to the 1984 famine. International food aid accounted for only 2-4 percent of the gross food in Ethiopia in previous famines (de Waal, 1991). However, the entire food supply chain cycle was affected by increasing governmental grain procurements that nearly quadrupled between 1976-1977 and again in 1981-1982 (de Waal, 2002). Procured food aid was subsidized for distribution primarily to the military and urban sectors. The government circulated food from the rural areas to the military and urban areas. Within the regions with the largest food deficits, the shortfalls were not spread out evenly because there was usually no transfer of food from surplus to deficit regions (de Waal, 2002).

2.3 Ethiopia's Food and Nutrition Security Issues

Food security has always been a crucial development issue for Ethiopia. Despite the fact that Ethiopia's immense natural and human potential is greater than in most of sub-Saharan Africa, the country cannot feed itself. Persistent droughts coupled with high food and fuel prices that have persisted in the country since 2008 and the global financial crisis have contributed to Ethiopia's failing food security. Additionally, political forces, mainly out of the farmers' control,

keep the people hungry, poor and frustrated. This situation threatens millions of lives that depend on farming in Ethiopia.

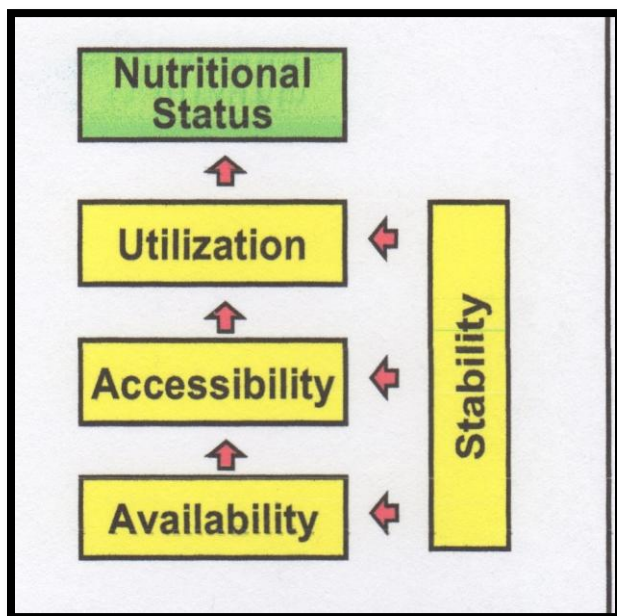
According to Bimerew and Beyene (2014), “food security is a multidisciplinary concept which includes economic, political, demographic, social (discriminatory access), cultural (eating habits), and technical aspects” (p. 150). The 1996 World Food Summit (WFS) definition of food security prevails as the current model of food and nutrition security which highlights the importance of nutrition. “Food security exists when all people, at all times, have physical and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life” (FAO, 2006, p.1) and generally refers to people having “physical and economic access” to food that meets both their nutritional needs and food preferences (WHO, 2015). The WFS definition highlights the four key components of food and nutrition security:

- **Food availability:** The availability of sufficient quantities of food of appropriate quality, supplied through domestic production or imports (including food aid).
- **Food access:** Access by individuals to adequate resources (entitlements) for acquiring appropriate foods for a nutritious diet. Entitlements are defined as the set of all commodity bundles over which a person can establish command given the legal, political, economic and social arrangements of the community in which they live (including traditional rights such as access to common resources).
- **Food use:** Utilization of food through adequate diet, clean water, sanitation and health care to reach a state of nutritional well-being where all physiological needs are met. This brings out the importance of non-food inputs in food security.
- **Food system stability:** To be food secure, a population, household or individual must have access to adequate food at all times. They should not risk losing access to food as a consequence of sudden shocks (e.g. an economic or climatic crisis) or cyclical events (e.g. seasonal food insecurity). The concept of stability can

therefore refer to both the availability and access dimensions of food security. (p.1).

However, food availability does not necessary assure access to food that is culturally acceptable and getting enough calories does necessarily guarantee a healthy and nutritional diet. According to Renzaho and Mellor (2010), food security should be based on four inter-related pillars to include and nutrition and asset creation as a part of stability. Asset creation involves putting in place structures and systems that sustain a household's or individual's ability to overcome economic and climatic shocks. Their conception of food security is not particularly different from the generally accepted food security concept. They, for instance, explain that food availability is about the amount of food that is available through domestic production or import, including food aid. In addition, Renzaho and Mellor explain that access to food means distribution of nutritious food which can be accessed by all household members.

Figure 2.3.1 Food and Nutrition Framework



Source: Gross, Schoeneberger, Pfeifer, Preuss, (2000)

In Ethiopia, food insecurity is extensive, with up to 40 percent of the population suffering from food insecurity at some point each year (FAOStat, 2012). Since 2004, Ethiopia has achieved an overall reduction in poverty levels as well as food insecurity (SDPRP, 2015). Nonetheless, poverty and food insecurity remain a big challenge to the country. Over 30% of the population lives below the food poverty line, unable to afford the minimum caloric intake for a healthy and active life (Barrett, 2001). The country is prone to drought, which has serious implications on food security as most of Ethiopia's agriculture is rain dependent. In a joint study by the Ethiopia Central Statistical Agency (ECSA) and the World Food Programme (WFP), the following was found:

- **Food poverty line:** For 2010-2011 stood at 1,985 birr. According to HICES data more than one in four Ethiopians (28%) fell below the food poverty line (29% in rural and 21% in urban), meaning more than one in three Ethiopians spent less on food than is required to consume the minimum level of calories for a healthy, active life. Nationally, 40% of households were food energy deficient, using the threshold of 2,550 kilocalories per adult equivalent per day. Overall, urban areas had a similar share of households affected by food energy deficiency (42%) as rural (40%). At national level the average daily energy consumption per adult stood at 3,127 kilocalories.
- **Poverty line:** For 2010-2011 on a national level, 23% of households fell below the poverty line, according to HICES data. At the regional level, the highest prevalence of households below the poverty line ranged between 25- 28%. By all indicators of wealth and poverty, the rural areas were poorer than urban areas. Simpler measures of wealth/poverty, such as the wealth (asset) index, showed a stronger relationship with dietary indicators. Poorer households (by wealth index) were much more likely to source the majority of their calories from starchy staples, and to consume less diverse diets than richer households.
- **Malnutrition at the national level:** According to the 2011 Ethiopia Demographic Health Survey, there has been a notable decline in chronic malnutrition rates, but the rate was still 'critical' with 44% of children under 5 years old stunted. The prevalence of underweight children has seen a stark drop, falling from 41% in 2000 to 29% in 2011, a prevalence that is still deemed 'serious' by WHO cut-offs.
- **Food consumption patterns:** Areas that were poor and borderline were more prevalent in rural areas where 29% of households had poor/ borderline food consumption, compared with 17% in urban areas. Starchy diets (more than 75%

of calories coming from starchy staple foods) were particularly common among households making a living from livestock, crop production and crop production and livestock combined.

- **Food expenditure at the national level:** About half (49%) of total household expenditures were on food. The levels were higher in rural Ethiopia (51%) than urban (41%).
- **Climate vulnerability:** Due to rainfall or specifically, the lack of rainfall is one of the main determinants of food production in Ethiopia. Wetter years are generally associated with higher food production. Across most of Ethiopia, households reported erratic rainfall as the main risk contributing to their food insecurity and overall vulnerability. Overall there have been declines in rainfall between March and September from 1980 to the present. (2014).

Ethiopia's poverty and vulnerability to food insecurity make it a country of recurrent emergency food aid needs. An estimated 5-6 million people are considered chronically food insecure and require some type of resource transfer, usually in the form of food aid, to meet their minimal food requirements every year (World Bank, 2015).

2.4 Food Aid in Ethiopia

Ethiopia currently receives more food aid than almost any other country in the world (Levinsohn and McMillan, 2007). Since 1985, well over half a million tons of food has been delivered to Ethiopia every year. But imported wheat, which makes up most of Ethiopia's food aid, is not to local people's taste. Ethiopians generally prefer the staple grain, teff, which is now being grown in many regions around the world.

Basically, the Ethiopian 1984-1985 famine marked the turning point for significantly increased amounts of international food aid, mainly in the form of wheat, being given to Ethiopia to alleviate hunger (Levinsohn and McMillan, 2007; de Waal, 1991). According to comprehensive international trade data, Ethiopia did not begin importing wheat until the early

1970s (Feenstra, Lipsey, Deng, Ma and Mo, 2005). However, between 1984 and 2003 wheat food aid was, on average, equal to 68.4% of domestic wheat production, and in some years, wheat food aid *exceeded* domestic wheat production (Levinsohn and McMillan, 2007). Thus, the potential for wheat food aid to impact producer prices and domestic output is significant. However, the research on food aid in Ethiopia and its effect on domestic production are inconclusive. Several studies report positive effects on recipient country food production, while others show negative effects. For example, Grannell (1986) argues that considerable attention was paid to the risk of negative effects at the local market level in Ethiopia. Grannell's findings suggest that food aid projects did not negatively impact domestic production.

