

# Tea Prices and Household Consumption Patterns in Tanzania

Mamello A. Nchake

and

Threza L. Mtenga

*Research Paper 552*

AFRICAN ECONOMIC RESEARCH CONSORTIUM  
CONSORTIUM POUR LA RECHERCHE ÉCONOMIQUE EN AFRIQUE

# Tea Prices and Household Consumption Patterns in Tanzania

*By*

*Mamello A. Nchake*

*Stellenbosch University, Stellenbosch, South Africa*

*and*

*Threza L. Mtenga*

*Ministry of Development Planning and Investment, Tanzania*

AERC Research Paper 552  
African Economic Research Consortium  
February 2024

**THIS RESEARCH STUDY** was supported by a grant from the African Economic Research Consortium. The findings, opinions and recommendations are, however, those of the authors and do not necessarily reflect the views of the Consortium, its individual members or the AERC Secretariat.

Published by: The African Economic Research Consortium  
P.O. Box 62882 – City Square  
Nairobi 00200, Kenya

ISBN                    978-9966-61-257-1

© 2024, African Economic Research Consortium.

# Contents

List of tables	v
List of figures	vi
Abstract	vii
1. Introduction	1
2. Background and Evidence on Research Issue	5
3. Methodology	11
4. Descriptive Statistics	16
5. Results and Discussions	19
6. Conclusions and Policy Recommendations	25
Notes	27
References	28
Appendix	33

## List of tables

1	Tea production by geographical zone for harvesting seasons 2013/2014 – 2015/2016	6
2	Tea production by sector for harvesting seasons, 2013/2014–2015/2016	7
3	Distribution of data by gender of head of household	16
4	Distribution of data by location	16
5	Distribution of data by location and gender of head of household	17
6	Summary statistics for the period 2008/2009–2012/2013	17
7	Household unit tea prices and household consumption (2008/2009 – 2012/2013)	20
8	International tea prices and household consumption (2008/2009 – 2012/2013)	22
9	Tea prices and HH consumption by gender of the household head	23
10	Tea prices and HH consumption by location of households	24
A	Regions by period (2008/09 – 2012/13)	32
B	Variable description	32

## List of figures

1	Tea-producing areas in Tanzania	6
2	Tea production by district (July 2013–June2016)	7
3	Measurements of household level tea prices	12
4	International tea prices	12
5	Tea prices and HH consumption for tea growers	19

# Abstract

Tea production is a significant contributor to Tanzania's output and income. The country is a price taker in regional and international tea markets. This makes it vulnerable to price shocks, which can have a detrimental impact on smallholder farmers, especially those who heavily rely on tea production for their income. This vulnerability is particularly critical for net producers who lack alternative income sources, especially in rural areas. The study uses a panel dataset from the Tanzania National Panel Survey (TNPS), collected over the periods 2008-2009, 2010-2011 and 2012-2013. The study's main findings indicate that tea price shocks have a strong negative effect on consumption patterns of smallholder farming households in Tanzania. The results also highlight that the impact of price shocks is not uniform across all households. It varies based on factors such as the gender of the household head and the location (rural or urban). The study underscores the importance of government intervention to support households affected by price shocks. Safety net programmes and welfare management initiatives can be vital in assisting these households to cope with economic uncertainties. Moreover, policies that encourage savings and the accumulation of productive assets can serve as a cushion against future shocks. Recognizing the variations in the effects of price volatility among different households, the study suggests the need for policies and strategies that are specifically designed to address the uncertainties in the tea market. This implies a nuanced approach to policies that address the diverse needs and vulnerabilities of tea-producing households.

**Keywords:** *Prices, consumption, Tanzania, Tea*

# 1. Introduction

Agriculture in Tanzania is an important sector that plays a significant role in the country's economy, employment and income distribution. It contributes approximately 29% of Tanzania's Gross Domestic Product (GDP) and 30% of its export earnings. The sector is a major source of employment, employing about 75% of the total labour force. It provides income to more than 80% of the country's population, with most of these individuals (70%) residing in rural areas. This highlights the role of agriculture in sustaining livelihoods, particularly in rural communities.

Tea production is a significant component of Tanzania's agriculture sector. It is one of the major sources of growth and income in developing countries that produce tea, including Tanzania. The cultivation of tea is widespread in Africa and Asia, covering approximately 2.5 million hectares of land (Vernarelli and Lambert, 2013; Khan and Mukhtar, 2013; Gramza-Michalowska, 2014). The global demand for tea products creates opportunities for export earnings, contributing to economic growth and overall welfare. The global market for tea is substantial, with a production value estimated at US\$ 15.4 billion (as of 2013 data). The retail value of tea products is even higher, estimated at US\$ 40.7 billion (as of 2014 data). This underscores the global demand for tea products. The production and export of tea have played a significant role in enhancing food security and the welfare of farming households in Africa and Asia. Income generated from tea production helps ensure that farming communities have access to food and other essential necessities. Kenya and Sri Lanka are examples of countries where tea export earnings have a substantial impact on food expenditure. In 2011, tea export earnings contributed to 51% of Kenya's food expenditure and an even higher 71% of Sri Lanka's food expenditure (FAO, 2015a).

Despite evidence of increased growth in production and export of tea in international markets, tea prices have fluctuated greatly in the past decade. The FAO composite tea price, which is an indicative price for black tea in international markets, increased significantly from 2006 to 2012, reaching a record high of US\$ 3.18/kg in 2009 (FAO, 2015c). However, in the first half of 2013, international tea prices declined significantly by 2.5%, and further declined by 5.3% in 2014 (FAO, 2015b). The fluctuation in tea prices in international and regional markets can be attributed to several factors, and it highlights the vulnerability of the tea industry to various external influences. The growth of middle class populations and changing consumer preferences in emerging markets, such as China and India, has led to increased



demand for tea. This surge in demand can put upward pressure on prices, especially if supply does not keep pace. Adverse weather conditions, such as droughts in major tea-producing countries such as India, Sri Lanka, and Kenya can significantly impact tea production. Reduced supply due to weather-related issues can cause prices to rise as demand remains stable or increases (FAO, 2016). Tea markets, like other commodity markets, can attract speculators and investors looking to profit from price volatility. Their participation in the market can amplify price fluctuations, as their actions may not always align with the fundamentals of tea supply and demand. Regional markets, such as the Mombasa market, can also experience price fluctuations due to various factors, including changes in auction prices and production costs (Mwangi, 2016). The average price of tea rose by 15.2% from 2010 to 2011 and by 6.7% from 2011 to 2012 but declined by 14% in 2014 and 4% in 2015 (FAO, 2016). These dynamics can vary from one region to another, leading to divergent price trends. Broader economic factors such as changes in exchange rates, inflation, and global economic uncertainty can impact tea prices. Currency fluctuations, for example, can affect the cost of production and export competitiveness. Different grades and qualities of tea may experience varying price movements (Mwangi, 2016). Higher quality teas often command better prices, and their prices may be less volatile compared to lower grade teas. Government policies related to tea production, trade, and taxation can also influence prices. Export restrictions or subsidies, for instance, can affect the supply and demand dynamics in international markets. Changing consumer preferences, such as a shift towards healthier beverages or specialty teas, can also affect the demand and pricing of certain types of tea. The combination of these factors can lead to volatility of tea prices in international and regional markets. It underscores the importance of monitoring and managing these risks for both tea producers and traders in the industry. Additionally, efforts to improve production practices, diversify export markets, and implement strategies for climate resilience can help mitigate the impact of price fluctuations on the tea sector.

Unpredictable changes in commodity prices can create uncertainty for countries that rely heavily on commodity exports, making it challenging for these countries to plan and implement effective sales policies (ICC, 2009). Input costs account for an average of 43% of the gross production value in these countries, suggesting that fluctuations in commodity prices can directly affect the cost of producing goods, which can further compound the economic challenges faced by producers (Angerer et al., 2009). Developing countries, in particular, are highly dependent on primary commodity exports. Therefore, when commodity prices are volatile, these countries are particularly vulnerable to economic shocks. Consequently, high movement in agricultural commodities is a concern for policy makers and international organizations worldwide. To address these challenges, policy makers and researchers must have a comprehensive understanding of the welfare effects of commodity price dynamics and how households respond to these fluctuations. This understanding is crucial for designing effective counter-cyclical stabilization policies (Beck et al., 2016).

Volatile commodity prices affect tea producers differently depending on their individual risk preferences. Generally, when international tea prices are higher, tea

producers can benefit. Higher prices mean potentially higher revenues for their tea products in the global market. High-risk tea producers may respond differently from low-risk producers when international prices rise, mainly due to their varying attitudes towards risk. High-risk producers are more likely to realize increased benefits from higher prices, since they might be willing to invest more and take greater risks to capitalize on these higher prices (Magrini et al., 2016). This is because they are more inclined to see higher prices as an opportunity to earn more despite the associated risks. Low-risk producers tend to be more conservative. They may employ fewer inputs or strategies to hedge against price variations (Bellemare et al., 2013). While this approach may provide low risk producers with some level of stability, they could miss out on potential income during periods of higher prices (Moghadam and Canuto, 2011).

