Diversification towards agro-processing in Zambia: A CGE analysis of financial and fiscal incentives

by
Robert Nhlane

Thesis presented in partial fulfilment of the requirements for the degree of Master of Science (Agricultural Economics) in the Faculty of AgriSciences at Stellenbosch University

Supervisor: Dr Cecilia Punt

December 2016

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December 2016

Abstract

The Zambian economy has in the past decade experienced steady annual growth with real Gross Domestic Product (GDP) growth rate averaging 6.7 percent per annum. However, reports by the Ministry of Finance and National Planning revealed that in 2015, the Zambian economy grew by only 3.6 percent. Volatilities in the global economy have in recent times negatively affected copper prices and output which has resulted into widening trade deficit, rapid depreciation of the local currency, rising cost of living and anticipated declining economic growth. To promote economic resilience, there is need therefore to diversify the economy away from copper. Hence, one of government's macroeconomic objectives is to promote and accelerate diversification of the Zambian economy towards among others the primary agriculture and agro-processing sectors. The main objective of the study was to assess the impact of providing fiscal and financial incentives to the agro-processing sector on the Zambian economy as a whole.

The model was calibrated to Zambia's most recent dataset, the 2007 Social Accounting Matrix (SAM) developed by the Zambia Institute for Policy Analysis and Research (ZIPAR) in collaboration with the International Food Policy Research Institute (IFPRI) and the United Nations University's World Institute for Development Economics (UNU-WIDER). This SAM is suitable for this study as it contains information on various taxes, production factors, households (both urban and rural) and various industries including primary agriculture and agro-processing. To analyze the effects of fiscal and financial incentives, a comparative static computable general equilibrium (CGE) model developed by Lofgren, Thomas and El-said (2002) was used. Four alternative scenarios were constructed and their individual effects analyzed and compared. These scenarios were introducing export taxes on primary agricultural commodities, increasing import tariffs on agro-processed commodities, introducing production subsidies on primary agriculture and increasing government direct transfer payments to households. All increased to 30 percent.

Findings suggest that the production subsidy and export tax policies are effective at promoting the domestic agro-processing sector. The subsidy policy increased quantity of exports of agro-processed commodities by 2.0 percent and reduced imports by 8.55 percent though quantity of domestic sales dropped by 0.8 percent. Furthermore, primary agriculture and agro-processing sectors contribution to GDP at factor costs rose by 27 percent and 8.19 percent. The subsidy policy also may lead to improvements in welfare of most households as shown by the

compensating variation (CV) results. Export tax policy is also effective at promoting domestic agro-processing as the intermediate input price and quantity of imported agro-processed commodities dropped by 0.22 percent and 3.14 percent while both quantities of domestic sales and exports increased by 0.3 percent and 2.5 percent respectively. With regards to the import tariff policy, although it led to an increase in quantity of domestic sales (1.8 percent), the corresponding decline in imports of agro-processed commodities (-33 percent) was huge for such a small gain and therefore this policy can have negative effects on consumer welfare. The contribution to GDP of most sectors dropped with only agro-processing that increased (4.82 percent). Finally, the transfer payment policy had positive but small effects on domestic sales (0.2 percent), exports (0.2 percent) and imports (0.2 percent).

It is recommended that the Government of Zambia use either production subsidies or export taxes to promote subsectors such as, cotton yarn and woven fabrics of cotton, high value tobacco products (such as cigars), refined sugar as well as some milling products. Alternatively, direct transfer payments in form of cash transfers to households may be implemented which would possibly help mitigate the negative effects caused by economic challenges faced. Finally, there is need to develop a strong and reliable mechanism for monitoring and evaluation of fiscal and financial incentives.

Opsomming

Die Zambiese ekonomie het in die afgelope dekade bestendige jaarlikse groei ervaar met 'n reële bruto binnelandse produk (BBP) groeikoers van gemiddeld 6.7 persent per jaar. Maar verslae deur die Departement van Finansies en die Nasionale Beplanningskommissie het aan die lig gebring dat in 2015 die Zambiese ekonomie met net 3.6 persent gegroei het. Skommelings in die globale ekonomie het in die afgelope tyd die prys en uitset van koper negatief beïnvloed, wat gelei het tot die vergroting van die handelstekort, vinnige verswakking van die plaaslike geldeenheid, stygende lewenskoste en verwagte dalende ekonomiese groei. Om ekonomiese veerkragtigheid te bevorder, is dit dus nodig om die ekonomie weg van koper te diversifiseer. Dus, een van die regering se makro-ekonomiese doelwitte is om diversifisering van die Zambiese ekonomie ten opsigte van onder andere die primêre landbou- en landbou-verwerking te bevorder en te versnel. Die hoofdoel van die studie was om die impak van die verskaffing van fiskale en finansiële aansporings aan die landbou-verwerking sektor op die Zambiese ekonomie as 'n geheel te evalueer.

Die model is gekalibreer met Zambië se mees onlangse datastel, die 2007 Sosiale Rekeninge Matriks (SAM) vir Zambië, ontwikkel deur die Zambiese Instituut vir Beleidsanalise en Navorsing (ZIPAR) in samewerking met die Internasionale Voedsel Beleid Navorsingsinstituut (IFPRI) en die Universiteit van die Verenigde Nasies se Wêreld Instituut vir Ontwikkelingsekonomie (UNU-WIDER). Die SAM is geskik vir hierdie studie aangesien dit inligting oor verskeie belastings, produksiefaktore, huishoudings (beide stedelik en landelik) en verskeie industrieë, insluitende primêre landbou en landbou-verwerking, bevat. Om die uitwerking van fiskale en finansiële aansporings te ontleed, is 'n vergelykende statiese berekenbare algemene ewewig (CGE) model, wat ontwikkel is deur Lofgren, Thomas en El-said (2002), gebruik. Vier alternatiewe scenario's is ontwikkel en hul individuele effekte is ontleed en vergelyk. Die scenarios is: die instelling van uitvoerbelasting op primêre landbouprodukte, die verhoging van invoertariewe op landbou-verwerkte kommoditeite, die instelling van die produksie subsidies op primêre landbou en die verhoging van direkte oordragbetalings van die regering aan huishoudings. Alles het tot 30 persent gestyg.

Bevindinge toon dat die produksie subisidie en uitvoerbelasting beleid effektief is vir die bevordering van plaaslike landbou-verwerking. Die subsidie beleid lei daartoe dat die hoeveelheid van die uitvoere van verwerkte landbouprodukte verhoog met 2.0 persent en invoere met 8.55 persent verminder al het die hoeveelheid binnelandse verkope met 0.8 persent

verminder. Verder het die bydrae van primêre landbou en landbou-verwerking tot die BBP teen faktorkoste gestyg met 27 persent en 8.19 persent onderskeidelik. Die subsidie beleid kan ook lei tot ‘n verbetering in welvaart van meeste huishoudings soos aangedui deur die resultate ten opsigte van die variasie van vergoeding. Uitvoerbelasting beleid is ook effektief om plaaslike produksie van landbou-verwerkte produkte aan te moedig, aangesien die prys van intermediêre insette en die hoeveelheid ingevoerde verwerkte landbouprodukte met 0.22 persent en 3.14 persent onderskeidelik afneem, terwyl hoeveelhede van binnelandse verkope en uitvoere met 0.3 persent en 2.5 persent onderskeidelik toeneem. Met betrekking tot die invoertarief beleid, hoewel dit gelei het tot 'n toename in die hoeveelheid van binnelandse verkope (1.8 persent), was die ooreenstemmende afname in die invoer van verwerkte landbouprodukte groot (-33 persent) vir so 'n klein voordeel en dus kan hierdie beleid negatiewe gevolge inhou vir die welvaart van verbruikers. Die bydrae tot die BBP van die meeste sektore daal, met slegs landbouverwerking se bydrae wat styg (4.82 persent). Ten slotte, die oordragbetaling beleid het ‘n positiewe maar klein uitwerking op binnelandse verkope (0.2 persent), uitvoere (0.2 persent) en invoere (0.2 persent) gehad.