However, Kirwan and McMillan (2007) contend that certain types of food aid, when not for *emergency* relief, can actually be destructive. They also assert that unloading food onto poorer nations (i.e. free, subsidized, or below market prices) undercuts local farmers, who cannot compete and are driven out of jobs and into poverty, further slanting the market share of the larger producers such as those from Canada, Europe and the United States. They further state that “in the case of Ethiopia, U.S. food aid donations are more closely related to the U.S. wheat prices than food supply (needs) in Ethiopia” (Kirwan and McMillan, 2007, p. 10). Wheat was the only cereal grain exported by the United States to Ethiopia in 2013, for a total value of \$32 million (USD) (Office of the United States Trade Representative, 2014).

Gilligan and Hoddinott (2006) studied the impact of two major post drought food aid programs in Ethiopia on consumption and food security: a food-for-work program known as the Employment Generation Schemes (EGS) and a program of Free Food Distribution (FFD). They contend that the “primary goal of emergency food aid after an economic shock is often to bolster short-term food and nutrition security” (p. v) and is seen as an important part of the Ethiopian

governments food policy” (p. v). However, food aid continues to generate heated debate, particularly around what effect it has on food consumption, nutrition and food markets.

Ethiopia is one of the fastest-growing economies in Africa, maintaining a growth rate of over 11 percent for the last five years. Although certain sectors of the economy benefits from the rapidly growing economy, the majority of the people are still in need. The Humanitarian Requirements Document issued by the Ethiopian government and humanitarian partners in September 2012 estimated that 3.76 million people required relief food assistance from August to December 2012. The total net emergency food and non-food requirement amounted to US\$189,433,303 (ECSA, 2014).

The government continues to address food insecurity through its long-term strategy of Agricultural Development-led Industrialization. This is complemented by Ethiopia’s Food Security Program which includes the Productive Safety Net Program (PSNP), the Household Asset Building Program (HABP), and others designed to ease households out of food insecurity.

Within the Early Warning Working Group (EWWG) and the Emergency Nurse Association (ENA) process, WFP is the largest contributor in terms of logistics support, and contributes significantly in terms of human resources. WFP has also played an important and positive role in the safety net program, based on its general and development program experience. With an emphasis on food aid distribution, WFP clearly plays a major role in food security in Ethiopia, handling 30–40% of national food distributions. The Ethiopian government together with national and international Non Governmental Organizations (NGO) handles the remainder.

2.5 Elements of Teff Transformation

The transformation of teff from a local staple, endemic to Ethiopia, into an international specialty commodity can be attributed to several independent and concurrent events as follows:

- Government food policies
- Famine and drought
- Ethiopian population growth
- International food aid
- Ethiopian diasporic communities
- Western demand

First, the stage was set by government food policies as a direct consequence of Derg cereal market policies. For example, after the major drought in 1984, authorities officially fixed wholesale grain prices for teff in 1985 at 4.5 ETB per kilogram, while open market prices ranged from 7.7 ETB/kg in food surplus in Gojjam and 15.7 ETB/kg in food deficit Wello. This helped to create the disparity between urban and rural consumption patterns.

During the famine of 1983–1986, media activity in the West elevated the international profile of the famine and helped secure international aid. The aid came in the form of food, corn and wheat, the main surplus staples of the West, and these grains did not leave Ethiopia after the crisis was over, with Ethiopians becoming accustomed to the low cost of these staples. In fact, corn and wheat are gradually reducing Ethiopian teff consumption and due to increased market prices of teff, consumption and distribution patterns of teff are changing

Global Ethiopian diasporic communities are also driving the demand for teff. During the early 1970s, Wayne Carlson became aware of teff while working as a biologist in Ethiopia. On

returning to the United States, Carlson planted some teff in the in high mountains of Idaho. Within 5 years Carlson was growing and harvesting 200 acres of four selected varieties, marketing and selling teff flour to numerous Ethiopian restaurants and natural food markets nationwide and to Ethiopian diasporic communities.

The international emerging popularity of teff has also been driven by the “Dr. Oz effect,” and the “Hollywood effect.” Western media outlets are now aggressively marketing the health benefits of teff. Dr. Oz featured teff on his television show as a super grain stating, “Teff leads the grains in calcium content, which helps strengthen bones. One grain of teff is up to 40% resistant starch, which can help you lose weight if you replace the other carbs you’re filling up on, what I call *carbage*” (Skolnic, 2013). Dr. Oz further states that teff can be cooked hot for a nice breakfast cereal: “1 cup of teff with 2 cups of water or juice, cover and simmer for 20 minutes or until it’s thick and the liquid is absorbed. Add fresh fruit on top. Teff is also available in tortillas for a great wrap or to make quesadillas. A lot better than refined flour tortillas and gluten-free too” (Skolnic, 2013). According to the Dr. Oz Show, teff is also known to reduce PMS symptoms and help you lose weight (Skolnic, 2013).

Rosanna Lee, a nutrition educator based in Toronto, Canada, says, “It’s ideal for vegetarians looking for sources of protein” (Skolnic, 2013). Teff has also recently been promoted as being Hollywood’s new super food as the new quinoa. Gwyneth Paltrow and Victoria Beckham are both fans of teff and the grain’s multiple uses, according to the Daily Mail. Professional athletes, people with special dietary needs and other health conscious people are attracted to teff’s nutritional power and gluten-free attributes (Cliff, 2014).

According to Bob's Red Mill, who sells teff on its website, teff has a mild, nutty flavor and lots of calcium, protein and fiber (Bob's Red Mill, 2014). Whole grain teff is a great addition to porridge, stews, pilaf or baked goods (Shiloh Farms, 2014). Cooked whole grain teff makes a unique hot breakfast cereal similar in consistency and texture to wheat farina. Teff can be made into polenta, added to veggie burgers, cakes, cookies and breads. Naturally gluten free, teff is a wonderful way to mix up your menu with something a bit exotic. Teff is being sold in local supermarkets in the United States and on the internet for up to \$8 per pound (Author's observations).

2.6 Generalizability of Ethiopian Teff to other Ancient Grains

There is no denying that the overall trend in global food production and consumption, in which First World appetites drive Third World cultivation practices (Schanbacher, 2014; Shaw, 2009). The results are often harmful economic effects and threats to domestic food and nutrition security. This was the case with rice in the early 1960s (Hewa and Darwin, 2005). Now conscious consumers, looking for healthy alternatives, have embraced teff, just as readily as they embraced quinoa, as an incredibly nutritious substitute for meat. Like teff, quinoa has a high protein content (between 10%-14%), and it contains essential, amino acids (USDA, 2015). Low in carbohydrates and high in fiber, quinoa has become increasingly popular with Western health-conscious consumers (Collins, 2013). The resurgence of quinoa may serve as a model for developing teff policies and practices in Ethiopia.

2.6.1 The Quinoa Effect

Not long ago, quinoa, like teff in Ethiopia, was just an obscure ancient grain of the Andes. A basic food staple for Peruvians and Bolivians, in the west, quinoa was found only in

specialty whole food stores. Westerners struggled to pronounce the name, yet it was promoted by food lovers as a novel addition to the familiar ranks of rice and now teff. Dieticians advocated quinoa because it fitted in with government's healthy eating advice to eat whole grains with meals or as a snack and to *make at least half your grains whole* (USDA, 2015).

Quinoa was marketed as the *miracle grain* of the Andes. Quinoa went global, and international sales soared (Perez, Nicklin, and Paz, 2011). However, increasing demand for healthy foods or good energy sources can have unfortunate consequences. The demand for quinoa pushed up prices, and now this ancient grain is too expensive for the rural poor Andean residents, who have traditionally relied on it as a nourishing staple food of their diet, and can no longer afford to eat it (Perez, et al., 2011). *The Guardian* reports the price has tripled since 2006, and that world-wide interest in quinoa means that it "now costs more than chicken" in places like Lima, Peru, with imported, less nutritious food being cheaper (Collins, 2013).

Traditionally, quinoa grain, like teff, was grown and made into flour, with which different types of breads were baked (Whole Grains Council, 2015). Today, quinoa plays an important part in gourmet and everyday kitchens. Further, its use has been extended to the cosmetic, pharmaceutical and industrial areas (FAO, 2013).

Currently, almost all the quinoa production is in the hands of small farmers and associations (Perez, et al., 2011). Quinoa can be found growing natively in all countries of the Andean region, from Colombia to the north of Argentina and the south of Chile. The main producing countries are Bolivia, Peru and the United States. However, fueled by western demand, the pressure is on to turn land that once produced a portfolio of diverse crops into a quinoa monoculture (Perez, et al., 2011).