High tea prices accompanied by significant fluctuations can be detrimental to tea producers. The production risks associated with such price volatility may discourage some producers from increasing their supply, despite the potential for higher profits. The literature based on African, Asian and Latin American data has revealed that men and women are affected by shocks differently (Due and Gladwin, 1991; Thomas et al., 2000; McKenzie, 2003). Incentives from changes in crop prices differ due to disparities in labour requirements between women and men, where women often bear the greater burden than men (Ongile, 1999; Sandys, 2008; Hill, 2011).<sup>1</sup> Women play a complex and fundamental role in the production, marketing, trading and consumption of most food crops around the world (Cohen and Smale, 2014). Yet, more often, they have less access to and control over the resources. Women generally experience gender-based vulnerabilities, including managing non-income household responsibilities and occupying low paying farm work, limited legal benefits and protections, limited decision-making authority, and lack of control of financial resources (Chant, 2008; Cohen and Smale 2014). As a result, in the presence of income shocks, women are more likely to lose assets than men, and their workloads are likely to increase more significantly than those of men (Cohen and Smale, 2014). Women, especially those who lack alternative sources of income, face increased uncertainty when it comes to allocating resources for essential needs such as food, education, and healthcare when they experience income shocks that disrupt their ability to meet these basic needs (Sandys, 2008; Hill, 2011). Nonetheless, many studies that examine how households respond to income shocks often overlook the gender perspective. Thus, the unique challenges and responses of women in the face of income shocks may not be adequately addressed in research and policy making (Cohen and Smale, 2014). One key reason for the neglect of the gender dimension in such studies is the lack of proper data that provides gender-disaggregated effects, without which it becomes difficult to assess and understand the specific impacts on women.

Tanzania is a significant player in the global tea market and is recognized as one of the main producers of certified tea in Africa, positioning the country as an important contributor to the global tea industry. Tea production plays a crucial role in Tanzania's economy as it is the fourth largest export agricultural product in the country, indicating its importance for generating foreign exchange earnings and contributing

to the nation's economic output. The tea industry in Tanzania is a major employer, particularly in rural areas, where it provides livelihoods for over 30,000 smallholder farmers involved in tea production, collectively producing a significant portion of the country's tea output. In recent years, Tanzania has experienced significant growth in tea production where output increased by 8.18% (2,743,423 kg) from 2013/2014 to 2014/2015 financial year (FAO, 2016). As a result, exports and foreign exchange earnings also increased by 6,810,393 kg and US\$ 1,561,475, respectively. Despite being a significant tea producer, Tanzania being a price taker in the regional (Mombasa auction market) and international tea markets does not have the influence to set or control tea prices through traditional demand and supply mechanisms. Instead, tea producers would prefer high prices to low prices, as they would be able to sell their surplus tea (tea more than their own household consumption) and realize higher income for non-tea consumption goods. It is apparent that the recent volatility in tea prices can have adverse effects on smallholder farmers in rural Tanzania, particularly those who heavily rely on the income generated from tea production. These farmers may lack alternative sources of income and depend on the export proceeds from tea.

Nonetheless, studies that evaluate the impact of tea price changes on smallholder farming households in Africa are limited. This study aims to contribute to the limited literature by evaluating how rural farming households adjust their consumption patterns when faced with frequently changing tea prices. The primary research question focuses on understanding how changes in the prices of tea influence the consumption decisions made by rural farming households. The study intends to examine whether there are differences in how male-headed and female-headed households respond to tea price shocks. This question acknowledges potential gender-based variations in consumption patterns and decisions in response to economic shocks. Another research question seeks to understand how urban and rural households differ in their responses to tea price variations. Finally, the study aims to identify and analyze the coping strategies adopted by smallholder farming households to mitigate the effects of tea price shocks. These strategies may include alternative income sources and ownership of productive resources by households to manage their economic situation and consumption needs during periods of negative price changes.

The rest of the paper is organized as follows. Section 2 discusses the background and related literature. Section 3 discusses the data issues and outlines the methodological framework. Sections 4 and 5 present the descriptive and econometric results, respectively. Section 6 concludes the paper and provides policy recommendations.

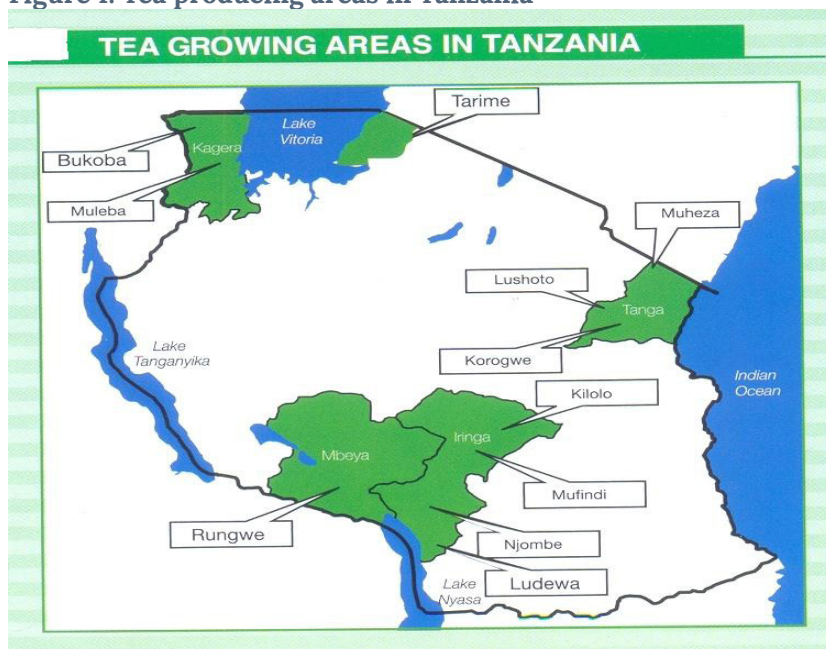
## **2. Background and Evidence on Research Issue**

### **2.1 Overview of Tanzania Tea Industry**

Agriculture forms a key part of the foundation of the Tanzanian economy. It plays a vital role in various aspects, including food production, supplying raw materials for industries, generating income and providing employment opportunities. As a result, the economy heavily relies on this sector. Tanzania's agriculture benefits from its diverse range of climatic conditions and geographical locations, which allow for the cultivation of a wide variety of agricultural products, including tea, and thereby contributing to the resilience of the sector and the overall economy.

Tea is a high impact crop in the Tanzanian economy; it is the fourth largest export crop and contributes to a third of the country's permanent crop production (TBT, 2017). Currently, Tanzania is the 5th largest producer of tea in Africa and the 14<sup>th</sup> largest in the world, producing around 0.73% of global production (EATTA, 2016). During the financial year 2015/2016, total exports of tea amounted to 30,057,921.33 kg with exports earnings of US\$ 51.7 million, or increases of 1.65% and 12.00%, respectively, from 2014/2015 (TBT, 2017).

Tea in Tanzania is grown by individual smallholder farmers and privately owned cooperative estates. The unprocessed tea leaves are sold to tea-processing factories. There are about 23,000 acres of tea, with smallholder farms and privately owned tea estates occupying approximately half or 11,500 acres of tea each (FAO, 2016). There are 23 primary processing factories, 19 of them owned by large-scale farmers and 4 jointly owned with smallholder farmers. There are 9 licensed blending and packaging factories owned by private companies, located in the 8 tea-producing districts across the six regions (see map on the next page).

**Figure 1: Tea producing areas in Tanzania**

Source: Tea Board of Tanzania<sup>2</sup>

Note: Green shaded are regions that grow tea; in the boxes are specific districts that grow tea in that region

There are three main tea-growing geographical zones in Tanzania. The Southern Highlands Zone (Mufindi, Njombe and Rungwe districts) is the largest tea-producing zone with over 80% of total production followed by the North-East Zone (Lushoto, Korogwe and Muheza districts) with almost 20% while Northwest Zone (Bukoba and Muleba districts) contributes an insignificant share (less than 1%). This study will focus on the farming households growing tea in the Southern Highlands Zone.

**Table 1: Tea production by geographical zone for harvesting seasons 2013/2014 – 2015/2016**

Zone Season	Northern Zone	Southern Zone	Total
July 2013-June 2014	6,397,519 kg	27,134,949 kg	33,532,468 kg
July 2014-June 2015	5,819,069 kg	29,930,700 kg	35,749,769 kg
July 2015-June 2016	5,921,869 kg	26,706,759 kg	32,628,628 kg
Contribution (2013/2014)	19%	81%	100
Contribution (2014/2015)	16%	84%	100
Contribution (2015/2016)	18%	82%	100

Source: Tea Board of Tanzania

Cooperative estates produce at large scale for commercial purposes and sell the tea leaves locally through tea processing factories and internationally through the Mombasa auction market. On the contrary, smallholder tea farmers are not involved anywhere beyond community selling centres, neither are they involved in the price-setting of the farm gate tea prices. Instead, the local price of raw and processed tea is

set by the Tea Board.<sup>3</sup> The price for processed (dry) tea varies according to grade, from TZS 6,000 to TZS 8,000 per kg. It takes 4.5kgs of unprocessed tea leaves to manufacture 1kg of dry (processed) tea leaves. The 2017 local price for unprocessed tea was TZS 240 per kg, yet the processing companies bought at a higher price of TZS 250 per kg. This was relatively higher compared to TZS 232 per kg in 2016. However, according to the Tea Research Institute of Tanzania (TRIT), many smallholder tea farmers have abandoned their farms due to recent fluctuating tea prices, and the increased costs of maintaining tea trees. As a result, their tea production has declined significantly in the past few years. The contribution of the smallholder to the total production in the tea sector was 33% in 2014/2015 and 30% in 2015/2016, while that of the estates' sub-sector was 70% and 67% in 2014/2015 and 2015/2016, respectively (Table 2).