Dit word aanbeveel dat die Regering van Zambië subsidies of uitvoerbelasting gebruik om subsektore soos katoen en weefstowwe van katoen, hoë waarde tabakprodukte (soos sigare), verfynde suiker asook 'n paar gemaalde produkte te bevorder. Alternatiewelik, kan direkte oordragbetaling in die vorm van kontant oordrafte aan huishoudings, geïmplementeer word om moontlik te help om die negatiewe effekte veroorsaak deur ekonomiese uitdagings, die hoof te bied. Op die ou end moet daar 'n sterk en betroubare meganisme vir die monitering en evaluering van fiskale en finansiële aansporings ontwikkel word.

Acknowledgements

Primarily, special thanks goes to the Almighty God without whom I am nothing and this thesis would not have been completed. My sincere appreciation and gratitude goes to the following who played a role in successful completion of my master's thesis:

- ❖ My supervisor, Dr Cecilia Punt, who taught me SAM based modelling and for her guidance, patience and support during supervision of my thesis
- ❖ The chairperson of the Department of Agricultural Economics at Stellenbosch University, Prof Nick Vink, for accommodating me in the department
- ❖ My sponsors, the Beit Trust Foundation (UK) and Stellenbosch University for their generous financial support rendered to me during the 2 years while I studied for my master's degree
- ❖ My employer, the University of Zambia, for providing supplementary funds that greatly smoothened my studies
- ❖ My family and son, Abraham, for their patience and motivation during the entire study period
- ❖ Finally, all my colleagues in the Department of Agricultural Economics; thank you for your friendship and association.

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Acronyms

AFDB	African Development Bank
BOZ	Bank of Zambia
CAADP	Comprehensive Africa Agriculture Development Programme
CES	Constant Elasticity of Substitution
CET	Constant Elasticity of Transformation
CGE	Computable General Equilibrium
CIA	Central Intelligence Agency
CIT	Corporate Income Tax
COMESA	Common Market for Eastern and Southern Africa
CV	Compensating variation
CSO	Central Statistical Office
DRC	Democratic Republic of Congo
EPZ	Export Processing Zones
EU	European Union
FAO	Food and Agriculture Organization
FDI	Foreign Direct Investment
FNDP	Fifth National Development Plan
FOB	Free On Board
GAMS	General Algebraic Modelling System
GDP	Gross Domestic Product

GRZ	Government Republic of Zambia
GTAP	Global Trade Analysis Project
IFPRI	International Food Policy Research Institute
IO	Input-Output
LES	Linear Expenditure System
METR	Marginal Effective Tax Rate
MFNP	Ministry of Finance and National Planning
MMD	Movement for Multiparty Democracy
MPC	Marginal Propensity to Consume
NEG	New Economic Geography
NTEs	Non-Traditional Exports
OECD	Organization for Economic Cooperation and Development
PAYE	Pay As You Earn
PF	Patriotic Front
PROVIDE	Provincial Decision-Making Enabling
RALS	Rural Agricultural Livelihoods Survey
RMC	Rubicon Management Consultants
ROW	Rest of the World
SADC	Southern Africa Development Community
SAM	Social Accounting Matrix
S-I	Savings-Investments

UAE	United Arab Emirates
UN	United Nations
UNU-WIDER	United Nations University’s World Institute for Development Economics Research
UNCTAD	United Nations Conference on Trade and Development
USD	United States Dollar
VAT	Value Added Tax
WB	World Bank
ZDA	Zambia Development Agency
ZEGA	Zambia Export Growers Association
ZIPAR	Zambia Institute for Policy Analysis and Research
ZMW	Zambian Kwacha rebased
ZRA	Zambia Revenue Authority

1. Introduction

1.1 Background

The Zambian economy has in the past decade experienced steady economic growth and recorded an average of 6.7 percent annual growth in real Gross Domestic Product (GDP) from 2000 to 2015 (Central Intelligency Agency, 2015). However reports by the MFNP (2015) revealed that in 2015, the Zambian economy grew by only 3.6 percent. The slow growth was attributed to the general decline in global growth, which reduced the demand, and hence the international prices of copper and other commodities. Other contributing factors include adverse weather conditions caused by El Nino and electricity deficits, which has further slowed down production in many sectors of the Zambian economy. Zambia's economy is largely dependent on one major commodity, namely copper, for its foreign exchange earnings. Other exports are cane sugar, barley, tobacco, gemstones, cotton lint, fresh flowers, cotton yarn, fresh fruits and vegetables, maize, wheat etc. Notable trading partners in terms of export shares are South Africa (31.3 percent), Democratic Republic of the Congo (18.7 percent), China (9.3 percent), Kenya (8.3 percent), Algeria (5.9 percent) and India (4.4 percent) (CIA, 2015).

From 2004, there was a steady increase in copper production and output mostly due to favourably higher copper prices on the international market and increased influx of foreign investments into the mining sector. With the Democratic Republic of Congo taking over as Africa's largest copper producer, output weakened in Zambia in 2014 while in the second quarter of 2015 prices and output had further declined due to China's economic slowdown. These external shocks pose serious problems for the economy such as increased inflation, unstable currency, reduced forex and widening budget deficit. For example, due to current developments in the global economy, both production and prices of copper have been affected and this has contributed to the worsening of the trade deficit which widened to USD 386 million in 2015 from USD 179 million in 2014 (MFNP, 2015). As of August 2015, Zambia's total exports amounted to ZMW5.4 billion and total imports at ZMW6.1 billion, giving a trade deficit of ZMW724.70 million. The exchange rate against major international currencies increased for example from K7.7 per US dollar in July 2015 to K12 per US dollar in October same year (Bank of Zambia, 2015). Zambia is an import based economy and with increases in exchange rates food inflation increased from 7.2 percent during the first quarter of 2015 to 8.1 percent during the second quarter (MFNP, 2015).

Zambia has abundant agricultural resources, but much of that potential remains underutilized with only 31.7 percent of arable land being used for agriculture. One alternative action is to diversify the Zambian economy away from copper to other sectors such as energy, tourism and agriculture. (MFNP, 2015). Key to the success of diversification is enhancement of export competiveness and creation of markets for products and commodities. Agro-processing activities will add value to products thereby creating linkages with other sectors and increasing the profit margins received by producers. This will help relieve the economy from the volatile changes that has been affecting copper prices and production. It is hypothesised that diversification of the economy will in the long-run build up foreign reserves and hence help to stabilize the exchange rate. It is for this reason that one of the government's macroeconomic objectives for 2016 is to accelerate the diversification of the economy, towards agriculture and agro processing as these sectors have the potential to foster economic growth and development. To achieve this, government intends to provide financial and technical support towards the stated sectors. In addition the government recently approved an industrialisation and job creation strategy in an effort to promote industrial development (Fessehaie, Roberts, Nair and Ncube, 2015).

1.2 Problem statement

Volatilities in the global economy have in recent times negatively affected copper prices and output which has resulted into widening trade deficit, rapid depreciation of the local currency, rising cost of living and anticipated declining economic growth. To promote economic resilience, there is need to diversify the economy away from copper. Hence, government's macroeconomic objective is to promote and accelerate diversification of the Zambian economy towards among other the agriculture and agro-processing sectors (MFNP, 2015).

Previous research has been conducted on the impact of investment programmes on agriculture in Zambia. One such study analysed the implementation of the Zambia Agriculture Investment Programme (Nokkala, 2001). The study used the Social Accounting Matrix based multipliers to investigate the impact of government and aid expenditure into either commercial agriculture or non-commercial agriculture on household incomes as well as total agricultural production and output. Thurlow, Benin, Diao and Kalinda (2008) did a study in which they used a dynamic CGE model to analyse the agricultural growth and investment options that can support the development of a more comprehensive rural development component under Zambia's Firth National Development Plan. In addition, the study assessed the aggregate public resources required by the agricultural sector for achieving the development goals committed to by the government i.e. the target of the Comprehensive Africa Agriculture Development Programme (CAADP) to achieve 6 percent agricultural growth per year. Dorosh & Thurlow (2014) used a CGE models to estimate the sectorial poverty–growth elasticities in five African countries that included Zambia while Fontana (2002) applied a gendered CGE model to analyse the effects of tariff removal on imported manufactured products and non-traditional agricultural export promotion strategies on female and male households.