Like teff, the cultivation of quinoa has transcended continental boundaries: it is being cultivated in France, England, Sweden, Denmark, Holland and Italy. In the United States it is being grown in Colorado and Nevada, and in Canada in the fields of Ontario (FAO, 2013). In Kenya and Mali, quinoa has shown high yields. In the Himalayas and the plains of northern India, the crop has also developed successfully. According to the Director-General, initial FAO studies indicate that quinoa production could also be developed in the Sahel, Yemen and other arid regions of the world (FAO, 2013).

However, Blythman (2013) wrote “the quinoa trade is also seen as an example of a damaging north-south exchange, with well-intentioned health conscious consumers of the north unwittingly driving poverty in the south” (Blythman, 2013). This is a cautionary tale of how a focus on exporting indigenous ancient foods staples can harm the producer country's food and nutrition security.

On the other hand, in light of climate change and the challenge of increasing the production of quality food to feed the world's increasing population, quinoa is now being promoted as an alternative for those countries suffering from food insecurity (FAO, 2013). In celebration of this ancient grain, and as an effort to promote quinoa as part of a broader FAO strategy to promote traditional or forgotten crops as a means to combat hunger and promote healthy eating, the United Nations General Assembly declared 2013 as the "International Year of Quinoa" (FAO, 2013).

Alluding to quinoa's unique nutritional characteristics and adaptability, FAO Director-General José Graziano da Silva stated that quinoa can play an important role in eradicating hunger, malnutrition and poverty on a global basis (FAO, 2013). Graziano da Silva said:

The International Year of Quinoa will serve not only to stimulate the development of the crop worldwide, but also as recognition that the challenges of the modern world can be confronted by calling on the accumulated knowledge of our ancestors and the small family farmers who currently are the major producers of the crop (FAO, 2013).

UN Secretary-General Ban Ki-moon went on to say that, "This extraordinary grain has been a cultural anchor and a staple in the diet of millions of people throughout the Andes for thousands of years. Quinoa is now poised for global recognition" (FAO, 2013). Unlike the former president of Ethiopia, who instituted an export ban on Ethiopian teff to protect the domestic consumers of its ancient grain, the Bolivian president supports the FAO goal to promote quinoa production and consumption globally. President Morales said, "Quinoa is an ancestral gift (to the world) of the Andean people," highlighting the important role of indigenous people as custodians of the crop for more than 7000 years (FAO, 2013).

2.6.2 The Problem with Rice

Rice is another treasured ancient grain that has become a problematic export for local farmers. Like teff, it can drive economic destruction and negatively impact domestic food and nutrition security. Its global footprint predates both quinoa and teff. Rice is a traditional Chinese food, which first was cultivated in Asian countries and has been grown around the world for thousands of years (Bhattacharjee and Quijano, 2007). It is the staple food for three billion people, most of them in Asia.

Rice, throughout history, has been one of man's most important foods. Rice has fed more people over a longer period of time than any other crop. Today, this unique grain helps sustain two-thirds of the world's population (Bhattacharjee and Quijano, 2007). Rice is one of the three leading crops in the world and has a variety of uses. People have used rice to make snacks,

desserts, main courses, alcoholic beverages and special foods for religious ceremonies. The first documented account of rice cultivation is found in a decree on rice planting authorized by a Chinese emperor about 2,800 BC. From China to ancient Greece, from Persia to the Nile Delta, rice migrated across the continents, eventually finding its way to the Western Hemisphere, and is now grown on all continents except Antarctica (Normile, 2008).

Rice is part of the culture and daily lives of its producers and consumers alike. But today, rice has become a burden to grow for many farmers in Asia. Bhattacharjee and Quijano (2007) assert that the local way of life is disappearing as farmers and communities, who once nurtured age-old cultivation methods and rice varieties, are losing out to agri-businesses that are spreading their reach through globalization, following the international path seemingly now taken by both quinoa and teff.

Like teff, due to its versatility, rice could be taken to many parts of the world. It is able to grow in the desert conditions of Saudi Arabia, in the wetland deltas of Southeast Asia and in the flooded rice plains of the United States. From its meager beginnings in South Carolina, rice has become a major U.S. agricultural product. Nearly 90 percent of the rice consumed in the United States today is produced within its borders. Presently, the United States is the worlds most advanced and innovative rice producer. The United States is also one of the largest exporters of rice in the world, and is respected worldwide for its abundant production of high-quality rice.

In terms of caloric value and value of production, rice is the most important crop in the world. For 3.3 billion people living in Asia, rice provides 35-80% of their total calorie intake (Bhattacharjee and Quijano, 2007). Although rice provides some nutritional value, such as protein, minerals, vitamins, and fiber, it does not provide enough nutrition to be a main source of

food. Brown rice has more nutritional value than white rice, and like teff, can be stored indefinitely, if it is stored in a cool, dry area. However, unlike teff, neither brown nor white rice provides the nutritional value that teff could provide.

2.7 The Global Golden Grain Market and Food Security

From a marketing point of view, globalization presents opportunities and challenges for world population to interact and interchange with technological innovations, such as new agricultural technologies for grains, which allow cultivation of various grains in different regions with adverse climate or soil conditions. The new technology of select grain variety cultivation could potentially give less developed countries an unprecedented opportunity *to jump through* the initial stages of development.

From rice to quinoa, and now teff, the axis of the health conscious shopping list is heavily skewed to the global market. These ancient grains are now in high demand in the western markets. In the case of rice, quinoa, teff and other ancient grains, there's an irony when the poor peasant's staple grain becomes too expensive at home because it has acquired hero-product status among affluent foreigners preoccupied with personal health. Viewed through a lens of food security, the current enthusiasm for ancient grains looks increasingly misplaced. As global demand grows, quinoa and teff prices climb as cultivation expands to new frontiers and pressures on productive resources increase, the traditional custodians of these *golden grains* face an uncertain future.

Chapter 3: Ethiopian Cereal Policies and Teff

3.1 Ethiopian Cereal Market and Government Policies

Utilizing the Economic and Social Development (ESD) conceptual framework on trade reforms and food security, this section traces the effects of the different Ethiopian government cereal market policies and the associated effect on food security in Ethiopia. The Ethiopian cereal markets have undergone dramatic changes throughout the past several decades. These shifts reflect the basic positions of successive governments, from the feudalistic system of the 1960s and the early 1970s, to the socialist state interventions under the Derg regime, to an extended period of progress and major developments in Ethiopia's infrastructure. This shift was accompanied by considerable liberalization of the cereal market in 1991, under the Ethiopian People's Revolutionary Democratic Front (EPRDF), Zenawi- led government, leading to the emergence of the mixed-method approach of the current government. These policy shifts highlight changes in the role of the state and their effects on food security, which shaped the structure of Ethiopian cereal markets over time outlined by Rashid and Negassa (2011) as follows:

3.1.1 The Imperial Era: 1960-1974

Ethiopia's cereal markets under Emperor Haile Selassie in the 1960s were characterized by a high share of marketed cereals in total production, limited government intervention, and very high transport costs because of the minimal road and telecommunications infrastructure.

The government established the Ethiopian Grain Council (EGC) in 1960 with the goal of stabilizing grain prices, particularly in urban areas, and for improving production of cereals for

export. However, the EGC was ineffective and the policies did little to support the local grain growing community and did not contribute toward the development of inter-regional grain trade.

3.1.2 The Derg Regime and State Controlled Markets: 1975-1990

The Derg socialist government of Ethiopia from 1975 – 1990 nationalized the cereal market and subsequently reorganized the industry into a state-owned corporation. Consistent with its ideology, the government instituted a wide range of controls over all grain production and marketing. These included annual quotas, restrictions on private grain trade and inter-regional grain trade, set days on which the local markets were to be held, and rationing of grain to urban consumers. The administration set wholesale prices of cereals for many local and regional markets between 1976 and the late 1980s.

The government established the Agricultural Marketing Corporation (AMC) in 1976 to procure grain for public distribution and price stabilization. The AMC concentrated on cereal procurement in the major grain producing regions, instituting delivery quotas that badly affected small farmers, as the quotas often overlooked the production constraints and consumption requirements of the poor. Farmers allegedly had to buy from the market in order to meet the quota requirement. According to Tadesse and Shively (2009), the forced quota delivery at a fixed price had other negative impacts on farmers by reducing their production and incomes, thus promoting the marketing of inferior produce, increasing farmers' dependence on local markets, and decreasing regional grain market integration.