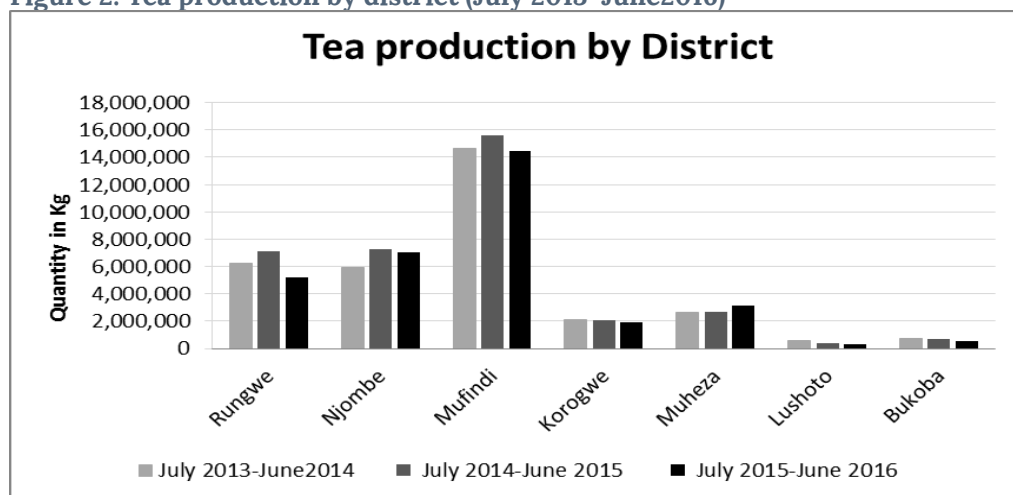
**Table 2: Tea production by sector for harvesting seasons, 2013/2014–2015/2016**

Season	Estates	Smallholders	Total
July 2013-June 2014	22,933,216 kg	10,591,525 kg	33,524,741 kg
July 2014-June 2015	24,830,273 kg	11,919,496 kg	35,749,769 kg
July 2015-June 2016	22,815,677 kg	9,812,951 kg	32,628,628 kg
Contribution (2013/2014)	68%	32%	100
Contribution (2014/2015)	67%	33%	100
Contribution (2015/2016)	70%	30%	100

Source: Tea Board of Tanzania

At the district level, Mufindi and Njombe, both located within the Iringa region in rural Tanzania, were the highest producing districts, accounting for over 60% of total tea production in the country (FAO 2014/2015 statistics). Rungwe District also contributed a relatively large share of tea production (20%) while Korogwe, Muheza, Lushoto and Bukoba accounted for 17%.

**Figure 2: Tea production by district (July 2013–June 2016)**



Source: Tea Board of Tanzania

Tea trees need a significant amount of time to grow (at least three years) before they can yield any harvest and have a lifespan of around 100 years. The existing trees were planted in the 1950s and require extensive maintenance to ensure quality produce. This suggests that tea supply and demand is price inelastic since production is not easily reversible once the trees are planted. This also means that once the tea trees are planted, tea producers are unable to switch between tea production and any alternative crop and, therefore, need to resort to other strategies to raise income for consumption smoothing during periods of low prices.

Tea is harvested by hand, and once handpicked, the tea leaves must be delivered to the tea factory the same day otherwise any delay after harvesting destroys the quality because the harvested tea has to be maintained within a prescribed temperature. The raw tea leaves are sold at the selling centre to the processing industry, and the farmers incur all the transport costs of transferring the leaves from the farm to the selling centre. Tea harvesting is predominantly carried out by women in many tea-producing regions, including Tanzania; women account for three quarters of workers in tea farms. For many women in tea-growing communities, tea cultivation is a critical source of livelihood. A drop in tea prices can directly impact their ability to earn a living, potentially forcing them to seek alternative and often less secure employment opportunities. Payment to farm workers is based on each kilogramme harvested, and the payment varies from TZS 100 to TZS 120 per kg. On average, a female farm worker harvests between 100kg and 250kg per week and is paid on a weekly basis. For the smallholder farming households, men are responsible for transporting the tea leaves to the community selling centre where they negotiate the price and collect the proceeds.

Given this background, it is apparent that tea production is an important source of income to rural smallholders, providing a safety net to smallholder farmers who contribute over 30% of total tea production in the country. As a result, failure to attract higher bidding price in the tea markets would mean that smallholder rural households in Tanzania are unable or unwilling to invest in higher technology (for example, fertilizer, irrigation system) that would increase tea productivity. In turn, low prices reduce income available for consumption of other basic goods such as health and education to smallholder households.

## **2.2 Related Literature**

The theoretical concept of household consumption behaviour is derived from the consumption function that links consumption decisions to disposable income. This definition of consumption originates from the law of Absolute Income Hypothesis (AIH), which shows that men are disposed as a rule and, on the average, increase their consumption as income increases but not by as much as increase in their income. Keynes (1936) defines consumption as the part of income that was not saved, thereby distinguishing between purchases that satisfy wants directly and investments that become assets in the absence of a satisfactory means of measuring



the goods consumed. Thus, a monetary measure of consumption has been widely accepted and used as a basis for predicting economic trend. The post-Keynesian consumption theories provided alternative explanations to Keynesian consumption function. Duesenberry (1949) argued that the utility of consumers depends on their relative income, while Friedman (1957) put forward the hypothesis that household consumption is proportional to the permanent income that a household could expect over a particular planning horizon. However, subsequent analysis into the determinants of consumption patterns (for example Modigliani and Brumberg, 1954) have revealed that consumption decisions are determined by many other factors apart from income. Other factors include household size, age of the head of household, and education of the head of household.

The empirical studies that analyse the impact of tea price fluctuations across countries, particularly in Asia and Africa, reveal that tea price fluctuations are unfavourable to smallholder producers and farm workers, particularly women and children. Viswanathan (2012) documented that the tea industry is the second largest employer in the organized sector after the Indian Railway, and more than 50% of all workers employed in the industry are women workers. However, price fluctuations of tea put pressure on tea growers and working conditions of workers in the form of low wages and withdrawal of basic facilities such as food, health, education, among others. This is because it is easier to cut costs by reducing labour cost (as the labour has weak bargaining power) than raising the price of tea (difficult in the competitive market economy). In most of the cases, producers must remain competitive by lowering wages, whereby women are affected more. Ganewatta and Edwards (2000) reported that the tea industry in Sri Lanka, one of the major tea producers in the world, is dominated by women. Consequently, tea price variations affect women through exploitation, including long working hours and increased workloads during periods of price hikes in the tea market. Hill (2011) added that women are often trapped and forced to bear the consequences of the exploitation due to lack of other sources of income, while men often quit. As a coping strategy to volatile tea prices, smallholder farmers in Sri Lanka often resort to selling in local markets where prices are higher to increase their sales and income (Perera, 2014).

In Bangladesh, volatile tea prices mostly affect women, children and adolescent girls. This is due to lack of appropriate regulatory framework and implementation to protect human rights and working conditions of farm workers (Ahmad et al., 2015). Summer and Sun (2014) reported that in Kenya, volatile tea prices have negative effects to farmers and workers but affect women more than men. This often forces women to undertake paid work or agree to exploitative labour conditions. In Uganda, volatile tea prices make it difficult for smallholder farmers to sustain production, thus driving them out of the market and forcing them to shut down production. Some farmers resort to selling their assets to smooth consumption (Bussolo et al., 2010).

It is apparent from the literature that changes in tea prices have had unfavourable effects on smallholder farmers. However, the degree of the effect differs across countries depending on the ability to cushion the farmers against price shocks. It is



therefore important to investigate the effects of tea price changes during the period when both international and regional tea prices are on a downward trend and the exchange rate is not favourable to exporters. This study becomes relevant and timely in terms of reforms and mechanisms to stabilize consumption and income for rural farming communities amid external commodity price shocks.

This study examines the effects of fluctuations in tea prices on smallholder farming households in Tanzania. Specifically, the study aims at examining the effects of tea price variations on household consumption. The study further analyses the various coping strategies adopted by tea farming households for consumption smoothing, such as participation in wage employment and access to credit.

## 3. Methodology

Our research question is clearly an empirical exercise that requires household-level data and a clear and rigorous methodological approach in relating consumption behaviour to the effects of price variations on tea farming households in Tanzania.