Agro-processing plays a significant role in rural and general economy as a whole. It adds value to farm produce leading to higher income transfer to the farmers from different classes of consumers (Chengappa, 2004). It is also true that the markets for processed products/food is expanding not only in Zambia but also in other countries within the Southern Africa region. Promoting agro-processing therefore presents opportunities for improving the trade balance. However, Trade Map (2016) statistics on selected subsectors of agro-processing show that most value added products are underperforming in terms of export values and annual growth. Statistics reveal that on average and from 2001 to 2015, Zambia's exports of raw sugar were valued at over USD 81 million per year compared to refined sugar products that were valued at about USD 22 million per year during the same period. Similar trends are observed with other agro-processed products such as processed cotton (cotton yarn and woven fabrics of cotton). A good example is that of 2014 in which processed cotton exports were recorded at only USD 5.3 million against raw cotton that amounted to USD 62 million. This is a clear indication that Zambia's agro-processing sector is underperforming as evidenced by lower exports relative to raw agricultural commodities. Hence there is need to boost the sector through among other things provision of fiscal and financial incentives.

Despite the forward and backward linkages that the agro-processing sector forms with other industries, there is little literature on the general equilibrium effects of providing incentives to this sector in Zambia. This study therefore aims to fill this gap by analysing the economy-wide impacts of financing the agro-processing sector through provision of fiscal and financial incentives.

1.3 Study objectives

The primary objective of the study is to assess the impact of providing fiscal and financial incentives to the agro-processing sector on the Zambian economy as a whole.

In trying to achieve the main objective, the study will specifically:

1. Evaluate the effects of export tax imposition on primary agricultural commodities which are intermediate inputs in agro-processing of products
2. Assess the effects of import tariff increase on agro-processed import products
3. Analyse the effects of production subsidy provision on primary agriculture
4. Evaluate the effects of direct government transfer payments to all households.

1.4 Significance of the study

Agro-processing has the potential to improve Zambia's trade balance as well as the living standards of rural households through enhanced incomes. It has been the government's objective since 2006 to promote growth in sectors like agro-processing by introducing tax and other incentives. However little literature exists that quantifies the impact of such incentives on the Zambian economy. This study therefore fills these gaps and provides knowledge and information on the effects of providing tax and financial incentives to the agro-processing sector. The findings of this research will be useful to provide guidelines and recommendation to various stakeholders that include the government, private sectors, academia and other decision-makers.

1.5 Data and methodology

The analysis is done using a static computable general equilibrium model developed by Lofgren *et al.*, (2002) and used in policy studies by Arndt, Jensen, Robinson and Tarp (2000), Lofgren and Robinson (2002), Alshehabi (2013), Lo and El-said (2001), Bahta, Willemse and Grove (2014), Diao, Somwaru and Tuan (2003) and many others. CGE models are explicit in recognising that changes or external shocks on one section of the economy can have effects on the economy as a whole. Lofgren and El-said (1999) emphasised that computable general equilibrium model captures both direct and indirect effects of a policy change on the economy. Hence this model will be useful in capturing the trade-offs and opportunity costs of providing support in the form of fiscal and financial incentives to the agro-processing sector. The model will also be useful in capturing inter-linkages between agriculture and agro-processing as well as with the rest of the economy.

The model is calibrated to Zambia's most recent publicly available dataset, the 2007 Social Accounting Matrix (SAM), developed by the Zambia Institute for Policy Analysis and Research (ZIPAR), in collaboration with the International Food Policy Research Institute

(IFPRI) and the United Nations University's World Institute for Development Economics Research (UNU-WIDER) (Chikuba *et al.*, 2013). Pyatt (1987) defined a SAM as a system of single entry bookkeeping presented in the form of a square matrix wherein each account is represented by both a row and column. Entries in the SAM represent transaction values where the rows capture incomes to the respective accounts while columns represent expenditures by respective accounts. Suffice to note that a national SAM such as the one used in this study is a countrywide data framework presenting the real economy of a single country.

According to the manual by Chikuba *et al*. (2013) the 2007 SAM for Zambia was constructed from various national data sources such as Input-Output tables, national accounts, government budgets and balance of payments. Information on labour and household consumption was derived from the 2006 Living Conditions Monitoring Survey. This SAM constitutes 44 accounts for productive activities and commodities without secondary production. Agro-processing was disaggregated into 8 accounts namely: meat, fish and dairy, grain milling, sugar refining, other food processing, beverages, tobacco curing and processing, textiles and clothing, and wood and paper making. Labour was disaggregated into four categories based on the level of education attained as follows: no primary education, with primary education (grade 7), with secondary education (grade 12) and with some tertiary education. The SAM has three capital accounts: land, livestock and other forms of capital. Per capita expenditure formed the basis for disaggregating households in the SAM. Lastly, the SAM has government, investment and foreign accounts (Chikuba *et al*., 2013).

A SAM captures the entire circular flow of incomes in the economy hence is more favourable than the Input-Output (IO) tables. This therefore makes the Social Accounting Matrix an ideal dataset to simulate the economy-wide impacts of government's incentives and financial support to the agro-processing sector.

1.6 Outline of thesis

The rest of the thesis will be organised as follows: chapter 2 provides the literature review on partial equilibrium effects of import tariffs, export taxes and production subsidies. The chapter is concluded by a brief discussion of CGE models and the justification for use in this study. Chapter 3 gives an overview of the Zambian macro-economy as well as the industry analysis of the primary agriculture and agro-processing sectors as well as the current tax incentive provided by the Zambian government. Chapter 4 is a discussion on the modelling methods/methodology and data used in the study. The CGE model used including its price and production structure and the 2007 Zambian SAM, are discussed. The scenarios, model closures and simulation results are presented in chapter 5. These results are presented in four categories that include: sectoral effects, income effects, macroeconomic effects and sensitivity analysis. Finally, chapter 6 constitutes the study summary, policy implications and recommendations.

2. Literature review

2.1 Introduction

This chapter starts by giving a brief discussion on the theory of neoclassical investment, pioneered by Jorgenson (1963) on which the fiscal and financial incentives are based. Then an analysis of specific incentives applicable to this study is done and the policy tools considered include export taxes, import tariffs and production subsidies. The next section provides a brief discussion of the role of agro-processing and primary agriculture in economic growth and development of a developing country like Zambia. This is followed by the justification for focusing on providing the various fiscal and financial incentives on the agro-processing sector. Then an in-depth review of previous studies that focused on fiscal and financial incentives (particularly tax policy) is done. The literature review on previous studies is divided into two: in the first category focus is on similar studies that used the computable general equilibrium models as a measurement technique while the other one looks at studies done using partial equilibrium models. The concluding section gives the general discussion of CGE models and provides the justification for using them in policy studies like this one.

2.2 Theory of neoclassical investment

According to Klemm (2010:315) tax incentives are "All measures that provide explicitly for a more favorable tax treatment of certain activities or sectors compared to what is granted to general industry". These incentives can be fiscal or non-fiscal in nature, direct or indirect. It is argued that market failures such as externalities, infant industries, information asymmetries and uncertainty and the political economy justify the provision of these incentives by the government. The basic role of the government is to create an enabling environment through provision of laws and regulatory framework. Through appropriate trade policies and provision of public goods a competitive environment is created that help ensure markets work well. In addition government's second order activities include providing finance to strategic sectors such as agriculture and agro-processing as well as transport and information (Jordan, 2012).

Jorgenson (1963) did a lot of empirical work on the neoclassical investment theory and provided a theoretical background, which explains the relationship between tax incentives and investment. He argued that firms would accumulate capital on the condition that benefits exceed costs. According to Parys and James (2010) the impact of tax incentives on investment can be evaluated by first estimating the effect it has on the user cost of capital. The theory of neoclassical investment assumes that as long as the user cost of capital goes down because of a tax incentive such as a decrease in corporate income tax, investment will automatically increase. Similarly, in this study, it can be argued that changes in import tariffs and export taxes can lead to reduced domestic prices of selected output that is used as intermediate inputs in agro-processing industries. This then implies increased availability of inputs at relatively lower cost and eventually boosting the processing sector.