Government restrictions also hindered trading. While governmental authorities allowed grain traders to operate, they had to sell a significant proportion of their purchases to the AMC at substantially lower prices than open market prices for both purchases from farmers and sales to

consumers. Regional governments also considerably impeded inter-regional grain trade. In some regions, the government completely banned the private sector from participating in the grain trade market.

3.1.3 Private Trade Reform: 1991-2009

After the overthrow of the Derg regime in May 1991, new food policies were instituted. Various economic reform programs, including major cereal market reforms were launched. As part of the reorganization that began in 1992, the government restructured the AMC as a public enterprise and allowed it to operate in the open market in competition with the private sector, changing the agency's name to Ethiopian Grain Trade Enterprise (EGTE).

The government issued new mandates aimed at stabilizing cereal prices, with the goal of increasing production and protecting consumers from price shocks, earning foreign exchange through exporting grains to the global market and maintaining strategic food reserves for disaster response and emergency food security operations (Tadesse and Shively, 2009).

However, the EGTE was unable to fulfill these mandates, which eventually led to a loss of policy credibility and ultimately a decline in farmer's confidence. This led to a series of proclamations and regulations from 1999 - 2000 that revised the EGTE's mandates significantly. These proclamations required the EGTE to gradually move away from price stabilization and instead to focus on promoting exports, facilitating emergency food security reserves, with the primary focus on being national disaster prevention (Tadesse and Shively, 2009).

3.2 Ethiopia's Challenges to sustain its Producers and Consumers

The conflict between supporting producers and consumers in food policy is not a new phenomenon. In the past, governments have struggled to design policies that promote improved livelihoods and quality of life for their poorest citizens while simultaneously improving the country's economy, but this is not an easy task. Designing and implementing policies that address agricultural development of a country that supports both producers and consumers is an ongoing challenge, and one that is particularly relevant in Ethiopia today, as the country struggles to meet the development goals set forth in the government's Growth and Transformation Plan (GTP). Developed by the Ethiopian government, the GTP is a national five year strategic framework to improve the country's economy by achieving a projected GDP growth of 11-15% per year for the agricultural sector from 2011 to 2015. According to the Development and Assistance Group (DAG) (2015), the plan includes details of the cost (estimated at US\$75–79 billion over the five years) and specific targets the government expects to attain by pursuing the following objectives:

- Enhance productivity and production of smallholder farmers and pastoralists
- Strengthen marketing systems
- Improve participation and engagement of the private sector
- Expand the amount of land under irrigation
- Reduce the number of chronically food-insecure households

Given the context of Ethiopia's historical experience of famines, the Late Prime Minister Meles Zenawi, who was a strong advocate for agricultural development, declared food security for Ethiopia as one of his primary goals (USAID, 2012). With the importance of teff in Ethiopian

history, culture, diet and its nutritional relevance, it is not surprising that teff has entered into Ethiopia's national policy. In January 2006, Zenawi enacted a policy that banned the export of teff grain and teff flour. While interpretations of the motivations behind the ban vary, consensus largely shows that the primary goal of the teff export ban was to increase teff production in order to address domestic food security and to ensure that this highly nutritious grain continued to meet domestic demand. However, as previously noted, the export ban did not affect the export of bread made from teff.

Chapter 4: Consequences of Ethiopian Food Policy Choices

4.1 Ethiopian Food Policy Choices

In considering the different policy options that directly or indirectly impact on food security in Ethiopia, I acknowledge the complexities of the challenges faced by Ethiopia as a poor, net food-importing country (Guha-Khasnobis, Acharya and Davis, 2007; United Nations, 2013; Valdés and Foster, 2012). The Ethiopian government has a wide range of policy objectives, which include consumer welfare protection, as follows:

- small farmer income creation
- revenue generation
- price stability
- increased food self-reliance
- food security
- improved nutrition
- regional development (Ethiopian Government Portal, 2012)

Unfortunately, these objectives often conflict and governments realize that their policy making instruments are not sufficient to achieve them all. Vesal (1999) points out that the Ethiopian government considers policy choice as the outcome of collective participation of the people; however, some opposition factions consider the government-implemented policies as impositions of the Ethiopian People's Democratic Front (EPRDF), which has been ruling the country since 1991, motivated by party agenda, power, and/or special interest groups (Vaughan, 2003).

Accusations abound against Ethiopia's current political leadership, which tends to promote a food policy and governance agenda that does not threaten its position of power in the country and includes the following:

- Use (political appropriation) of public programs, including poverty alleviation, food safety nets and education, international food and development aid, at different levels of the government, with the aim of entrenching single-party rule and discriminating against opposition voices.
- Restricting opposition parties' access to funding (both public and international), media, office space, and key democratic processes such as appointment to the National Electoral Board.
- Imposing the political control over local village councils and small farmers themselves, including through the army, secret police and the withholding of basic benefits such as food aid (Medrek, 2011).

Indeed, some go beyond the above assertions and further assert that food security is undermined when government policies favor distribution of food that follows ethnic lines and political affiliations (Medrek, 2011).

When faced with the threat of food shortages, there is a strong tendency for governments to impose export bans in reaction to potential food price increases or shortages in their own country (AMIS, 2011; Bigman, 1985; FAO, 2011; Gilbert, 2012). However, it has been shown that this is a poor strategy for managing domestic food prices, and has a range of unintended consequences. Both the short term and long term impacts of food policy designs affect the domestic and international economies, including market exclusion, short and long term price increases, decreased profits, decreased production and global food price inflation.

Ethiopia's decision to impose a ban on teff did not escape this scenario. This food policy decision comes at a large opportunity cost for Ethiopia as it continues to limit its involvement in the global cereal market. In particular, this ban seems to favor the needs of Ethiopian's consumers over its smallholder farmers, who could stand to gain significantly from engagement in the international teff trade. However, the export ban does not apply to Ethiopian bread bakers who are allowed to export teff in the form of processed *injera*.

4.2 Potential Consequences of the 2006 Teff Export Ban

There are many advantages and disadvantages with regard to the 2006 teff export ban in Ethiopia. The highly nutritious nature of teff, many experts believe, plays a vital role in promoting good nutrition for the average Ethiopian. In particular, the consumption of *injera* contributes to the prevention of many diseases and conditions that can often result from an unbalanced diet, including anemia, obesity, osteoporosis, and diabetes.

4.2.1 Teff Export Ban: Advantages

The advantages of keeping an export ban on teff in place to favor Ethiopian consumers and protect smallholder farmers, in certain respects, are significant. One of the advantages of keeping the ban in place is that it signals that domestic food security is the Government of Ethiopia's key priority. More importantly, it communicates to the country and to the world that Ethiopia is focusing its priorities on food and nutrition security by supporting its poor consumers, for whom affordability and availability of teff is almost a non-negotiable aspect of Ethiopian life. The export ban also discourages the manipulation of the local farmers by multinational companies' attempts to take control over the local farmers' seed supplies.

4.2.3 Teff Export Ban: Disadvantages

Teff is already unaffordable for many Ethiopians. Exporting Ethiopian teff could potentially undermine the claim that Ethiopia has made food security a top priority. Given existing concerns of inflation and rising commodity prices, a policy shift toward exporting Ethiopian teff could potentially result in increasing prices even further, making teff even more unaffordable in Ethiopia, thereby worsening conditions for Ethiopia's poorest economic class.

Exporting teff could contribute to increased malnutrition, as Ethiopians would be forced to switch to cheaper, less nutritious substitutes such as sorghum, barley, or wheat as a staple cereal in their diet. Already, the continued price increase of teff has forced many Ethiopians, primarily its rural and urban poor consumers and even teff smallholder farmers, to dilute teff *injera* with other cereals (table 4.2.1).

Table 4.2.1 Mixing Teff with other Cereals

	Unit	<u>Ethiopian Consumers</u>		
		Richest	Middle income	Poorest
Number of observations	Number	251	274	275
Consumers that blend teff with other cereals	%	14	39	55
Composition of flour				
Teff	%	93	84	76
Wheat-teff mix	%	0	0	0
Corn-teff mix	%	0	2	6
Other cereals-teff mix	%	7	14	24
Total	%	100	100	100

Source: Author's computations based on Addis Abba Food Retail Survey (2012); CSA (2013)

Additionally, enabling international export of Ethiopian teff grain could simply deplete domestic supply, if all or most of the domestic teff production was used to supply international demand. Opening the doors to international trade in teff would expose Ethiopia to additional risks. For example, land conflicts may arise as teff-producing areas would become increasingly valuable. A similar predicament faces Bolivia today, as exports of its indigenous *super food* quinoa have soared and have led to malnutrition and violence over land ownership.