### 3.1 Data Sources and Measurements

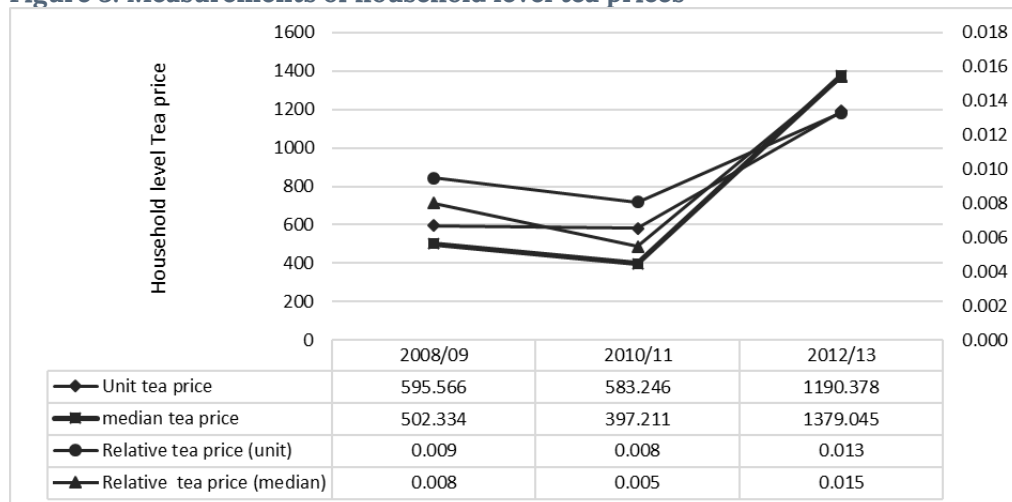
We use a panel data obtained from three waves of the Tanzania National Panel Survey (TNPS) collected over the periods 2008-2009, 2010-2011 and 2012-2013 across 26 regions. A balanced panel is used of 2,946 households in each period, amounting to a sample of 8,838 households (6,749 males and 2,089 females), which were sampled over the three survey periods. This data includes information on household characteristics of sampled households, including ownership, employment, wages and sources of expected income from tea, non-tea production and non-agricultural activities, asset ownership, household consumption patterns on tea and non-tea products, gender dimensions and other household characteristics. We use household expenditure to estimate household consumption patterns (Srivastava and Mohanty, 2010).

The dataset also has information on output yield, harvest and losses, use of technology (such as irrigation system, organic fertilizers, soil erosion controls/water harvesting machines, pesticides/herbicides), storage availability for inventory stock, farming capacity, among others. Importantly, data on international, Mombasa auction prices and local tea prices charged by tea processing factories and community traders was collected from the FAO statistical database, East African Tea Trade Association and Tea Board of Tanzania, respectively.

Figure 3 presents the trends in annual average tea prices in Tanzanian Shillings per kg at the household level price in terms of the unit value (total revenue from tea sales divided by total quantity of tea sold). We also compute the median of the unit value computed at the district level. This is the price at which local farmers in Tanzania receive for selling their unprocessed tea in the tea market. Finally, we compute the relative price (tea unit price divided by the food prices facing that household) for local tea growers during the period 2008/2009 to 2012/2013. The relative price of tea is measured in terms of the basket of selected basic food commodities (such as maize, rice, potatoes, beans and sorghum).<sup>4</sup> The data reflects the fluctuating trends over the sampled period for both measures of tea prices, suggesting that during the

period 2008/09 to 2012/13, tea growers faced uncertainty in the local tea markets. The diagram shows that, generally, all tea prices facing tea growers in Tanzania were unstable during the three periods, particularly declining at the household level but increasing in the exports markets.

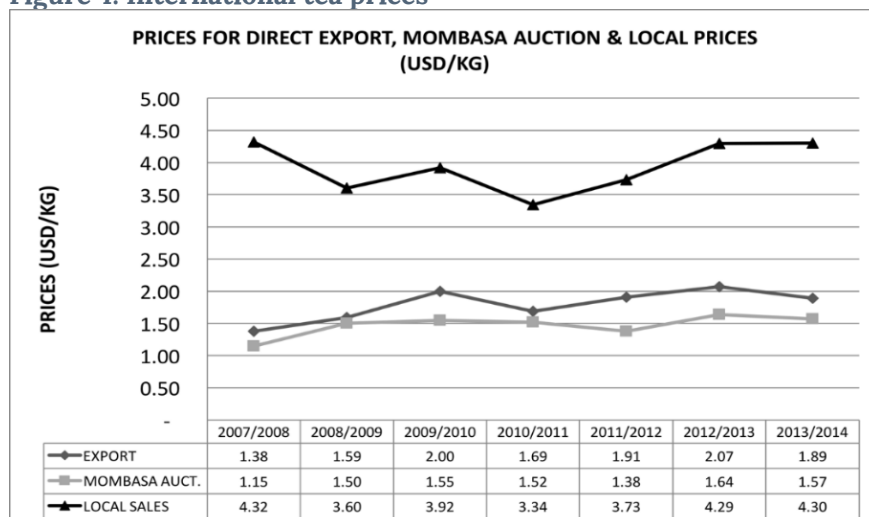
**Figure 3: Measurements of household level tea prices**



Source: Authors' own calculations

Figure 4 presents the trends in annual average tea prices in US dollars per kg, charged for exported tea to the rest of the world, tea sold at the Mombasa auction market and for tea sold in the local market by the tea processing factories and community traders during the period 2007/2008-2013/2014. The results show that tea growers faced uncertainty in the local markets, and also in regional and international markets over this period.

**Figure 4: International tea prices**



Source: Tea Board of Tanzania (2018)

After extensive sorting and cleaning, the final sample shows that in the three waves of data used in this study, the distribution of sample is similar across the different regions, except for Dar es Salaam, which constituted around 15% of the total sample (Appendix Table A).

The problem of non-response and attrition is a key limitation of longitudinal data. Attrition creates a problem of missing data and can potentially have serious consequences when researchers use only data of responding individuals (Little and Rubin, 1989). Attrition reduces the effective sample size and limits the ability to observe longitudinal patterns in outcomes of interest. Attrition may also result in attrition bias, which may impede the ability to draw valid inference from econometric analysis. There are several approaches used to handle attrition, but their relevance depends on the assumptions made about the origins and causes of the missing data problem. In this study, we apply inverse probability weighting. This approach involves estimation of the probability of response as a function of observed characteristics (Jones et al., 2004).

## 3.2 Conceptual Framework

One of the pioneering studies on the distributional impact of price changes is Deaton (1989) on the rice price in Thailand. The approach proposed by Deaton combines information on the price change of specific goods, rice in his study, with households' data to calculate welfare changes. The key feature of this approach is the use of a household survey to calculate the welfare impact on each single household in the sample. The unit value of a consumption can be seen as the highest acceptable price, or simply a 'subjective price'. However, unit values are not the same as prices, as unit values reflect both quality and price variations (Deaton, 1988; 1997). Thus, Deaton (1988) developed a method that considers both quality and measurement errors when unit price is used as a proxy for market price. The method is widely used in existing literature. For this reason, this paper uses the same method, which is to compute the median unit value for each cluster. This is used as a measure of the price of a given good for each district in Tanzania.

To conceptualize the effects of tea price change on farming households' outcomes in Tanzania, this study explores the various channels through which tea price changes may affect household consumption. The basic economic theory explains the effect of price changes on consumption through the budget constraint. This study focusses on two channels. The first channel is where changes in tea price affect household consumption through an income shock. The uncertainty in tea prices could lead to ambiguity in household income for tea growers. The negative income shock can potentially reduce household consumption, particularly if tea growers do not have any mechanism to smoothen consumption over time. In such cases, tea growing households may not be able to cope with these shocks. The larger the price fluctuation, the more uncertainty in terms of income, and the more important it becomes to search for strategies to maintain a stable consumption for family members. The strategies may include access to credit, wage employment, savings or reduction of consumption

itself. The second channel where tea price changes can potentially affect household consumption is through production shock. Decisions on whether to increase or reduce investment in tea production may be affected by the uncertainty in tea prices. This may also lead to alterations in the diversification strategies by tea growing households, such as growing food crops that could act as safeguards for households against tea price shocks. The study focuses more on the income shock channel as a means through which changes in tea prices may affect household consumption.

### 3.3 Empirical Framework

Drawing from the framework above, the simplified household-level model is specified as follows:

$$\hat{y}_{it} = \alpha + \theta p_t + \sigma X_{it} + \gamma_d + \mu_{it} \quad (1)$$

Where  $\hat{y}_{it}$  is the growth in consumption expenditure for farming household  $i$  at period  $t$ .<sup>5</sup> This variable is deflated, using consumer price index, to control for the effects of inflation on household welfare.  $p_t$  is the measure of tea price in each period  $t$ . We measure the price of tea by first computing the unit value as the proxy for the household level tea price, computed as the total revenue from tea sales divided by the quantity of tea sold during the survey period. To avoid any potential measurement errors (Deaton, 1988), we use the median price, which is computed as the median unit value of tea at the district level. For robustness checks, we use export prices offered by international tea markets to tea farmers for their semi-processed tea. Drawing from Beck et al. (2016), we deal with the potential endogeneity by interacting the variable with district-specific fixed effects. The fixed effects also account for district-invariant characteristics that are not included in the model.

The vector of control ( $X_{it}$ ) includes explanatory variables that are important to the living conditions of the household (HH). They include the highest *level of education attained*, and *age* of household head. We also control family size measured by sum of household members (*HH size*). We also analyse the implications of tea price shocks based on diversification of income sources of each household (such as additional household income through wage employment, ownership of household enterprise and of land or access to credit). *Wage employment* is an indicator variable equal to 1 if at least one of the HH members participated in wage work and zero otherwise. *Land ownership* is an indicator variable, which is equal to 1 if a household owns at least one piece of farming land. *Access to credit* is an indicator variable, which is equal to 1 if any of the family members has borrowed money in the past 12 months. *HH enterprise* is an indicator variable equal to 1 if the household owns a private enterprise. We also include age-squared to control for any potential non-linearity.