2.3 Economics behind export taxes

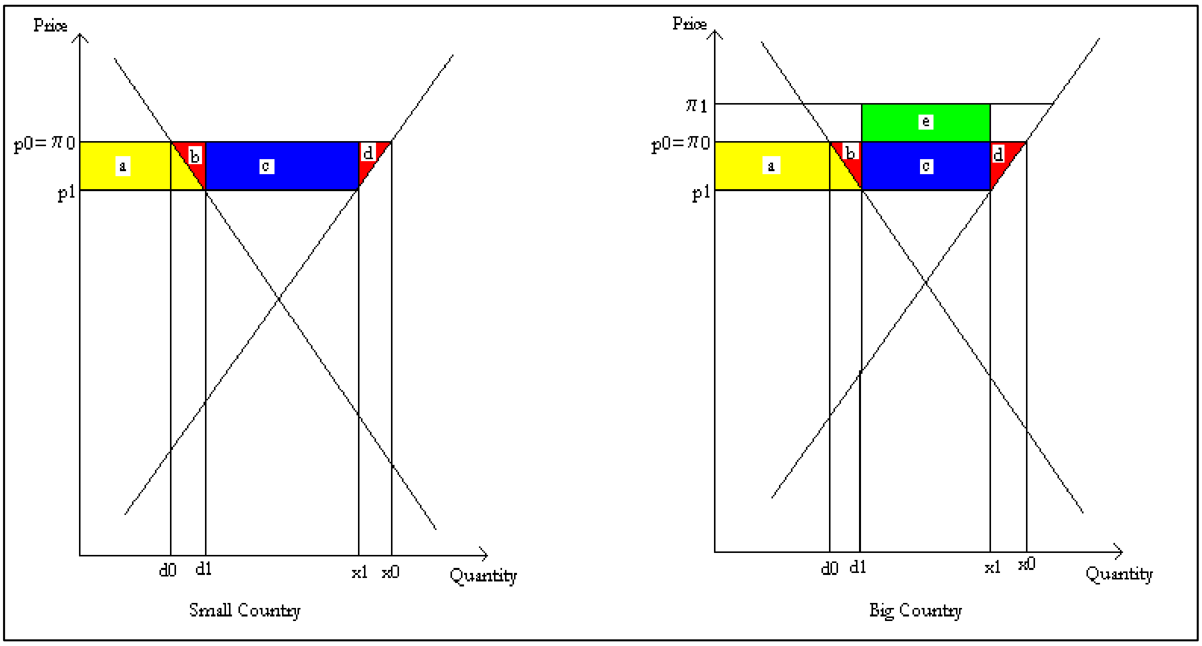
Export taxes can be defined as taxes imposed by a given country on selected export commodities. There are various motives such as to discourage exportation of a given product or group of commodities that are either deemed essential for the growth of a particular sector or for food security concerns. For example, raw agricultural commodities can be subjected to export taxes to ensure adequate supply for the locals to access as food. The economic effects of an export tax works in similar but opposite way as import tariffs. The application of export taxes results into trade diversion in the import market away from the country imposing the export taxes (Sandrey, 2014). The results of imposing export taxes i.e. whether it raises the prices of the export commodities in the export market and lower them in the domestic market depends on market share. Generally, in the case of a large country with significant market share, an export tax will be able to increase overall prices and lead to better terms of trade while with a small country case, a country imposing export taxes would lose its market share (Bouet and Laborde, 2008).

To illustrate the effects of an export tax in partial equilibrium, figure 2-1 is used. To begin assume a small country case, (implying that such a country is too small in trade volumes in a particular product to influence the world prices) with initial price in the domestic and world markets given by p_0 and π_0 while domestic demand and supply are given by d_0 and x_0. At this stage the quantity exported by producers is given by the difference between x_0 and d_0. By imposing export tax, t on exported commodities, the price received by local producers drops from p_0 to p_1 and the producers in the domestic market initially find it profitable to supply the domestic market rather than the foreign market where export taxes are relevant. As a result, supply increases in the local market, which eventually reduces the domestic price until a point where the domestic price equals the world price (p_0(1+t) =π_0). Once this happens, the local producers become indifferent whether to supply the local market or the foreign market in the form of exports. In terms of welfare, the consumers benefit from this policy as the consumer surplus increases by area a in yellow. Domestic producers on the other hand loose as their surplus falls by areas (a + b + c + d). On a positive note, government revenues rise by area *c*. The overall effect therefore is national welfare loss equal to area (b + d). Despite this such a policy according to Bouet and Laborde (2008) also has distributional effects which can be used especially if the government policy is to make food affordable by poorer households for example. Note that here emphasis was on effects in a small country case because in this study it is assumed that Zambia's trade volumes in primary agricultural commodities is small such that changes in this sector would not influence world prices and incomes.

It is worth mentioning that the main difference with a large country assumption is that changes in a given country's supply of a particular product would change the price prevailing in the world market (refer to the second panel in figure 2.1). This is so because it is assumed that if a large country exports a significant share of world exports, it can affect the world price when altering the quantity of its exports. Imposing an export tax raises the world price to π_1 which increases government revenues by (c + e). Areas b + d show losses in welfare arising from these new distortions while area e represents an improvement in national terms of trade. Final exports are given by the difference between x_1 and d_1 and are sold at π_1 instead of π_0. The gain in terms of trade for each unit is given by the difference (π_1 - π_0).

In this study, export taxes are simulated on primary agricultural commodities to test the hypothesis that such a tax would restrict exports of raw produce, which would in turn ensure that the players in the agro-processing sector have access to a steady supply of intermediate inputs at relatively lower prices. In addition to analyzing the changes in export quantities and incomes, the simulation employed in this study is a general equilibrium one that captures direct and indirect effects not only in the sector being studied but all sectors as a whole.