One of the new sources of agricultural finance risks is speculation, which may cause added price volatility, and end up hurting Ethiopian smallholder teff farmers as well as teff consumers (Schanbacher, 2014). The teff export ban limits Ethiopia's exposure to international

trade risks; this in turn limits the vulnerability of Ethiopian teff smallholder farmers to price volatility. By allowing the export of teff grain, there is also a risk of bio-piracy, and Ethiopia would be more vulnerable to foreign national or multi-national companies' attempts to modify and patent its indigenous seed.

The Fridtjof Nansen Institute (FNI) investigated the disastrous effects of a 2005 agreement between the Ethiopian Institute of Biodiversity Conservation (IBC) and a Dutch company, HPFI, which provided access and benefit-sharing of Ethiopian teff varieties. The agreement gave HPFI access to 12 Ethiopian teff varieties, which would be used for exploring teff-based food product development that could be marketed to the European and United States food markets. In return for access to these genetic resources, HPFI was supposed to share both financial and other benefits with Ethiopia. FNI's report describes the unsatisfactory outcomes for Ethiopia of this agreement. Specifically, Ethiopia only received 4,000 USD in financial returns when HPFI went bankrupt. Subsequently, other companies set up by the same owners were able to continue to exploit the benefits of Ethiopia's genetic resources to their advantage without sharing further any of the economic returns with Ethiopia (Andersen and Winge, 2012).

4.3 Lifting the Teff Ban: National and International Potential

There is a growing global demand for teff, and other countries are capitalizing on this through the international trade of teff. Many countries around the world have begun to produce and export teff. The biggest international sellers of teff include: Canada, China, India, Netherlands, South Africa, United Kingdom, and the United States (FAO, 2013). While Ethiopia is the world's largest producer of teff by volume, because of the export ban, it cannot currently benefit from this trade by exporting its indigenous crop.

The ability to export teff could increase smallholder farmers' incomes as well as stimulate Ethiopia's agricultural development. In addition, involvement of international players in the teff market could serve to accelerate the development of what is now a relatively immature market. Domestic issues of teff's low yields and lack of significant value-added product development could be improved significantly (Demeke, et al, 2013).

Ethiopian smallholder farmers are constrained from the benefits of the ever increasing demand of the international teff market; however, the current teff export policy allows for international export of processed teff, largely in the form of ready-to-eat teff *injera*. According to Bekabil, et al., (2011), this oversight in the policy is intended to drive value-addition of teff products in Ethiopia. However, while the export of *injera* is increasing, it remains limited. For example, in 2011, the export volume for *injera* for Ethiopia was 1,800 metric tons (Bekabil, et al., 2011). This is 0.21% of the overall national teff market production (which is roughly 3.5 million tons) and represents only 56 million Ethiopian birr (which is roughly 3.1 million USD) of export revenue (Bekabil, et al., 2011).

Because teff has the highest market value among the cereals grown in Ethiopia, teff is also a source of cash income to the Ethiopian small farm households. By exploring opportunities to export teff grain, Ethiopia's GDP potentially stands to gain. Teff grain prices have increased annually by 12% from 2008 to 2010 (Bekabil, et al., 2011). This increased demand for teff is driven by domestic consumer preference for teff, population growth and international demand. The benefits that teff market suppliers reap from this price trend are a strong indication of the great economic potential of the international teff trade. If teff is traded internationally, global demand for teff will raise prices further and incentivize production increases, which will directly drive domestic economic growth (Rashid and Negassa, 2011). Exporting teff grain would

therefore increase export earnings, increase GDP, and help achieve the goals of Ethiopia's Growth and Transformation Plan. The rapid development anticipated by opening the market to export would also benefit smallholder farmers. Farmers' income could be significantly increased, as demonstrated by current teff international market prices. Thus, exporting teff could directly increase the income of farmers as well as benefitting the national teff market.

The current teff market is extremely underdeveloped, mainly due to fragmentation and price variability (Bekabil, et al., 2011; Rashid and Negassa, 2011). First, the market lacks large-scale processing or purchasing to capture economies of scale. For example, Mama Fresh Injera, one of few large-scale buyers, purchased only 0.12% of the market in 2012 (Bekabil, et al., 2011). Second, price volatility, caused by seasonal variation and a lack of standardization, negatively impacts farmer liquidity and consumer consumption patterns. Introducing international demand would drive efficiency through commoditization of teff (Bekabil, et al., 2011; Rashid and Negassa, 2011).

Finally, this commoditization of teff would be attained through the creation of large-scale activities that would be necessary to support exporting, such as processing, storage, and the addition of teff to the Ethiopian Commodity Exchange (Bekabil, et al., 2011). These changes would increase farmer profitability by lowering high production costs and would also indirectly benefit Ethiopian consumers through long-term price stabilization. Liberalizing the teff industry could potentially generate financial gains for smallholder farmers, and the market overall, through lower production costs and increased revenues from domestic sale and international export.

If Ethiopia were to reverse the export ban and allow teff grain to be exported, it is possible that farmers would benefit from higher international prices, there would be improved domestic availability of teff at affordable prices, and the Government of Ethiopia would receive additional export earnings. Regardless of the specific outcomes, lifting the ban would alleviate the lost opportunities incurred daily as Ethiopia limits its involvement in the international teff trade, particularly as other countries produce and export teff. Enabling teff grain export could help Ethiopia toward attain its goal of achieving food and nutrition security for its citizens. The question facing Ethiopia's political leadership today is whether or not the potential benefits of such a decision outweigh the dramatic potential risks and setbacks of a policy whose goal is to keep teff affordable and available at home.

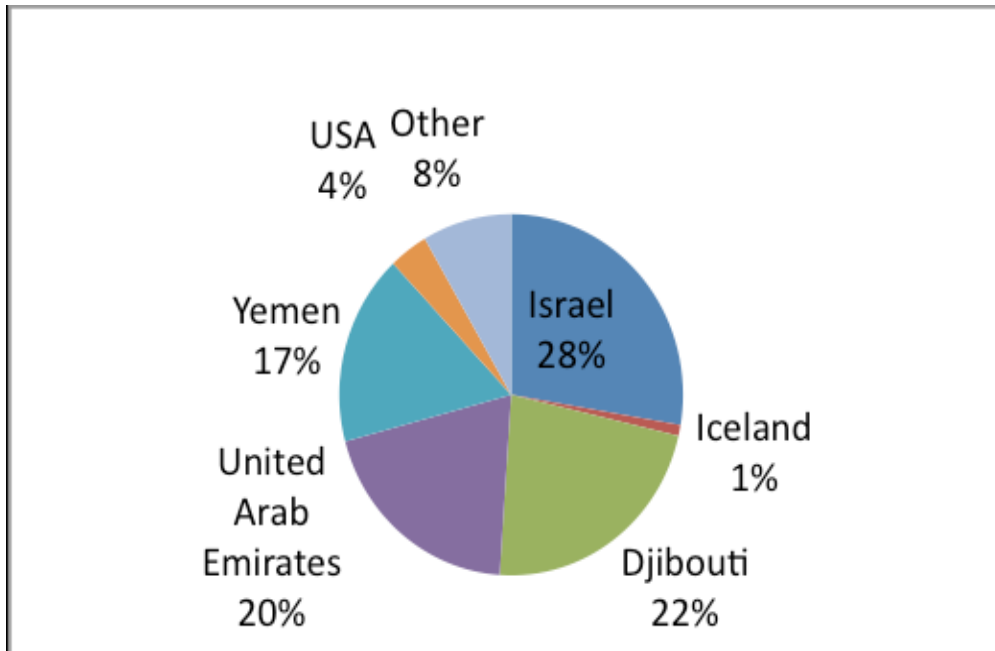
4.4 Teff Export Ban: The Reality

The export ban was meant to fight commodity price inflation that was taking place at an accelerated rate in Ethiopia. The stated objective of the teff export ban was to stabilize prices in the domestic market. Ironically, the ban did not bring down the price of teff. Since the export ban of teff, the domestic price of teff has continued to rise as domestic demand for teff outweighs domestic production (Rashid, 2010). It can be argued that this policy was in favor of Ethiopia's teff consumers, many who live in poverty as rural farmers and who find teff increasingly unaffordable (Bekabil, et al., 2011; Rashid and Negassa, 2011; USAID, 2012). However, it is clear that the Ethiopian teff export ban has not been totally successful in achieving its goals.

Since 2006, teff prices have continued to rise as domestic and international consumption and demand for teff continues to exceed domestic production and supply. Most ironic is that teff, as value added *injera*, continues to be ferried out of Ethiopia. Export of teff as *injera* is not

affected by the ban on teff grain and teff flour. During the period 2000-2010, teff *injera*, was exported to several countries to serve the international demands for teff *injera* as shown in figure 4.4.1.