The assumption is that the more diversified income sources the household has, the more the household can 'smooth' its consumption and the less negative the impact changes in prices on household consumption. We also control for household wealth by including the indicator variable, which takes the value of 1 if the household owned land for agriculture or a house.

$\gamma_d$  is district-specific fixed effect to allow for spatial heterogeneity in time trends such as input prices and weather conditions faced by each of the tea producing regions in Tanzania.  $\mu_{it}$  is the error term.

## 4. Descriptive Statistics

The data in Table 3 shows that across all the three periods, male-headed households (above 70%) were more than female-headed households (less than 30%).

**Table 3: Distribution of data by gender of head of household**

Head of Household	Frequency	Percent (%)
2008-2009		
Male	2,251	76.4
Female	695	23.6
Total	2,946	100
2010-2011		
Male	2,295	77.9
Female	651	22.1
Total	2,946	100
2012-2013		
Male	2,203	74.8
Female	743	25.2
Total	2,946	100

Source: Authors' own calculations

The data further indicates that the distribution of farming households also differs across the locations. Table 4 shows that across the three waves of data, there were more smallholder farming households in rural areas (above 65%) than in urban areas (just above 30%). This confirms that, just like many developing countries, most smallholder farming activities in Tanzania take place in rural regions than in urban locations.

**Table 4: Distribution of data by location**

Location of household	Frequency	Percent
2008-2009		
Urban	1,020	34.6
Rural	1,926	65.4
Total	2,946	100.0
2010-2011		
Urban	903	30.7
Rural	2,043	69.4
Total	2,946	100.0
2012-2013		

Urban	995	33.8
Rural	1,951	66.2
Total	2,946	100.0

Source: Authors' own calculations

Further disaggregating by gender, the data confirms that most smallholder farming households are in the rural areas (above 60%) than in urban areas. The distribution remains consistent even when the households are distinguished by gender of head of household.

**Table 5: Distribution of data by location and gender of head of household**

Head of Household	Urban	Rural	Total
2008-2009			
Male	773	1,478	2,251
Female	247	448	695
Total	1,020	1,926	2,946
2010-2011			
Male	692	1,603	2,295
Female	211	440	651
Total	903	2,043	2,946
2012-2013			
Male	733	1,470	2,203
Female	262	481	743
Total	995	1,951	2,946

Source: Authors' own calculations

The summary statistics, as presented in Table 6, show that there is considerable variation among the selected indicators of sources of income and wealth for the smallholder farming households. The average household size in the sample is 5 members per household with a variation of 3. The data show that, on average, each household spends TZS 22,500 per week on food items and TZS 100,000 on non-food items in one month.

The average area for farming activities for a typical smallholder farmer in the sample for the three waves of data is 5 acres. The largest plot area is 625 acres while the smallest is 0.1 acres, and the variation is 13.6.

**Table 6: Summary statistics for the period 2008/2009–2012/2013**

Variable	No. of observations	Mean	Std. Dev.	2008/09	2010/11	2012/2013
Unit price of tea (TZS@Kg)	115	808.73	738.90	595.57	583.25	1,190.38
Median price of tea (TZS@Kg)	907	606.03	535.17	502.33	397.21	1,379.05
Real HH consumption (expenditure)	8,838	1267.18	6,318.15	2,244.90	845.73	710.91
Real HH consumption (growth) <sup>1</sup>	4,196	5.59	1.79	6.43	4.83	4.83
Value of tea sold (TZS)	8,838	21,553.21	8569.19	6391.34	17,325.88	40,942.39



Quantity of tea sold (kg)	8,838	38.67	1,022.05	14.72	37.60	63.69
Farm area (acres, GPS)	7,217	5.13	13.64	5.39	5.88	4.41
Household size	8,838	5.39	2.96	5.25	5.57	5.34

Source: Authors' calculations

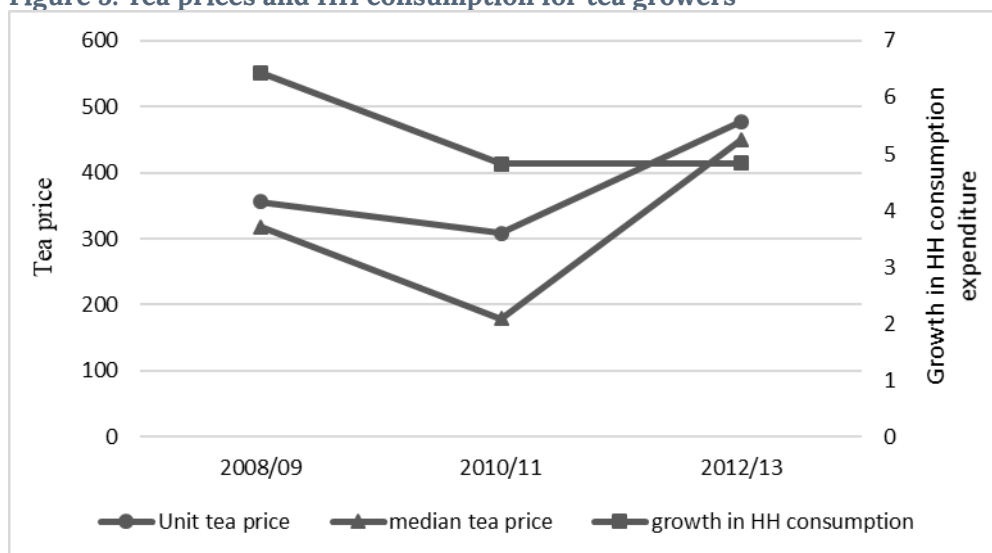
The sample shows that there are 115 tea growing farmers in total, who also grow other crops such as fruits and grains. The tea farmers are mainly located in Tanga and Mbeya regions, which are in the rural parts of Tanzania.

Table 6 shows that, on average, a tea household receives 800 Tanzanian Shillings for every kilogram of tea it produces and sell. But this price varies significantly over the three periods where it increased in the first period, declined in the second period and then increased again in the last period. This confirms the earlier discussions that reflected volatile tea prices over these periods. However, the value of sales is relatively high over the sample period. On average, a typical tea farmer earns about TZS 21,553 from tea sales with a maximum of over TZS 96.4 million and a minimum of TZS 100,000. This confirms the importance of tea production among smallholder farmers in Tanzania. The quantity of tea sold varies from 5,000 Kgs to 62,960 Kgs in each season. We also computed the household level price of tea among the sample tea growers. The data shows that, on average, each tea growing household received TZS 38.67 per Kg of tea sold. The data also shows that generally, real household expenditure among the sampled households was around TZS 1,267, with a growth of 6% per week on average. However, this growth has been declining over the three periods from 6.4% in 2008/09 to 4.8% in 2012/2013.

## 5. Results and Discussions

Figure 5 presents the descriptive relationship between growth in household consumption, as the main indicator of household welfare, and tea prices (the household level tea price and farm-gate tea price at the district level) faced by Tanzanian farming households. The results show a negative relationship between tea prices and household consumption for tea growers. The simple correlation between growth in household consumption and unit tea price is -0.14 at the household level. Based on this simple descriptive analysis, we expect a negative link between tea prices and changes in household consumption. In the next section, we interrogate this relationship, based on econometric analysis.

**Figure 5: Tea prices and HH consumption for tea growers**



**Note:** Unit tea price (household level tea price) is calculated as the total revenue from tea sales divided by the quantity of tea sold. Median tea price is calculated as the median unit price for tea, averaged across households at the district level. Household consumption growth is the growth in total household consumption expenditure, averaging across time.

We first use the unit value as a measure of household-level prices of tea facing tea growers in Tanzania (Table 8). This is the farm-gate price received by tea farmers. The results show a negative relationship between tea price change and growth in household consumption expenditure, even when we control for other observable and

unobservable factors. The results remain consistent even when accounting for the presence of other shocks on income and/or assets, and alternative income sources available to households to provide a cushion against shocks. In general, these results reveal that fluctuating tea prices translate into transitory changes in income, which in turn affects household consumption patterns for tea farming households in Tanzania.

Table 8 presents the first set of regression results explaining the relationship between the changes in household consumption and household unit tea prices at household level (columns 1 to 3) and at community level (columns 4 to 6). This is the farm-gate price received by tea farmers. The basic results presented in columns 1 and 4 show a negative relationship between unit level tea prices and growth in household consumption expenditure in Tanzania. The results show that a 1% increase in the unit value of tea is associated with 0.95% decrease in growth in household consumption and vice versa. This suggests that households that perceive a tea price shock reduce their consumption spending significantly. In columns 2 and 4, we account for other characteristics of the household head (such as education and age) and household characteristics, including household size. As expected, household size, as a measure of family size, has a positive relationship to changes in household consumption. An increase in household size by one additional person is associated with a 17% increase in growth in household consumption. This suggests that an increase in family size is likely to result in growth in household consumption expenditure (Bick and Choi, 2013). The level of education of the household head was positively related to growth in household consumption. However, the coefficient A 1 additional year of education of the head of household is associated with a 38% increase in growth in household consumption and vice versa. This result suggests that perhaps households in which the head of household has a relatively higher level of education are able to smooth their consumption through increased income sources than those with lower level of education (Becker and Murphy, 2007; Alem and Söderbom, 2012). The coefficients of age and age squared, although statistically insignificant, are negative and positive, respectively, suggesting that young households cope better with tea price shock than moderately older ones.