Figure 2-1: Effects of imposing export taxes in a small and large country case



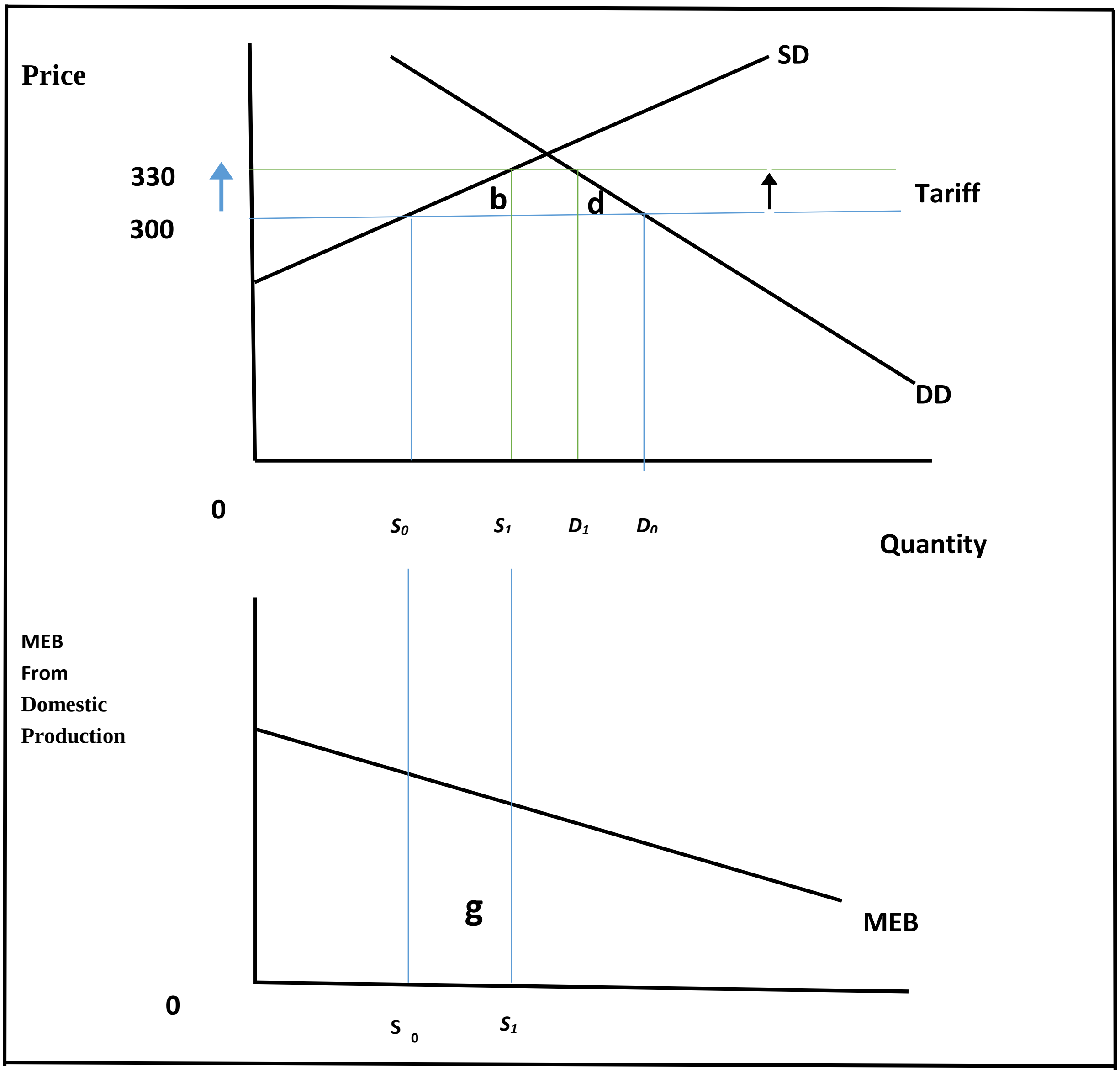
Source: Bouet and Laborde (2008) page 3

2.4 Theory of import tariffs

According to Lindert and Pugel (1996) an import tariff can be defined as a tax imposed on goods or services that are imported into a given country. Governments impose import tariffs with the aim to protect and promote a given sector that is seen as strategic to economic growth, poverty reduction or simply national development among other reasons. A country can decide to impose an import tariff as a policy tool to encourage domestic production of the good especially if it imports most of the good and has potential to produce. Import tariffs fall into two categories; specific tariff which is the tax charged per physical unit of imports such as dollar per kg of wheat and ad valorem tariff which is expressed as a percent of the market value of imported goods or services. The effects of an import tariff vary depending on whether the country imposing it has large enough trade volumes in a particular product to affect world prices or it is small that it takes prices as given. The welfare effects of import tariffs also vary among the consumers, producers and the government. Despite some welfare losses that come with such tariffs, some economists argue that there may be some social side benefits that accrue if such a good is produced domestically. Examples of such benefits are technology transfer, acquisition of modern skills and employment creation (Lindert and Pugel 1996).

To illustrate how this works, assume a country intends to encourage domestic processing of cotton lint by imposing $30 on imported lint. To make the explanation clear, figure 2-2 is used where S_D and D_D represent domestic supply and demand curves while S and D show the quantities supplied and demanded respectively. The marginal external benefit curve is represented by MEB. At the starting point before the tariff, the domestic price of cotton lint is $300 and the quantity demanded is D_0 while quantity supplied is given by S_0. Imposing an import tariff of $30 increases the domestic price of cotton lint from $300 to $330. At this price, quantity supplied increases from S_0 to S_1 while quantity demanded drops from D_0 to D_1. From figure 2-2, it is clear that such a tariff would lead to welfare losses equal to areas b and d. However, assume that the marginal side benefits of producing cotton lint can be represented by the area under Marginal External Benefit (MEB) curve as shown in the figure 2-2. Introducing an import tariff increases the price of cotton lint, which further encourages more production to take place. Domestic production increases from S_0 to S_1 which brings about additional marginal external benefits to the nation equal to area g. The MEB in this case is important because it represent the extra benefits that are not captured by producer surplus. It is important to note however that the overall effect of imposing import tariffs depends on whether area g is larger than combined area b and d or vice versa. In this section, a partial analysis of import tariff has been given to analyze the effects on quantity demanded and supplied of imported cotton lint as well as welfare changes. This study builds on this analysis and extends the analysis to include all agro-processed commodities. Moreover, a static computable general equilibrium model fully discussed in section 4.2, is used to capture the effects of tariff imposition on agro-processing commodities and the indirect effects on the entire Zambian economy.

Figure 2-2: Effects of an import tariff hike on domestic production



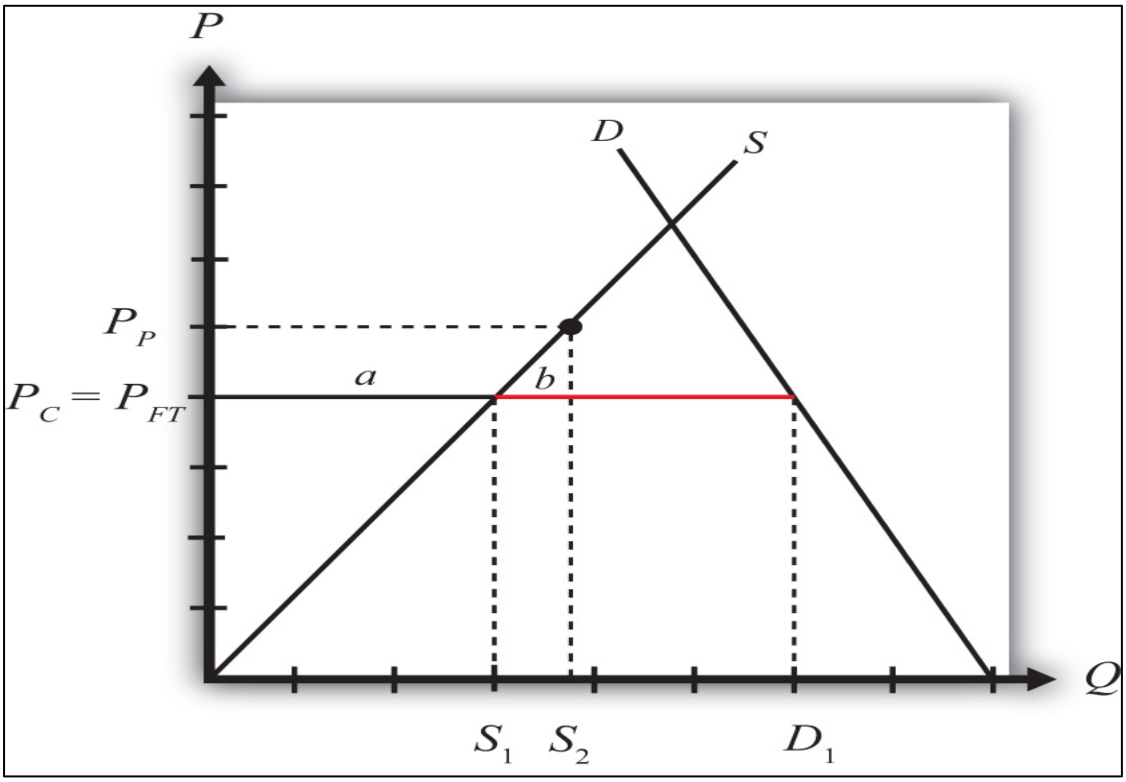
Source: Pugel (2012)

2.5 Subsidy as an alternative policy tool

It is clear that the objective of a country in most cases when imposing a tariff as discussed in the previous section is not to discourage consumption or imports of a given good but rather to promote domestic production. It is therefore important to analyze alternative policy tools that can generate the similar results but which might be more appropriate. That said instead of introducing or increasing import tariffs, the government of a given country could provide production subsidy to priority sectors.

Figure 2-3 is an illustration of how a production subsidy works in a small importing country case. In the figure, S shows domestic supply curve while D gives domestic demand curve at price, *PFT* that is the free trade price. S_1 and D_1 represent the initial quantity supplied and demanded respectively. The amount of imports is given by the difference between D_1 and S_1. The imposition of production subsidy *s* increases the domestic producer price by the same value as the subsidy to P_P. Since the assumption is that of a small country, such a change does not affect world prices of the same commodity hence domestic consumer price, remain unchanged at *PFT*. With a higher domestic producer price, domestic supply increases from S_1 to S_2 while domestic demand remains at D_1. Eventually the quantity of imports drops to $(D_1 - S_2)$ from $(D_1 - S_1)$. In terms of welfare effects, consumers are not affected, as the domestic consumer price remains unchanged. Producers on the other hand benefit as their producer surplus increases (area *a*). The subsidy has to be funded by the government through increases in taxes paid by some households in the economy hence the loss in government income is given by –(a + b) and the net national welfare effect is negative shown by –b. In this study, a production subsidy is given to the primary agricultural sector to analyse the general equilibrium effects on the whole economy and agro-processing sector in particular.