Figure 4.4.1 Teff Export (as *injera*) by Destination (2000 to 2010)



Source: FAO (2013)

Because the government did not place a ban on the export of value added teff, as *injera*, it can be asserted that the export ban on teff has been basically ineffective in achieving the Ethiopian government's stated goal of ensuring food security for its citizens and protecting local teff markets. Basically, the export ban on teff has effectively prevented Ethiopian farmers from fully participating in the growing global trade of teff, while allowing Ethiopian bakers to fully benefit from the increasing international teff product trade.

The existing teff export ban is a situation burdened by complications and is rooted in deep historical significance. This is a clear example of the all-too-common tension that the

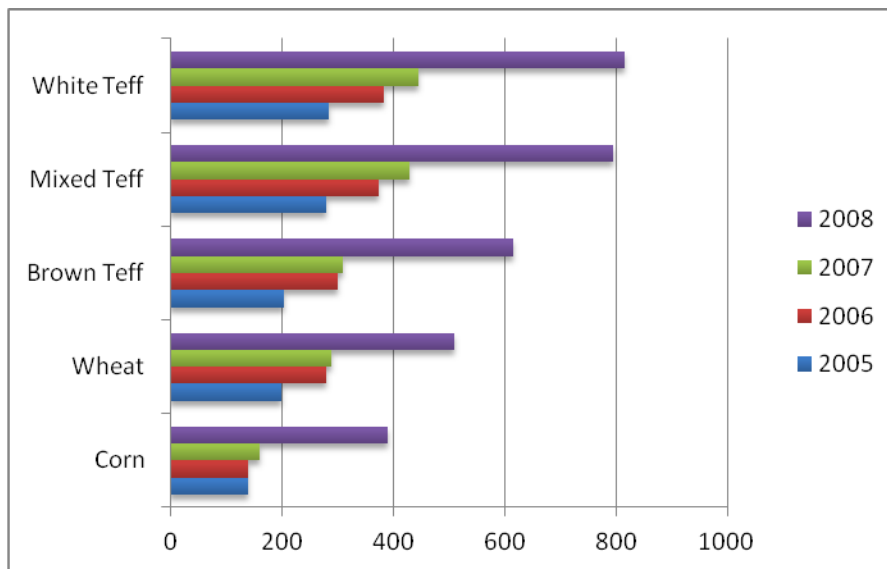
Ethiopian government has faced between providing for the needs of their poor consumers and supporting their food producers, many of whom are poor smallholder farmers, while addressing the needs of the local businesses. Ultimately, the case of teff export will be one of many tests facing Ethiopia's leadership. In order to drive agricultural growth in Ethiopia, its leadership must decide how it will proceed with regard to engaging the international agricultural sector. This decision will prove significant for the future of a rapidly developing, internationally appealing country such as Ethiopia. It will signal the manner in which national leadership intends to deal with other economic and political decisions regarding agricultural development, and will have significant impact on Ethiopia's mission to achieve its 2015 National Growth and Transformation Plan targets.

4.5 Teff Price Variability, Seasonality and Volatility: An Overview

Teff is the highest priced cereal grown in Ethiopia. Following the prevalence of high food price inflation in the country in 2008, the price of teff has also experienced a huge increase in recent years. White teff's price, for instance, on average has increased by 200% from 2005 to 2008. According to Rashid and Negassa (2011), the price of teff took off, starting in May and June of 2008 when wheat and corn prices also peaked.

Teff wholesale prices increased from Birr 593 per quintal in April, 2008 to Birr 810 per quintal in May, 2008 and then to Birr 931 per quintal in June of the same year (Rashid and Negassa, 2011). Since then, white teff has become a grain that fetches a higher price per quintal, although less per hectare (due to lesser yields) than wheat. Similar price increases were observed for mixed and brown teff (Rashid and Negassa, 2011).

Figure 4.5.1 Price Trends of Teff and other Staple Crops in Ethiopia (2005-2008)



Source: Authors compilation based on EGTE data

The price gap between white teff compared to mixed teff and brown teff has expanded from 7% and 30% in 2005 to 24% and 55%, respectively, in 2008. This implies a preference for white teff by consumers over mixed and brown teff. As shown in table 4.5.1, this indicates the existence of a strong consumer preference for white teff (Rashid and Negassa, 2011).

Table 4.5.1 Ethiopian Teff Variety Preference

Ethiopian Consumers				
	Unit	Richest	Middle income	Poorest
Number of observations	Number	251	274	275
Type of teff bought				
White	%	89	61	15
Mixed	%	4	32	62
Red-brown	%	7	7	23
Total	%	100	100	100

Source: Author's calculations from Addis Abba Food Retail Survey (2012); CSA (2013)

According to Rashid and Negassa (2011), seasonal teff price variability has two important implications. On the one hand, farmers are losing the potential income gain from higher market prices that exist during the lean season, often due to the fact that farmers have already sold out their stocks. On the other hand, the fact that teff prices are constantly changing also imposes high costs of purchase to consumers in certain seasons, affecting constant consumption patterns over the year.

In Ethiopia food prices have become more volatile since the global food crisis of 2007–2008. However, in his study on food price volatility in Africa, Minot (2012) reported that the price of teff was less volatile than other grains. He pointed out that the relatively low price volatility for teff is probably related to the fact that it is a drought-tolerant crop, as teff is primarily grown in the highlands of Ethiopia. Minot (2012) asserts the following:

The prices of tradable commodities are largely determined by international markets, although fluctuations in the exchange rate and trade policy also play a role. In contrast, volatility in the price of nontradable commodities is determined primarily by domestic supply-and-demand conditions, particularly weather-related fluctuations in supply (p. 11).

Minot's findings suggest that instability in international markets are not the main source of price volatility in Ethiopia and suggest that domestic factors play a larger role in price volatility. Since teff is a rain-fed crop, this could account for the price increases from season to season, as discussed above.

A key component in global food price volatility is the way governments react to disruptions in domestic supply (Taylor, 2005). Price volatility has a strong impact on food security because it affects household incomes and purchasing power (Tullis and Hollist, 1986). This is particularly true for poor households in Ethiopia because price volatility also interacts with domestic price levels to affect welfare, food and nutrition security and can transform vulnerable people into destitute and hungry people (Minot, 2012).

Price volatility contributes toward increasing both Ethiopian smallholder farmers and poor consumers vulnerability to poverty, and even more susceptible to food and nutrition insecurity. Because food represents a large share of Ethiopian farmer income and the budget of Ethiopian poor consumers, large price changes have big effects on real incomes (Tullis and Hollist, 1986). Thus, even short episodes of high teff prices for consumers or low teff prices for farmers can cause production to be sold at low prices, contributing to potential poverty traps for Ethiopians.

4.6 Maximizing the Teff Value Chain

Basically, a value chain is defined as the full range of activities which are required to bring a product or service from idea phase conception, through the different phases of production (involving a combination of physical transformation and the input of various producer services), to deliver a product or service to the consumer; this concept was developed by Michael Porter in his 1980 book *Competitive Advantage* (The Economic Times, 2015). The conception of the teff value chain is based on the process of seeing an agricultural operation as a system, consisting of subsystems each with inputs, transformation processes and outputs that involve the acquisition and consumption of resources such as money, labor, materials, equipment, buildings, land, administration and management (Kaplinsky and Morris, 2000). According Bekabil, et al., (2011), adopting a “‘value chain approach’ to economic development helps to address the major constraints faced by the sector/business under consideration and use opportunities available at multiple levels along the value chain” (p.5). This model works on both the domestic and international levels (Gurría, 2012).

In their study, Bekabil et al. (2011) identified six key components of the teff value chain. Their assessment of the current state of each phase revealed the need for a strategic approach to maximizing the entire value chain:

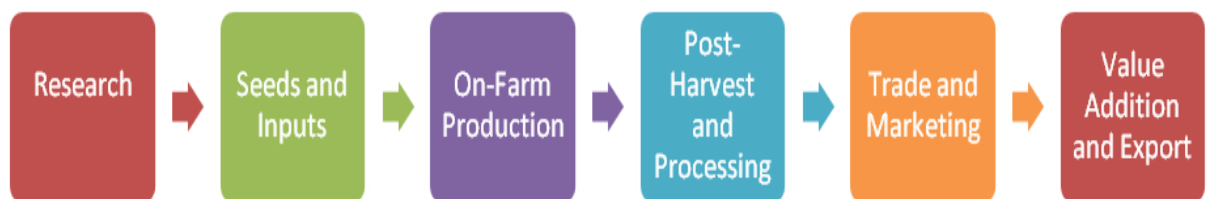
- **Research and breeding:** Teff has been under-resourced relative to other crops. Breeders have developed improved varieties, but the implementation of these varieties has been limited. Little research on teff outside of these improvements.
- **Seeds and inputs:** Few farmers apply improved seeds, but over half use at least some fertilizer and herbicide to raise yields, allowing yields to rise from around 8qtl/ha ten years ago to around 12 qtl/ha now.
- **Production practices:** Given its nature to be drought-resistant and adapted to a wide range of agro-ecological conditions. Teff, (as a crop) is popular among

farmers, however, when grown under the current traditional management practices, teff is a labor-intensive crop because of the high rates of cultivation and weeding required.