**Table 7: Household unit tea prices and household consumption (2008/2009 – 2012/2013)**

Dependent variable is growth in household consumption	(1)	(2)	(3)	(4)	(5)	(6)
Price of tea	-0.955** (0.414)	-0.912** (0.499)	-1.070** (0.523)	-0.381** (0.151)	-0.354** (0.152)	-0.328** (0.157)
Demographics						
HH size		0.101* (0.089)	0.150* (0.088)		0.176*** (0.041)	0.168*** (0.042)
Education		0.357 (0.600)	0.278 (0.607)		0.378** (0.152)	0.395*** (0.150)

Age		-0.016	-0.039		-0.042	-0.039
		(0.094)	(0.099)		(0.032)	(0.033)
Age squared/100		0.018	0.042		0.036	0.032
		(0.081)	(0.088)		(0.029)	(0.031)
Income sources						
Wage employment			1.142			0.110
			(1.293)			(0.406)
Access to credit			0.533***			0.457*
			(0.056)			(0.334)
HH enterprise						1.128**
						(0.446)
Land ownership						0.756
						(0.468)
Constant	11.399***	11.681**	17.176***	7.394***	7.076***	6.857***
	(2.645)	(4.770)	(5.638)	(0.978)	(1.307)	(1.624)
Observations	53	53	53	344	344	344
Adj. R-squared	0.35	0.36	0.41	0.07	0.15	0.16
District-fixed effects	Yes	Yes	Yes	Yes	Yes	Yes

**Note:** The results are based on equation (1). The dependent variable is the log of growth in total household consumption expenditure over the survey period. The measure of price is computed as the total revenue from tea sales divided by the quantity of tea sold during the survey period. This is measured at the unit value at household level (columns 1–3) and at community level (columns 4–6). Demographic characteristics include highest *level of education attained*, and *age* of household head. *Wage employment* is an indicator variable equal to 1 if at least one of the HH members participated in wage work and zero otherwise. *Land ownership* is an indicator variable, which is equal to 1 if a household owns at least one piece of farming land. *Access to credit* is an indicator variable, which is equal to 1 if any of the family members has borrowed money in the past 12 months. *HH enterprise* is an indicator variable equal to 1 if the household owns a private enterprise. We also include age-squared to control for any potential non-linearity. Columns 1 and 4 present the basic results. Columns 2 and 5 include other controls related to household characteristics while columns 3 and 6 include additional controls on household income and wealth indicators. All regressions are estimated with district-fixed effects and a constant. The robust standard errors are in parentheses; \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ .

We also consider the ability of the household to insure itself against tea price shocks, through alternative income sources and ownership of productive assets. In particular, we focus on: (i) whether at least one of the adult household member had wage employment; (ii) whether any of the household members had borrowed money in the past 12 months; (iii) whether the household owned income-generating family enterprise; and (iv) whether the household owned land. In the absence of government support programmes, these could be important coping strategies for poor households to manage the effect of idiosyncratic shocks. This is consistent with the premise that the more diversified income sources the household has, the higher the probability that the household can ‘smooth’ its consumption and the less negative impact the price shock will be on household consumption (Morduch, 1995). However, only access to credit and ownership of household enterprise are statistically

significant. Collectively, these results suggest that, to some extent, households could use income from these alternative sources to create sufficient safety nets for the price shocks as alternative income diversification sources lead to an increase in household consumption. Available sources of income to farming households do not all allow them to smooth their consumption in the presence of a price shock.

We also use international tea prices to analyse the relationship (Table 9). This is important for our study as tea is a traded and exported crop in Tanzania. The results show a strong negative relationship between tea price and changes in household consumption. A 1 percentage increase in international tea prices is associated with a 2.8 percentage decline in growth in household consumption expenditure. This result is consistent across all specifications. The results are also comparable to the results obtained using the household unit prices in Table 8, although the magnitudes of the coefficients in this case are almost twice larger. This could suggest that the effect of international tea prices is more than twice the effect of local tea prices on household tea consumption. In general, these results collectively suggest that fluctuations in tea prices translate into transitory changes in income, which in turn affects household consumption patterns.

**Table 8: International tea prices and household consumption (2008/2009 – 2012/2013)**

Dependent variable is growth in household consumption	(1)	(2)	(3)	(4)	(5)	(6)
Price of tea	-2.846*** (0.098)	-2.782*** (0.095)	-2.886*** (0.109)	-2.839*** (0.109)	-2.775*** (0.105)	-2.830*** (0.121)
Observations	4,061	4,061	4,061	4,061	4,061	4,061
Adj. R-squared	0.30	0.36	0.37	0.28	0.34	0.35
Controls	No	Yes	Yes	No	Yes	Yes
District-fixed effects	Yes	Yes	Yes	Yes	Yes	Yes

**Note:** The dependent variable is the log of growth in total household consumption expenditure over the survey period. The measure of price is computed as the total revenue from tea sale divided by the quantity of tea sold during the survey period. Controls include characteristics of head of household, location, shocks to HH income + assets and measures of alternative household income sources. Column 1 presents the basic results. All regressions are estimated with district-fixed effects and a constant. The robust standard errors are in parentheses; \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ .

## Robustness checks

For robustness checks, we examine whether the distributional effects of tea price fluctuations are different between female-headed and male-headed households in Tanzania. We also explore this relationship, distinguishing between the location of the household.

## ***Effects of tea prices by gender of household head***

Women in rural areas may become heads of households temporarily (due to internal or external migration) or permanently (due to divorce or death of the spouse). In this study, most of the households are headed by men (76%) while only 24% of the total sample are female-headed households. The results presented in Table 10 indicate that the effects of tea price variation have a statistically significant negative effect on consumption patterns for male-headed households, while the effect for female-headed households is not statistically significant. This could be because women are involved in tea plantation and harvesting while men engage more in tea marketing and sales. It follows that the effect of tea price variations will have a larger effect on the latter group of households. However, the results should be treated with caution as further information will be required to establish intra-household participation in tea growing farming by gender.

**Table 9: Tea prices and HH consumption by gender of the household head**

Variables	Male-headed households			Female-headed households		
	(1)	(2)	(3)	(4)	(5)	(6)
Price of tea	-0.659***	-0.592***	-0.531**	0.048	0.027	-0.074
	(0.198)	(0.201)	(0.209)	(0.197)	(0.190)	(0.196)
Observations	232	232	232	112	112	112
Adj. R-squared	0.10	0.15	0.18	0.22	0.33	0.37
Controls + constant	No	Yes	Yes	No	Yes	Yes
District-fixed effects	Yes	Yes	Yes	Yes	Yes	Yes

**Note:** The dependent variable is the log of growth in total household consumption expenditure over the survey period. Controls include characteristics of head of household, HH size, location, wage employment, shocks to HH income, access to credit and land ownership. Column 1 presents the basic results. Columns 2 includes other controls related to household characteristics while column 3 includes additional controls on household income and wealth indicators. The robust standard errors are in parentheses; \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ .

## ***Effects of tea prices by location of household***

A larger share of tea farming households (over 80%) in this sample are in the rural parts of the country. Again, urban communities have more opportunities to diversify their income sources, which act as some form of insurance against economic shocks. The expectation, therefore, is that any shock in agricultural commodity prices will mostly affect the households in the rural areas than those in urban areas. The results presented in Table 11 confirm this prediction. The coefficient of the household tea price shock is negative and statistically significant for rural households but not statistically significant for urban households. This suggests that there is a clear systematic difference in consumption patterns between households across locations, where rural households are more affected by tea price shocks than urban households.

**Table 10: Tea prices and HH consumption by location of households**

Variables	Urban Households			Rural Households		
	(1)	(2)	(3)	(4)	(5)	(6)
Price of tea	-0.474	-0.525	-0.621	-0.383**	-0.333**	-0.305**
	(0.487)	(0.519)	(0.579)	(0.163)	(0.166)	(0.173)
Observations	37	37	37	307	307	307
Adj. R-squared	0.18	0.20	0.39	0.09	0.17	0.18
Controls + constant	No	Yes	Yes	No	Yes	Yes
District-fixed effects	Yes	Yes	Yes	Yes	Yes	Yes

**Note:** The dependent variable is the log of growth in total household consumption expenditure over the three periods. Controls include characteristics of head of household, HH size, wage employment, shocks to HH income and land ownership. Columns 1 to 3 present the results for households located in urban areas while columns 4 to 6 present the results for households located in rural areas. The robust standard errors are in parentheses; \*\*\* p<0.01, \*\* p<0.05, \* p<0.1.

## 6. Conclusions and Policy Recommendations

This study analyses the impact of tea price fluctuations on consumption expenditure of tea-growing households in Tanzania. We use a sample of farming households extracted from very detailed data from the Tanzania National Panel Survey (TNPS) collected over the periods 2008-2009, 2010-2011 and 2012-2013. The descriptive statistics are based on the combined database and the individual datasets for each period to show trends in various indicators used in the study. The results indicate that at the household level, there are significant differences in terms of household consumption expenditure and access to resources and participation in farm and off-farm activities. The descriptive results further show a positive relationship in tea price shocks and household consumption among tea-growing households in Tanzania. Overall, the results show that tea price shocks negatively affect household consumption among tea-growing households in rural Tanzania. The results are consistent across different measures of household unit price of tea. Household consumption increases with household size and level of education of head of household, but no statistically significant evidence that consumption varies with age of household head.