Figure 2-3: Effects of production subsidy in a small importing country case



Source: Lardbucket (2012)

2.6 General arguments for provision of incentives

2.6.1 Food security and price stability

There are a number of reasons for giving incentives for example an export tax can act as an incentive to domestic consumers of the taxed food commodity because it lowers the domestic price relative to the one prevailing in the international market. The immediate effect of such a policy is that producers would tend to sell more on the domestic market relative to export market. This means that domestic households would be able to purchase the commodity in question at relatively lower prices as their purchasing power is effectively increased. Bouët and Debucquet (2010) give an example of how the Indonesian government imposed export taxes on palm oil products in 1994 because these products were considered essential commodities. During the 2006-2008 food crisis, several governments used this same rationale to restrict exports by imposing export taxes.

2.6.2 Local processing and manufacturing of products

Similarly, an export tax can act as an indirect subsidy, in this case to domestic manufacturers and processors. If the commodity being taxed were an important input in the manufacturing or indeed processing of agricultural products, imposing a tax on such a commodity would lower its domestic price thereby reducing the average cost of production and increasing profitability ceteris paribus. Bouët and Debucquet (2010) argue that if export taxes were imposed on primary commodities, particularly unprocessed ones, such a tax would operate as an indirect subsidy to processing sectors that are involved in value addition by lowering the price of intermediate inputs in the domestic market relative to the international market. The authors further provide examples of countries that implemented export taxes to promote local value addition and processing. To promote the local yarn cotton sector, Pakistan imposed export tax on raw cotton while Indonesia and Malaysia imposed them on palm oil to stimulate biodiesel and cooking oil production.

2.6.3 Foreign direct investment attraction

Foreign investment plays a key role in an economy as it can yield net benefits to the host country through creation of employment for local residents, widening the tax base and in some cases transferring of technology that may not be available in the domestic economy. Therefore, governments of developing economies can implement (through the tax system), tax incentives aimed at attracting foreign investment. Empirical evidence shows mixed findings as to how well these incentives work in as far as attracting foreign investment. It is important to note therefore that the effectiveness of these incentives depends on many factors and the extent to which foreign firms respond and behave. Shah (2006) argues that if not properly implemented the costs of these incentives may outweigh the intended benefits of attracting foreign investment leading to transfer of tax revenues to foreign treasures.

2.6.4 Infant industry argument

In some cases, there may be firms operating in strategic sectors of an economy whose sizes are too small to compete with well-established foreign firms producing or trading in the similar sectors as their domestic counterparts. The use of tax incentives is justified and if properly implemented can be an effective policy tool to promote the infant firms until such a point that they become competitive. In Zambia, the growing middle class is putting pressure on the demand for processed foods and beverages. The ICC (2015) and ZDA (2011) note that import demand for these processed agro-products in Zambia is growing faster than world averages. Zambia's most common agro-processed imports from South Africa and lately Asia and Latin America include fish, bakery products, dairy products, prepared fruits, vegetables, and miscellaneous edible preparations. The increased import of these agro-processed products is a clear indication that Zambia's agro-processing industry is still underdeveloped. The application of temporary tax and financial incentives that target small-growing firms operating in sectors of interest is therefore justified. The rationale for targeting such small firms is due to the challenges of competition and capital constraints that makes it increasingly difficult to access funds especially in developing economies such as Zambia. The realization of benefits from such government policy may not be immediate as there is always a time lag. Some foreign firms may have market power and political influence that they take advantage of such opportunities. For example, the government can provide tax incentives that are meant to promote the disadvantaged domestic infant firms in which case foreign firms with relatively larger market share may benefit instead. Hence there is need to design the incentives in a way that they are not dissipated as tax transfers to foreign treasuries.

Food and beverages is the largest component of household consumption in Zambia, and in the region (with the exception of South Africa and Namibia). The rise of the urban middle class is critical because it is driving consumption of processed foods and beverages (Fessehaie *et al.* , 2015).

2.6.5 Fiscal incentives

This study dwells on import-based and export-based fiscal incentives. Import based incentives are those that give reduced rates and in some cases exoneration from import duty payments on capital goods such as machinery as well as other specific inputs used in a given production process (Shah, 2006). In some case, the import tariffs may be increased as a fiscal policy measure to protect and promote infant industries. Export-based fiscal incentives on the other hand may provide relief to firms in form of exemptions from paying export duties/taxes, lowering of tax rates on incomes earned from exports or giving of tax credits for duties paid on imported input materials. In some cases, firms are given reduced income tax based on the value of manufactured exports. Sales-based investment incentives afford the firms reduction in corporate income tax based on the total amount of sales made in a given period of time (Shah, 2006).

2.6.6 Financial incentives

Unlike fiscal incentives that work through the tax system, financial incentives involve the direct provision of investment funds or transfer payments (UNCTAD, 1997). The government is the major funder and may do so for many reasons either to provide funding for new investments or certain activities or to pay the cost of capital and operation costs. Financial incentives come in different forms including government grants, subsidised credits or loans and equity sharing by the government and private investors. Capital investment-based incentives provide accelerated depreciation: investment and reinvestment allowances while labor-based incentives provide reduced social security contributions mainly based on the number of jobs created by a firm (UNCTAD, 1997).

2.7 Applied studies using different measurement techniques

2.7.1 Computable general equilibrium models

Computable general equilibrium models have been used widely in Africa to study tax and non-tax policy effects on various sectors such as agriculture. A study was done that applied a static computable general equilibrium (CGE) model to examine the effects of agricultural liberalization and food trade in the OECD countries (Nyhodo, Punt and Vink, 2009). Variables simulated included import tariffs, tax rates on factor use and export subsidies, which were reduced in four phases of 25 percent points each. These scenarios were run using the GLOBE model that uses GTAP data as database. To estimate the effects on the South African economy, the simulation results were adjusted and used as policy shock to the PROVIDE model. The results revealed that at 75 percent liberalization, weighted average world prices of imports and exports would range between -19.6 to +3.8 percent and -3.0 to +29.7 percent respectively. Single country simulation results from the PROVIDE model indicated that South African economy would respond positively because of liberalization. The authors pointed out that despite negative effects on some sectors, the overall effect would be positive.

Thurlow and Van Seventer (2002) cited in Mabugu and Chitiga (2009) applied the IFPRI standard CGE model developed by Löfgren *et al.* (2001) to simulate the effects of complete tariffs removal. The findings revealed that aggregate production would increases. The authors explain the results by stating that by reducing import barriers, the country experiences a reduction in real cost (reduced import prices) and goes on to point out that such a policy represents an important source of efficiency gains.

Pienaar and Partridge (2016) utilized a CGE model developed for South Africa to assess the economic effects of losing preferential treatment for agricultural products provided under AGOA. The authors simulated the effects of export tariffs increase on agricultural products. Results showed that the nominal GDP for south Africa would drop by 0.0009 percent which in monetary terms is equivalent to a loss of over R40 million. Primary agricultural production reduces with the fruit and vegetable subsectors worst affected. Downstream industries are also affected especially beverages and tobacco.

Jensen, Sandrey and Vink (2012) applied CGE model that utilized GTAP to evaluate trade in agricultural and manufactured goods between South Africa and countries belonging to SADC, East African Community and Common Market for Eastern and Southern Africa. Simulation results suggested that while South Africa benefits from integration in SADC, it is not the case with COMESA and EAC. A similar study was conducted by Hallaert (2007) that focused on Madagascar economy. The author used CGE model to assess the effects of customs tariffs removal on imports from SADC member countries. Findings showed that the SADC Free Trade Area would lead to small changes on Madagascar's real GDP as only a small share of the country's total imports are affected by liberalization. Nevertheless, some sectors such as textile and clothing would benefit from such a policy change.

Similarly a short-run computable general equilibrium model was used to study the role of tariff reforms (particularly import tariffs) in Zimbabwe's 1990s trade liberalization (Mabugu, 2001).

The author found that tariffs applied to intermediates negatively affect the traded sectors as it leads to low production. In addition, the author further recommended putting in place an alternative tax regime first before making decisions to remove customs tax revenue.

McDonald, Punt, Rantho and Van Schoor (2008) used a static general equilibrium model to assess the costs and benefits of imposing higher import tariffs on importation of wheat into South Africa. Simulations involved increasing the tariffs on wheat imports by up to 25 percentage points to quantify the costs and benefits not just on the local wheat industry, but also the downstream linkages on the South African economy as a whole. In addition, the model made it possible to estimate the effects on factors of production, households and government. Findings indicated that costs (in terms of income losses incurred by other sectors) as a result were higher than the benefits on the local wheat industry, which were largely concentrated. Poor households were made worse-off as their welfare was negatively affected due to relative increases in the prices of food items.