- **Harvest and processing:** Traditional harvesting and threshing practices lead to high pre- and post-harvest loss rates, thereby reducing the grain yield per hectare and the quantity available to consumers.
- **Trade and marketing:** The teff value chain is fragmented and involves many players. Most farmers sell to assemblers individually, who then sell on to traders and wholesalers. Most teff is sold at harvest when prices are low.
- **Value addition and export:** Most teff is bought as grain, milled and made into *injera*; further value addition and export opportunities are limited as processing teff grain into flour and *injera* is currently limited to a small number of urban processors. The nutritionally rich nature of teff has not been explored for the latent potential as an industrial crop. Likewise, an export ban is in place in order to avoid raising the domestic consumer prices further (p. 2).

Agriculture is a major contributor to the national economy of Ethiopia, representing 41% of Ethiopia's GDP. The teff value chain is of vital importance, as the grain sector comprises a large part of the agricultural sector.

Figure 4.6.1 Teff Value Chain



Source: Adapted from Bekabil et al., (2011)

Teff is one of the most important cereal crops of Ethiopia, both in terms of food and nutrition security and preference, and there are many reasons to focus agricultural development on the teff value chain outlined by Bultosa, Hall and Taylor (2002) as follows:

- Enhance the sustainability of the teff production process to increase the income of over 6 million smallholder farmers and so that the future potential of teff production in Ethiopia remains fruitful and intact.
- Improve the availability of teff grain and teff-related products so that Ethiopian consumers, both urban and rural dwellers, can benefit from additional consumption of a highly-nutritious, culturally significant grain.
- Create local economic multipliers resulting from increased teff-based employment that benefits the local economy through production and marketing activities.
- Develop and strengthen teff value-addition opportunities by making different products teff can be used in innumerable food products and every product that is normally made from wheat can be made with teff (2002).

For example, investment in mechanized threshers would reduce grain loss incurred from traditional post-harvesting processes and value addition opportunities for teff should be increased, both by expanding the existing commercial production of flour and *injera*, as well as developing new teff-based products in the food industry and opening up the export markets. These steps would develop systematic demand and lengthen the teff value chain (Bekabil et al., 2011).

Ethiopian efforts to improve grain production technologies have, for some food grain crops such as corn, produced significant results. So, it can be reasonably asserted that the increase of national production through investment and advances in teff grain technology should potentially increase the availability of this grain at the domestic household level, thus increasing food and nutritional security, as well as meeting the international market demands.

4.7 Research Results

This study found that while there was no profound effect on food security with the replacement of teff with wheat, the negative aspects of this replacement in terms of specific health components as it relates to the nutrition security of Ethiopians in Ethiopia are implicated. Based on nationwide Ethiopian cereal consumption, using 2550 kilocalorie per day adult equivalent as the benchmark to classify food and nutrition security in Ethiopia, isolating for teff and wheat, the results are shown in table 4.7.3 as follows:

Table 4.7.3 Food and Nutrition Security Status in Ethiopia: 2005-2007

Elements	2005 Before export ban	January 6, 2006 Export ban instituted	January 6, 2007 End date of analysis
Food and nutrition security status	1303	1298	1346
Teff	*255 (20%)	252 (19%)	257 (19%)
Wheat	*325 (25%)	290 (22%)	288 (21%)

Note: *Pre-ban baseline

Source: Authors computations based on various data sets: FAOStat. (2012); RPP (2015); HICES (2011)

Using 2005 data as the baseline, teff and wheat contributions and the overall caloric consumption remained basically unchanged for the first year of the teff export ban. The expected increase in domestic availability and consumption of Ethiopian teff failed to materialize after the ban was implemented. This was most likely due to increased international demand for teff, which increased prices, making teff less affordable in Ethiopia. Adding to the stagnation was the fact that teff was still being exported out of Ethiopia as value-added injera, which was not affected by the export ban of teff.

Compositionally, cereals consist of 12-14 percent water, 65-75 percent carbohydrates, 2-6 percent lipids and 7-12 percent protein. Most cereals are quite similar in gross composition being low in protein and high in carbohydrates. Further, it has been shown that the micro- and macronutrients level of teff grain is higher, than that of wheat, as shown in tables 4.7.1 and 4.7.2.

Table 4.7.1 Average Chemical Composition of Teff Grain

Parameter	Mean ±*SD
Moisture content/%db	11.83±0.07
Protein (N×6.25)/%	10.73±0.06
Ash/%	2.93±0.08
Fat/%	3.07±0.03
**Carbohydrate/%	71.441±0.09
Thousand grain weight (TGW)/g	0.33±0.01
Length/mm	1.08±0.11
Width/mm	0.63±0.11

Note: *Standard deviation, **Calculated by difference

Source: Authors computations based on data Mengesha (1966); USDA (2015)

However, the chemical components of cereals are not uniformly distributed in the grain. Usually, the hulls and bran are high in cellulose and ash. The bran, endosperm and germ vary in the levels of starch, protein, fat and ash. Cell walls are the main components of dietary fiber. It has been shown that fiber plays a beneficial role in health and disease. Dietary fiber absorbs water and provides roughage for the bowels, assisting intestinal elimination. The crude fiber content of cereals varies a great deal. Teff provides about 32 percent of the USDA recommended Daily Value (DV) of fiber, whereas wheat provides a minimal amount.

Overall, teff and wheat grains are comparable in nutrition with notable exceptions in that teff contains significantly more fiber, calcium and iron than wheat. In fact, iron content of teff is about 2-3 times that of wheat. Iron deficiency anemia, due to low consumption of foods high in iron, is a widespread public health problem in Ethiopia with more than half of children under five and more than a quarter of women are anemic. There have been some studies that implicate a correlation between teff consumption and the low rates of anemia in the highlands of Ethiopia. However further research is needed to confirm these claims.

Table 4.7.2 Average Chemical Composition of Durum Wheat Grain

Parameter	Mean ±*SD
Moisture content/%db	12.65±0.50
Protein (N×6.25)/%	12.55±1.69
Ash/%	1.45±0.70
Fat/%	2.07±0.37
**Carbohydrate/%	72.05±1.34
Thousand grain weight (TGW)/g	43±2
Length/mm	7.42±0.23
Width/mm	2.98±0.12

Note: *Standard deviation, **Calculated by difference

Source: Authors computations based on data Abebe, et al., (2011); FAO (2008);(Mengesha (1966); USDA (2015);

Teff is also gluten-free. Teff is naturally disease and pest resistant. Even though teff is a rich source of nutrients and essential amino acids, it is also a relatively expensive grain when compared to wheat in Ethiopia.

Wheat has more protein than teff grain and less fat. However, wheat has more carbohydrates than teff and contains gluten. The glycemic index is a measure of the impact of a

food on the glucose levels in the blood. Foods with a high glycemic index are implicated in Type II diabetes. Wheat has a higher glycemic index compared to teff.

Chapter 5: Summary and Conclusion

Historically, government policies during the Derg regime along with international food aid during the famine, Ethiopian diasporic communities, and international demand of teff have all contributed to the transformation of Ethiopian consumption and distribution patterns of teff in Ethiopia. Both urban and rural populations have shifted to greater consumption of lower priced corn and wheat (especially in the form of food aid), making significant contributions to food security in the country. More recently, international publicity and marketing campaigns promoting the health benefits of teff have led to increased demand globally, pushing up domestic prices and leading to the decline of teff consumption in Ethiopia.

A primary focus of this paper is the replacement of Ethiopian teff consumption in Ethiopia, primarily by food aid, such as wheat. It also points out the issues with the process of globalization in regards to food and nutrition security concerning other ancient grains. A glance at a western shopping cart demonstrates a higher dependency on food products imported from faraway places. As the food miles that products must travel to fill our carts increases, there is more need to strengthen our own food security by lessening the reliance on imported foods, and looking first and foremost to what can be grown locally as being a step in the right direction.

Although the government has put a ban on the export of teff grain and teff flour in an effort to protect local markets, *injera* is still being exported to the international community to meet global niche market demands and the local farmers are not directly benefiting from this market and food and nutrition insecurity remain chronic issues facing the country. However, the elements which are transforming the consumption and distribution of teff from a staple, once endemic to Ethiopia, into a highly revered and sought after international super-food, could also

be beneficial to the Ethiopian economy and contribute toward food and nutrition security in the country.