However, consumption is relatively lower for households that are female-headed, and the coefficient of tea prices is statistically insignificant. Tea price shocks affect households differently across locations as consumption for rural households is more affected by tea price shocks than urban households. One reason for this systematic difference could be the ability of urban households to cope with shocks compared to rural households. We take into consideration alternative resources available to households for consumption smoothing over time, in the presence of tea price shocks. The results reveal that in the absence of government support, having access to credit and income from family enterprise may provide the necessary safety nets for tea farming households against tea price shocks.

Important implications for policy can be derived from the results. Welfare effects of tea price shocks vary considerably across households in terms of gender and location. Without clear understanding of the composition of farming households, effective measures to mitigate the vulnerability of various households cannot be properly identified. The inability of households to cope against shocks given their available resources confirms the importance of government response in terms of providing sufficient safety nets through welfare management programmes for the affected



households. Indeed, government policies can play a pivotal role in encouraging savings and the accumulation of productive assets as a means of building resilience for farming households against various economic shocks, including those related to agricultural market fluctuations. Addressing the differential impacts of tea price fluctuations on households requires a holistic approach that combines targeted policies, market interventions and community development strategies. By recognizing the unique vulnerabilities of smallholder farmers and tea workers, policy makers and stakeholders can work together to create a more equitable and resilient tea sector.

## Notes

- 1 Other studies where volatile prices of tea have been found to have negative effects to women than men include Ganewatta and Edwards (2000), Sandys (2008), Loconto (2010), Bussolo et al. (2010), Hill (2011), Viswanathan (2012), Perera (2014), Summer and Sun (2014), Ahmad et al. (2015).
- 2 <http://www.teaboard.go.tz/index.php/2013-02-19-12-45-11/other-tea-statistics>.
- 3 It oversees various aspects of the tea sector, including quality control, certification and marketing.
- 4 The food prices are obtained from the Tanzania National Bureau of Statistics.
- 5 For this study, time represents the three-time periods 2008-2009, 2010-2011 and 2012-2013.

## References

- Alem, Y. and Söderbom, M. 2012. "Household-level consumption in urban Ethiopia: The effects of a large food price shock". *World Development*, 40(1): 146-162.
- Angerer, G., Erdmann, L., Marscheider-Weidemann, F., Scharp, M., Lüllmann, A., Handke, V. and Marwede, M. 2009. Raw materials for future technologies - Influence of the sector-specific raw material requirements in commodity-intensive future technologies on future raw material demand, Fraunhofer Institute for System- und Innovations for Schung ISI, 132.
- Ahmad, I., Yasin, M., Rowshon, A. and AKM, R. I. 2015. "Study on socio-economic and educational condition of tea worker at Sylhet in Bangladesh". *Journal of Tea Science Research*, 5(5).
- Balen, J., McManus, D.P., Li, Y.S., Zhao, Z.Y., Yuan, L.P., Utzinger, J., Williams, G.M., Li, Y., Ren, M.Y., Liu, Z.C, Zhou, J. and Raso, G. 2010. "Comparison of two approaches for measuring household wealth via an asset-based index in rural and peri-urban settings of Hunan Province, China". *Emerging Themes in Epidemiology*, 7.
- Baffes, J. 2004. Tanzania's tea sector: Constraints and challenges. Africa Region Findings and Good Practice Info briefs No. 245. Washington, DC: World Bank.
- Barrett, C.B. 1996. "On price risk and the inverse farm size-productivity relationship". *Journal of Development Economics*, 51: 193-215.
- Barrett, C.B. and M.F. Bellemare. 2011. "Why food price volatility doesn't matter". *Foreign Affairs*, July 11, 2011, <http://www.foreignaffairs.com/articles/67981/christopher-b-barrett-and-marc-fbellemare/why-food-price-volatility-doesn-t-matter> last accessed May 11, 2012.
- Bates, R. 1981. *Markets and States in tropical Africa*. Berkeley: University of California Press.
- Beck, U., Singhal, S. and Tarp, F. 2016. Coffee price volatility and intra-household labour supply: Evidence from Viet Nam. WIDER Working Paper No. 2016/16.
- Becker, G.S. and Murphy, K.M. 2007. "Education and consumption: The effects of education in the household compared to the marketplace". *Journal of Human Capital*, 1(1): 9-35.
- Bellemare, M.F. and Barrett, C.B. 2006. "An ordered tobit model of market participation: Evidence from Kenya and Ethiopia". *American Journal of Agricultural Economics*, 88: 324-337.

- Bellemare, M.F., Barrett, C.B. and Just, D.R. 2013. "The welfare impacts of commodity price volatility: Evidence from rural Ethiopia". *American Journal of Agricultural Economics*, 95(4): 877-899.
- Bick, A. and Choi, S. 2013. "Revisiting the effect of household size on consumption over the life-cycle". *Journal of Economic Dynamics and Control*, 37(12): 2998-3011.
- Burbidge, J.B., L. Magee and A.L. Robb. 1988. "Alternative transformations to handle extreme values of the dependent variable". *Journal of the American Statistical Association*, 83: 123-127.
- Bussolo, M., Godart, O., Lay, J. and Thiele, R. 2010. *The impact of commodity price changes on rural households: Coffee in Uganda*. Washington DC: The International Bank for Reconstruction and Development.
- Chai Bora. 2016. Tea history in Tanzania [http://www.chaibora.com/bw/index.php/tz-tea]. Site visited on 20/11/2016.
- Chant, S. 2008. "The 'feminisation of poverty' and the 'feminisation' of anti-poverty programmes: Room for revision?" *The Journal of Development Studies*, 44(2): 165-197.
- Cohen, M.J. and M. Smale (eds). 2014. *Global food-price shocks and poor people: Themes and case studies*. Routledge.
- CTA. 2013. Agri-trade informed analysis and expert opinion on tea sector.
- Deaton, A. (1988). Quality, quantity, and spatial variation of price. *The American Economic Review*, 418-430.
- Deaton, A. (1989). Rice prices and income distribution in Thailand: a non-parametric analysis. *The Economic Journal*, 99(395), 1-37.
- Deaton, A. (1997). The analysis of household surveys: a microeconomic approach to development policy. World Bank Publications.
- Dehn J. 2000. Commodity price uncertainty in developing countries. Working Paper at the Centre for the Study of African Economies. Working Paper WPS/2000-10.
- Due, J. M. and Gladwin, C.H. 1991. "Impacts of structural adjustment programs on African women farmers and female-headed households". *American Journal of Agricultural Economics*, 73(5): 1431-1439.
- EATTA, (2016). East African Tea Trade Association Rule Book [https://infotradekenya.go.ke/media/EATTA%20Rule%20Book\\_22%20July%202016\\_Final.pdf](https://infotradekenya.go.ke/media/EATTA%20Rule%20Book_22%20July%202016_Final.pdf)
- FAO. 2015a. Contribution of tea production and exports to food security, rural development and smallholder welfare in selected producing countries. Rome: Food and Agriculture Organization of the United Nations.
- FAO. 2015b. Socio-economic implications of climate change for tea producing countries. Rome: Food and Agriculture Organization of the United Nations.
- FAO. 2015c. *World tea production and trade: Current and future development*. Rome: Food and Agriculture Organization of the United Nations .
- FAO. 2016. Report of the tea industry in Tanzania. Rome: Food and Agriculture Organization of the United Nations. Accessed from [www.fao.org/fileadmin/templates/est/.../Tea/.../16-CRS7-TanzaniaMktReport.docx](http://www.fao.org/fileadmin/templates/est/.../Tea/.../16-CRS7-TanzaniaMktReport.docx).

- Friedman, M. 1957. *A theory of the consumption function*. Princeton University Press.
- Flowers, C. 2007. Water management and smallholder fairtrade tea producers in South Western Uganda. Dissertation Submitted for Award of Doctoral Degree at Cranfield University, England.
- Gramza-Michalowska, A. 2014. "Caffeine in tea *Camellia sinensis* - content, absorption, benefits and risks of consumption". *Journal of Nutrition Health and Aging*, 18(2): 143-149.
- Ganewatta, G. and Edwards, G.W. 2000. The Sri Lanka tea industry: Economic issues and government policies. 44th Annual Conference of Australian Agricultural and Resources Economics Society, University of Sydney, Australia.
- Gatsby Charitable Foundation. 2016. Tanzanian tea sector. <http://www.gatsby.org.uk/africa/programmes/tanzanian-tea-sector>.
- Gilbert, C.L. 2010. "How to understand high food prices". *Journal of Agricultural Economics*, 61(2): 398-425.
- Hecht, A. 2015. Coffee: A volatile year-to-year commodity. [<https://www.thebalance.com/coffee-a-volatile-year-to-year-commodity-808982>]. Site visited on 20/11/2016.
- Herath, H.M.U.N. and De Silva, S. 2011. "Strategies for competitive advantage in value added tea marketing". *Tropical Agricultural Research*, 22(3):251-262.
- Hill, C. 2011. Enabling rural women's economic empowerment: Institutions, opportunities, and participation'. In Background paper: UN women expert group meeting Accra, Ghana.
- International Coffee Council - ICC. 2009. Coffee price volatility, 103rd Session 23–25 September 2009. London, England.
- Jones, A.M., X. Koolman and N. Rice. 2004. "Health-related attrition in the BHPS and ECHP: Using inverse probability weighted estimators in nonlinear models". *Journal of the Royal Statistical Society: Series A*.
- Keynes, J.M. 1936. *The general theory of employment, interest and money*. London: London Press.
- Khan, N. and Mukhtar, H. 2013. "Tea and health: Studies in humans". *Current Pharmaceutical Design*, 19(34): 6141-6147.
- Koskei, R.C. 2012. Access and use of information by smallholder tea farmers in Bureti District, Kenya. Dissertation submitted for award of Doctoral Degree at Egerton University, Kenya.
- Le Mare, A. 2008. "The impact of fair trade on social and economic development: A review of the literature". *Geography Compass*, 2(6): 1922-1942.
- Little, R. J., & Rubin, D. B. (1989). The analysis of social science data with missing values. *Sociological methods & research*, 18(2-3), 292-326.
- Loconto, A.M. 2010. Sustainabilitytea: Shaping sustainability in Tanzanian tea production. Dissertation submitted for award of Doctoral Degree at Michigan State University, USA.
- MacKinnon, J.G. and L. Magee. 1990. "Transforming the dependent variable in regression models". *International Economic Review*, 31: 315–339.