A study was also conducted which involved a sample of fifteen developing countries that included Zambia. In this study, a general equilibrium model was used to compare the effects of indirect taxes, tariffs and exchange rates on agricultural prices and production (Jensen, Robinson and Tarp, 2002). Related to this study, four simulations were carried out that included elimination of (1) production subsidies, (2) consumption subsidies/taxes, (3) export taxes and (4) import tariffs. While earlier studies done for the World Bank, for example Krueger, Schiff and Alberto (1992) showed bias against agriculture in terms of production as a result of the tax changes, the general equilibrium analysis of this study found that indirect taxes, tariffs and export taxes negatively affected agriculture in only one country. In five countries, it was neutral while in the other four it provided a moderate subsidy to agriculture. Finally, the general equilibrium analysis indicated that agriculture was actually strongly favored in the five countries as production increased. The authors concluded that the system of indirect taxes and tariffs did not amount to significant agricultural bias i.e. hindering production in these countries in the 1990s. They further noted that partial equilibrium methodologies used in earlier studies tended to overstate the discrimination against agricultural production because of these tax policies.

CGE models have also been applied outside Africa to analyse tax policy changes. For example, in 2012 Australia introduced a carbon tax scheme applied in different sectors with an exception of the agricultural sector. In order to analyse the impact that such a scheme could have had on the agricultural sector, Meng (2015) employed a computable general equilibrium model (CGE) that involved simulating different carbon tax policy experiments. The findings revealed that all agricultural sectors would be negatively affected. According to the modelling results, carbon tax applied to the Australian agricultural sector would lead to reduction in output, employment and profitability in the sector as well as a reduction in real GDP.

Clarete and Roumasset (1990) analyzed the effects of tax incentives on the Philippian economy using a general equilibrium model. The author analyzed two incentives; tax rebates and drawbacks on imports of machinery and equipment imported for use by sectors deemed strategic for Philippian economic growth. Removal of all tax incentives but keeping existing subsidies on investment; keeping tax incentives and providing investment on a uniform-rate basis to all sectors while holding real government spending constant; and removal of the entire package of tax and duty rebates on imported capital equipment and investment subsidies were the three policy simulations that author conducted. The research findings revealed that in the second scenario where tax incentives were retained and investment subsidies provided on a same rate to all sectors, private investment increased while in the other two it fell. They then concluded that tax incentives play a significant role in promoting private investment.

Related to this study was research conducted by Gomo (2015) who used a combination of a microsimulation model of labor supply, a detailed tax-benefit module and a CGE model. They author used these models to analyse the effects of government transfers on income inequality and poverty in south Africa. According to the research findings, doubling government social transfers causes a 5.5 percent reduction in poverty if relative poverty measure is used. On the other hand, if an absolute poverty line of R322 per month is used instead, poverty reduces by 7 percent.

2.7.2 Partial equilibrium models

Very limited literature exists on tax incentive studies in developing countries especially, Africa. One recent study was done by Parys and James (2010) and analyzed the effectiveness of tax incentives over the period 1994–2006. The authors used panel data econometrics to analyze effects of tax incentives and non-tax incentives on investment in the 12 countries in West and Central Africa. Their findings revealed no concrete evidence, which shows that tax holidays are effective at spurring investment. On the other hand, non-tax incentives such as reducing complexity of the tax system showed to have significant impact at increasing investment while legal protection guarantees had no impact on fixed capital formation despite increasing foreign direct investment.

Klemm and Parys (2012) carried out an econometric analysis in which they tested for tax competition in tax incentives and assessed the effects of tax incentives on Foreign Direct Investment (FDI) in a sample of African, Caribbean and Latin American countries. Their findings revealed that in a similar manner that countries react to taxes in their counterparts so do they with tax incentives. Furthermore, their empirical results also showed a positive relationship between tax incentives, particularly tax holiday and level of FDI. They noted that the gains in investment were partially offset by the negative effect of the resultant corporate income tax rate hikes and hence found no robust effect on total gross capital. They concluded that their research findings suggest that FDI crowds out other investments such that new investment was not attracted.

Related to tax incentive is a study done on incentive perception and preference in the Export Processing Zones (EPZ) of Kenya. Rolfe, Woodward and Kagira (2004) used the decision modelling approach to evaluate the relative importance attached to the various incentives by firms operating in Kenya's EPZ. The experiments involved investors from different countries represented by managers of firms domicile in Kenya and the primary objective was to test investor preferences for incentives. The incentives considered were corporate income tax holidays, quality of infrastructure, local sales allowance, and no location (zone) restrictions. In addition to excellent infrastructure, the research findings indicated that investors prefer an upfront tax holiday. The participants preferred a tax holiday running for a period of ten years over low steady profit tax rate. The authors concluded that the tax holiday revealed a short-term outlook on investors, which may not necessarily lead to improvements in Kenya's labor market.

2.7.3 Other studies

There are some recent studies, which have been conducted in Zambia that are closely related to taxation and tax incentives. Mwila, *et al.* (2011) used both qualitative and quantitative methods to study the constraints in Zambia's tax system and to identify possible solutions to overcome them. Among the many challenges, they found that tax incentives narrowed Zambia's tax base and was a source of revenue leakages. This is however debatable considering that the authors were not explicit enough to explain the kind of data and methodology used in their study. That revenues decline due to tax incentives is obvious (as an immediate effect) but if more economic activities occur over time as a result of tax incentives that can result into more taxes for the government hence widening the tax base. Makano and Imakando (2015) on the other hand did a desktop study to analyse the weaknesses in Zambia Development Agency Act of 2006. This Act provides a number of tax incentives to both domestic and foreign businesses operating in strategic sectors with a condition that they are registered with the Zambia Development Agency. The authors recommended that the monitoring and evaluation be improved and further studies be done to quantify the costs and benefits of tax incentives.

2.8 Rationale for diversification towards agro-processing sector

2.8.1 Role in economic growth

Agro-processing plays a vital role in economic growth and development. Hirschman (1958) linkage hypothesis provides a good theoretical background on why to focus on agro-processing sector as a step towards development of economies. This hypothesis states that the best development path lies in selecting those activities where progress will induce further progress elsewhere. It follows therefore that the higher the linkages an activity forms with other activities, the stronger the stimulus to economic growth it can provide. The interdependence that the agro-processing sector forms with other sectors is high in terms of the proportion of commodities/output purchased from or sold to other sectors in a given economy. These forward and backward linkages make agro-processing a key sector in accelerating economic growth.

A linkage can be looked at as the degree to which a particular sector can generate demand for the products produced in other sectors (FAO, 1997). Forward linkages occur when a sector encourages investment in subsequent stages of production. For example, the establishment of a paper and paperboard processing plant can lead to more advanced activities such as processing of stationery, furniture, paper bags and many others timber products. On the other hand, if it promotes investments in earlier stages of production it is called backward linkage. Here the establishment of agro-processing can have positive feedback effects on primary agriculture. Agro-processing industries purchase intermediate inputs (primary agricultural output) from primary agriculture hence they expand markets for agricultural produce, which would further stimulate production. In addition to this, some positive externalities result from establishing agro-processing industries such as transport, communication and power facilities, which further benefit the primary agricultural sector. Finally, agro-processing activities can lead to increased employment in both rural and urban households. The increased demand for machinery and equipment and packaging materials can also stimulate the industrial manufacturing, further accelerating economic growth (FAO, 1997).

Stimulating primary agriculture also has important implications for the Zambian economy. This is so because Zambia comprises of a large percentage of households that heavily depend on agricultural activities for their livelihood. Agriculture has the potential to contribute to economic growth and development. Within the literature, findings show mixed results and no general consensus has been reached regarding the role of agriculture to economic growth. Some researchers postulate that the development of the agriculture sector is a necessary precondition for the growth of industries and the economy. For instance some scholars argue that the growth of an economy as a whole to some degree is dependent on the growth of sectors such as agriculture (Schultz, 1964; Gollin, Parente and Rogerson, 2002). Awokuse and Xie (2015) used directed acyclic graphs (an algorithm of causation) to investigate how agriculture and gross domestic product are linked. The results revealed the important role of agriculture, which is an engine of economic growth but that its impact varies from country to country. In some countries, the hypothesis of agriculture-led growth holds while findings from other countries suggest that for agricultural development to take place, the economy as a whole must be vibrant and growing.