Ethiopia faces food and nutrition security issues, but not because the country's population is growing faster than its potential to produce food. Food production in Ethiopia is vastly less than the country's known potential. Ethiopian farmers still use antiquated farming techniques; fertilizer use is negligible; only 4 percent of the cropland has been improved with irrigation; and most of the country's cropped area is not planted with seeds improved through scientific plant breeding, so teff yields are only a fraction of what they could be. Ethiopia is failing to keep up with population growth not because it has exhausted its potential, but instead because too little has been invested in reaching that potential.

Without an international export market of teff grain and teff flour, the Ethiopian farmers are not able to benefit from this growing market, and the industry is not getting the capital it needs to become more efficient. Instead of relying on international food aid staples to mitigate food in-security issues, Ethiopia should focus on improving methods of producing its primary staple teff.

The Ethiopian government, which has accorded attention to teff for purely domestic food security reasons, must now expand its horizons and poise the country to take advantage of the emerging global opportunities of this crop. The country will need to invest heavily in research into teff, with the aim of improving its yield and to disseminate this knowledge and new technology to Ethiopian farmers. Where possible, Ethiopia should also incentivize major increases in teff production using market forces. Given rising food and commodity prices, the Government of Ethiopia currently has restrictions on the export of teff. While this may be the

right measure in the short run and appropriate in order to stabilize the crop's price for millions of Ethiopians, it is not the solution for long term economic progress and food and nutrition security in Ethiopia. I conclude that the only lasting solution is for Ethiopia to focus on improving methods of producing teff by promoting investment in the domestic teff industry and lifting the 2006 ban on teff in order to provide price incentives to farmers to produce much more teff and take advantage of the growing international teff market.

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Appendix A: Teff and Wheat Nutrition Comparison

Nutrient	Unit	Teff		Durum Wheat	
		Value per 100 g	%DV	Value per 100 g	%DV
Proximates					
Water	g	8.82		10.94	
Energy	kcal	367		339	
Protein	g	13.3	26.6	13.68	26.7
Total lipid (fat)	g	2.38		2.47	
Ash	g	2.37		1.78	
Carbohydrate, by difference	g	73.13		71.13	
Fiber, total dietary	g	8	32.3	-	-
Sugars, total	g	1.84		-	
Starch	g	36.56		-	
Minerals					
Calcium, Ca	mg	180	18.2	34	3.6
Iron, Fe	mg	7.63	42.7	3.52	19.8
Magnesium, Mg	mg	184	46.4	144	35.9
Phosphorus, P	mg	429	43.2	508	51
Potassium, K	mg	427	12.5	431	12.5
Sodium, Na	mg	12	1	2	0
Zinc, Zn	mg	3.63	24.5	4.16	27.6
Copper, Cu	mg	0.81	40.6	0.553	27.6
Manganese, Mn	mg	9.24	464.6	3.012	150.5
Selenium, Se	µg	4.4	6.3	89.4	127.6
Vitamins					
Thiamin	mg	0.39	26	0.419	28.1
Riboflavin	mg	0.27	16.1	0.121	7.3
Niacin	mg	3.363	16.7	6.738	33.9
Pantothenic acid	mg	0.942	9.4	0.935	0.4
Vitamin B-6	mg	0.482	24.5	0.419	20.8
Vitamin A, IU	IU	9		0	
Lipids					
Fatty acids, total saturated	g	0.449		0.454	
Fatty acids, total monounsaturated	g	0.589		0.344	
Fatty acids, total polyunsaturated	g	1.071		0.978	
Amino Acids					
Tryptophan	g	0.139		0.176	
Threonine	g	0.51		0.366	
Isoleucine	g	0.501		0.533	
Leucine	g	1.068		0.934	
Lysine	g	0.376		0.303	
Methionine	g	0.428		0.221	
Phenylalanine	g	0.698		0.681	
Valine	g	0.686		0.594	
Histidine	g	0.301		0.322	

Source: USDA National Nutrient Database for Standard Reference (2015)

Appendix B: Structural Changes in Ethiopian Cereals Markets since the 1960s

Indicators	1961-1974 Imperial Regime	1975-1980 Transition period	1980-1990 State controlled	1991-2000 Liberalization	2000-08 Rapid Growth
Cereal Production ('000 tons)	4,641	4,527	5,601	7,056	10,672
Marketed as % of Production	25% ^[i]	11% ^[ii]	19% ^[iii]	25% ^[iv]	28%
Public Market Share %	10% ^[v]	57% ^[vi]	40% ^[vii]	4%	2%
Marketed ('000 tons)	1,160	498	1,064	1,764	3,000
Public sector ('000 tons)	116	286	426	71	56 ^[viii]
Population (millions)	28	36	43	58	77
Marketed (kgs/capita)	41	14	25	31	39
Source of Market Supplies	Small farm rents to landlords	Collapse of markets after land reform	Compulsory quota for all market	Liberalization; increasing trade	Liberalized market; private trade
% of farmers owing less than two hectares of land	--	--	75%	70%	54%
Government intervention and price stabilization	--	--	Yes	Yes	only during the food crisis
Key market actors	Private sector limited	AMC declining private sector	AMC, limited private trade	EGTE, traders; growing processing	EGTE, traders, co-ops, ECX, processors

Notes: [i] Estimates for 1977-1978, from Ghose 1985, 136, assuming 40 percent of the cereal crop area under tenancy with rents equal to 50 percent plus additional 5 percent to account for sales by other farmers.

[ii] Estimate is from the Ministry of Agriculture cited by Ghose 1985 (excludes Tigray and Eritrea).

[iii] Peasant farmers accounted for 84 percent of total cereal market and private sales are 60 percent of the market in 1981-1981 (Ghose, 1985). Thus, peasant sales to AMC are equal to 24 percent (84-60 percent) of the market or of the total market or 29 percent (24/84 percent) of the total peasant cereal market sales. Given that AMC smallholder sales were on average 4.4 percent of total smallholder production (Alemayehu Seyoum PhD thesis), total smallholder sales are 4.4/29 percent = 17 percent, and the total market surplus is 17/84 percent = 19 percent of production.

[iv] 1995-1996 estimates are from Negassa, Myers and Jayne 1997, p.24)

[v] 1974-1975 estimates are from Holmberg 1977, p.9.

[vi] 1978-1980 AMC estimates cited in Dadi et al., 1992, p. 213.

[vii] 1981-1982 estimates from Ghose, 1985, p. 137.

[viii] Average cereal purchase by the EGTE from 2004-2005 to 2007-2008

Appendix C: Chronology of Government Grain Market Interventions 1950-2007

Proclamation/Notice/Regulation No. and Year	Relevant institution directly affected	Stated objectives of policy interventions
Ethiopian Grain Board Proclamation No. 113/1950	Ethiopian Grain Board (EGB)	To license grain export and control quality To oversee marketing intelligence To regulate domestic and export purchases and export sales prices
General Notice No. 267/1960	Ethiopian Grain Corporation (EGC)	To purchase and sell grain in the local and foreign markets To establish grain purchase and sales outlets throughout the country To hold stocks to stabilize prices
Agricultural Marketing Corporation Establishment Proclamation No. 105/1976	Agricultural Marketing Corporation (AMC)	To purchase agricultural products for export or sell in the domestic market To import agricultural products To purchase and sell inputs within Ethiopia or abroad To purchase, process, mill, transport, sell or store, agricultural products and inputs for profit or otherwise To construct, equip and maintain buildings, silos, storage facilities, grain elevators and other structures and machinery To maintain a national grain reserve
Agricultural Marketing Corporation Establishment Proclamation No. 105/1977	Agricultural Marketing Corporation (AMC)	To purchase agricultural products for export or sell in the domestic market To import agricultural products To purchase and sell inputs within Ethiopia or abroad To purchase, process, mill, transport, sell or store, agricultural products and inputs for profit or otherwise To construct, equip and maintain buildings, silos, storage facilities, grain elevators and other structures and machinery To maintain a national grain reserve

Warehouse receipts System Proclamation No. 372/2003	Warehouse Operators	---
Proclamation No. 380/2004	EGTE	The accountability of EGTE changes from the public enterprise authority to Ministry of Agriculture and Rural Development
Ethiopian Commodity Exchange Proclamation No. 550/2007	Ethiopian Commodity Exchange	To create an efficient, transparent, and orderly marketing system that serves the needs of buyers, sellers, and intermediaries and that promotes increased market participation of Ethiopian small scale producers To provide automated back office operation to record, monitor, and publicly disseminate information on Exchange transactions
Ethiopian Commodity Exchange Authority Proclamation No. 551/2007	Ethiopian Commodity Exchange	To ensure the development of an efficient modern trading system, and to regulate and control the secure, transparent and stable functioning of a Commodity Exchange and to protect the rights and benefits of sellers, buyers, intermediaries and the general public

Source: Rashid (2010)