- Magrini, M. B., Anton, M., Cholez, C., Corre-Hellou, G., Duc, G., Jeuffroy, M. H., ... & Walrand, S. (2016). Why are grain-legumes rarely present in cropping systems despite their environmental and nutritional benefits? Analyzing lock-in in the French agrifood system. *Ecological Economics*, 126, 152-162.
- McKenzie, D. 2003. "How do households cope with aggregate shocks? Evidence from the Mexican Peso crisis?" *World Development*, 31(7): 1179-99.
- Modigliani, F. and R. Brumberg. 1954. "Utility analysis and the consumption function: An interpretation of cross-section data". In Kurihara, K. (ed), *Post-Keynesian Economics*. Rutgers University Press.
- Moghadam, R., & Canuto, O. (2011). Managing Volatility in Low-Income Countries: The Role and Potential for Contingent Financial Instruments. International Monetary Fund and World Bank.
- Morduch, J. 1995. "Income smoothing and consumption smoothing". *Journal of Economic Perspectives*, 9(3): 103-114.
- Mwangi, M.C. 2016. "The causes of high cost of tea production and sustainability of the tea subsector in Kenya". *International Journal of Science and Research (IJSR)*, 5(9): 1186-1189.
- Ongile, G.A. 1999. Gender and agricultural supply responses to structural adjustment programmes: A case study of smallholder tea producers in Kericho. Research Report No. 109. Nordic Africa Institute.
- Pence, K.M. 2006. "The role of wealth transformations: An application to estimating the effect of tax incentives on savings". *BE Journal of Economic Analysis and Policy Contributions*, 5 (1).
- Perera, P. 2014. "Tea smallholders in Sri Lanka: Issues and challenges in remote areas". *International Journal of Business and Social Science*, 5(12).
- S&D Coffee Report. 2016. Coffee and tea market report. <http://www.sdcoffeetea.com/november-11-2016-coffee-and-tea-market-report/>.
- Sandys, E. 2008. *Rural women in changing world: Opportunities and challenges*. United Nations Publications, USA.
- Singh, I., L. Squire and J. Strauss. 1986. *Agricultural household models*. Baltimore, MD: Johns Hopkins University Press.
- Summer, A. and Sun, M. 2014. Towards gender equality through fairtrade? A case study on small-scale tea farmers in Nandi Hills, Kenya. Dissertation submitted for award of Masters' Degree at Lund University, Sweden.
- Srivastava, A. and Mohanty, S.K. 2010. "Economic proxies, household consumption and health estimates". *Economic and Political Weekly*, 55-63.
- Tea Board of Tanzania - TBT. 2017. Overview of tea sub-sector. Ministry of Agriculture Food Security and Co-operatives. [www.agriculture.go.tz/Lost%20Files/Recovered\\_Word\\_2057.doc](http://www.agriculture.go.tz/Lost%20Files/Recovered_Word_2057.doc). Tea Board of Tanzania. <http://www.teaboard.go.tz/>.
- Thapa, Y.B. 2004. Commodity case study-Tea. The Implications of WTO Membership on Nepalese Agriculture. FAO, UNDP, and Ministry of Agriculture and Cooperatives. Kathmandu, Nepal.

- Thomas, D., Beegle, K. and E. Frankenberg. 2000. Labour market transitions of men and women during economic crisis: Evidence from Indonesia. RAND Labour and Population Program Working Paper Series, 00-11.
- Vernarelli, J.A. and Lambert, J.D. 2013. "Tea consumption is inversely associated with weight status and other markers for metabolic syndrome in US adults". *European Journal of Nutrition*, 52(3): 1039-1048.
- Viswanathan, N.M. 2012. A study on the productivity of tea in Tamil Nadu with special reference to the Nilgiris district.
- World Tea News. 2014. Tea: The future is green and herbal - Global markets, competitors and opportunities-2013-2018 analysis and forecasts. Retrieved from <http://www.reportlinker.com/p01907817/Tea-The-Future-is-Green-and-Herbal---Global-Markets-Competitors-and-Opportunities---2013-2018-Analysis-and-Forecasts>.

# Appendix

**Table A: Regions by period (2008/09 – 2012/13)**

Region name	2008/2009	2010/2011	2012/2013	Total
Dodoma	85	91	89	265
Arusha	98	101	106	305
Kilimanjaro	100	95	98	293
Tanga	103	102	104	309
Morogoro	103	111	112	326
Pwani	56	60	63	179
Dar es Salaam	451	446	443	1,340
Lindi	140	140	138	418
Mtwara	176	175	176	527
Ruvuma	128	129	128	385
Iringa	120	118	119	357
Mbeya	137	137	141	415
Singida	52	55	50	157
Tabora	103	102	102	307
Rukwa	78	81	79	238
Kigoma	101	98	95	294
Shinyanga	126	124	124	374
Kagera	115	119	120	354
Mwanza	113	107	111	331
Mara	54	55	53	162
Manyara	73	68	63	204
Kaskazini Unguja	67	68	68	203
Kusini Unguja	31	37	37	105
Mjini/Magharibi	174	165	167	506
Kaskazini Pemba	78	78	78	234
Kusini Pemba	84	84	82	250
Total	2,946	2,946	2,946	8,838

**Table B: Variable description**

Variable name	Description	Source
<b>Unit price of tea</b>	The total revenue from tea sales divided by the quantity of tea produced during the survey period	Tanzania National Panel Survey (TNPS)
<b>Median price of tea</b>	The median unit value of tea at the district level	Tanzania National Panel Survey (TNPS)
<b>International price</b>	Export prices (in US\$ or TZS) charged offered by international tea markets to tea farmers for their semi-processed tea	Tea Board of Tanzania (TBT)
<b>HH consumption growth</b>	Growth in consumption expenditure for farming household, deflated using the consumer price index	Tanzania National Panel Survey (TNPS)



<b>HH size</b>	Sum of household members	Tanzania National Panel Survey (TNPS)
<b>Education</b>	Highest level of education attained	Tanzania National Panel Survey (TNPS)
<b>Age</b>	Age of household head	Tanzania National Panel Survey (TNPS)
<b>Age squared/100</b>	Square of age of household head	Tanzania National Panel Survey (TNPS)
<b>Wage employment</b>	An indicator variable = 1 if at least one of household members participated in wage work and zero otherwise	Tanzania National Panel Survey (TNPS)
<b>Access to credit</b>	An indicator variable which is equal to 1 if any of the family members has borrowed money in the past 12 months	Tanzania National Panel Survey (TNPS)
<b>HH enterprise</b>	An indicator variable equal to 1 if the household owns a private enterprise and zero otherwise	Tanzania National Panel Survey (TNPS)
<b>Land ownership</b>	An indicator variable which is equal to 1 if a household owns at least one piece of farming land	Tanzania National Panel Survey (TNPS)

(Footnotes)

- 1 Real household consumption growth is in percentage terms.



## Mission

To strengthen local capacity for conducting independent, rigorous inquiry into the problems facing the management of economies in sub-Saharan Africa.

The mission rests on two basic premises: that development is more likely to occur where there is sustained sound management of the economy, and that such management is more likely to happen where there is an active, well-informed group of locally based professional economists to conduct policy-relevant research.

Bringing Rigour and Evidence to Economic Policy Making in Africa

- Improve quality.
- Ensure Sustainability.
- Expand influence.

[www.aercafrica.org](http://www.aercafrica.org)

## Learn More



[www.facebook.com/aercafrica](https://www.facebook.com/aercafrica)



[www.instagram.com/aercafrica\\_official/](https://www.instagram.com/aercafrica_official/)



[twitter.com/aercafrica](https://twitter.com/aercafrica)



[www.linkedin.com/school/aercafrica/](https://www.linkedin.com/school/aercafrica/)

## Contact Us

African Economic Research Consortium  
Consortium pour la Recherche Economique en Afrique  
Middle East Bank Towers,  
3rd Floor, Jakaya Kikwete Road  
Nairobi 00200, Kenya  
Tel: +254 (0) 20 273 4150  
[communications@ercafrica.org](mailto:communications@ercafrica.org)