In economies where agriculture is a main source of livelihood in terms of the number of jobs it creates and where its contribution to the gross domestic product is relatively higher, increased agricultural productivity can have profound benefits to the rural and general economy as a whole. For example, higher rates of productivity in the agricultural sector can result into further capital investments not only in agriculture itself but also in other sectors of an economy such as processing and manufacturing. Furthermore, increased agricultural productivity can be a good source of foreign exchange earnings through agricultural exports. It also helps to stabilize food prices, which is beneficial for poorer domestic consumers and it provides the much-needed incomes for domestic producers. Higher domestic incomes and lower food prices entail enhanced purchasing power which acts as stimuli for demand for agricultural and non-agricultural goods and services (Mellor, 1986, and Timmer, 1988).

According to Johnston and Mellor (1961) there are five direct market-based linkages through which agriculture affects economic growth and development.

1. Surplus labor supply to the industrial sector
2. Food supply for domestic consumption
3. Market for goods produced in the industrial sector
4. Generation of domestic savings that can further be invested in the industrial sector
5. Earnings from agricultural exports provide the much needed foreign exchange which can then be used to import intermediate and capital goods

In addition to these five inter-sectoral linkages, Timmer (1995) further provides the indirect non-market linkages that agriculture creates. Agriculture helps improve the quality of factors of production such as labor through provision of food and fiber that has better caloric nutrients. The author further observed the importance of agriculture in ensuring that food is available at stable prices and reduction of poverty among poor households. All in all, agriculture feeds the people and leads to an energetic and healthy workforce hence improving labor productivity. Awokuse and Xie (2015) note that the importance of agriculture to the growth and development of an economy has been underestimated mainly due to data limitations and lack of proper modelling techniques that capture its indirect effects.

2.8.2 Agricultural investment, economic growth and poverty reduction

There exists a link between investment and economic growth measured by increases in gross domestic product and between economic growth and poverty reduction. Kydd *et al.*, (2004) sets forth conditions under which meaningful reduction in poverty among poor households is to be achieved. They recognized the importance of assets and that there is need for increased access by the poor households to a more diversified portfolio of assets that includes capital goods. In addition, measures have to be put in place that will lead to improvements in the productivity of these assets. It is also necessary that the poor households' vulnerability to external shocks be minimized. In order for improved access to assets to occur there is need for changes in government policies, institutional framework or simply asset redistribution programs within a given society. Policies that reduce the cost of assets also play an important role in enhancing access and acquisition of these assets by poor people.

There is growing inequality between rural and urban dwellers in terms of income and other economic opportunities in most developing countries, Zambia inclusive (Lwanda and Quarles, 2013). Irz, Lin, Thirtle and Wiggins (2001) used the New Economic Geography theory to provide an argument as to why there is increased disparities between rural and urban areas.

Most remote rural places are characterized by very poor infrastructure such as roads and communication facilities. This makes it hard for such areas to have access to reliable and timely information and as such tend to have underdeveloped markets for inputs and output. While this is so in rural areas, the opposite is true for urban areas and as a result, the latter tends to have a strong comparative advantage hence attracting most of the economic activities. They further argue that in these disadvantaged rural areas only economic activities with a strong natural base such as agricultural and local processing of agricultural products tend to thrive. It is hoped therefore that the provision of tax incentives to agriculture and processing of agricultural products would provide the much-needed benefits to the majority of poor households that live in places that are too remote to thrive without some interventions. Dorosh and Thurlow (2013) further found strong linkages between agriculture and small towns particularly in downstream agricultural processing sectors. Hence postulates that investing in agricultural activities in the small towns would lead to greater economic growth and poverty alleviation than in industries located in cites which have weaker linkages with rural areas.

2.9 Theory of CGE models

2.9.1 A brief background

The computable general equilibrium (CGE) modelling approach has a long history of application in policy studies since Johansen's multispectral growth model of 1960 for Norway (Doi, 2006). They have been used widely in both developed and developing countries to study the impact of various economic policies. It is also true that CGE models have been applied in many fields ranging from public finance (fiscal/taxation policies) to policies related to agriculture and the environment (McDonald and Punt, 2005). As the name suggests, CGE models contain numerical equations that facilitate the economic evaluation of policy issues in the general equilibrium context. Dervis, De Melo and Robinson (1982) describe a CGE model as a modelling system that captures all interactions taking place in the entire economy between demand, income and production structures and upon a shock allows prices to adjust to ensure consistency between demand and production decisions. This is in line with Doi (2006) who states that a CGE model is designed to endogenously compute and solve the prices and quantities that clear the market at the new equilibrium point should the model be subjected to a shock. CGE models also incorporate the production and consumption in all goods as well as the factor markets.

The main database for a CGE model is the Social Accounting Matrix (SAM). A SAM is a comprehensive data framework that records all transactions taking place in a given economic system and includes those transactions that occur with the rest of the world. In fact Robinson and Lofgren (2005) state that the SAM should be considered as not only a database but also as a logical framework for economic models that analyse interactions in the entire economy. The construction of SAMs draws from a variety of data sources such as the Input-Output tables that record the flow of intermediate inputs between productive sectors of the economy. Hence, it can be viewed as an extension of the Leontief's input-output accounts in order to captures the entire circular flow of transactions in a given economic system. The SAM also include the flow of income and expenditure between households, enterprises, government and the rest of the world. In a similar manner, that national accounts are a source of data for macro econometric models, the SAM also provides the statistical underpinning for CGE models.

2.9.2 Justification for CGE model

As already discussed in previous sections, CGE models are popular not only in developed countries but also in developing countries. The models have been used widely to study a number of policy issues such as changes in taxes and tariffs. According to Pyatt (1987), cited in McDonald and Punt (2005:83) "A critical feature of CGE models is the identification of the interdependency effects associated with the price formation process of an economy which is fundamentally influenced by the structure of taxes in an economy". Thus, the CGE model permits the analysis of direct and indirect effects induced by changes in taxes and other policies. One of the most important advantages of CGE modelling compared to other methodologies is the ability of the model to incorporate various macroeconomic, sectoral and social impacts as well as to quantify theses effects throughout the economy (Fontana, 2004). In addition to price changes, adjusting the taxes and tariffs may have effects on quantities, which are not captured if other methodologies such as the Marginal Effective Tax Rates (METR) are applied. CGE models make it possible to quantify such changes, allow insight into the size of change, whether big or small, and underpins the major causal chains. This can further be backed by Shah (1995:100) who states "…an applied general equilibrium model can provide a disaggregated view of the economy and thereby yield quantitative estimates of all important interactions". It is therefore a valuable tool in assessing the relative merits of alternative tax policy changes. In addition to capturing all the transactions in the economy, CGE models permits flexibility in prices, which make them more superior to the Leontief Input-Output models. In the Leontief's

Input-Output models, substantial components of the accounts are exogenized while in CGE models, all accounts are endogenously determined. Compared with partial equilibrium models, CGE models such as the one used in this study, captures the complex interactions in an entire economy, which is not the case with the former models. Finally, the model used in this study permits that value added prices are computed directly under various scenarios and measure of how resources are pulled to factors markets.

2.10 Summary and conclusions

This chapter explored the neoclassical investment theory and reviewed that both fiscal and financial incentives build on this very theory. Furthermore, export taxes and import tariffs are classified as fiscal incentives while production subsidies and transfer payments to households fall under financial incentives.

The literature also reviewed that there is a close link between primary agriculture and agro-processing. Primary agriculture produces output, which are used as inputs in the agro-processing sector. Empirical evidence shows that agriculture and related activities support a majority of rural households in developing countries hence both primary agriculture and agro-processing have potential to contribute not only to poverty reduction and food security but also to economic growth and development. It therefore makes logical sense to support these sectors through provision of incentives.

From the review of literature, it can be concluded that CGE models are robust because they have been applied widely in policy studies similar to this one, not only in Africa but also in most developed countries. In conclusion therefore, CGE models are more appropriate to policy studies compared to partial equilibrium models. CGE models permit analysis of direct and indirect effects and allow incorporation of various macroeconomic, sectoral and social impacts. They have the ability to quantify effects of policy changes, permit flexibility in prices making them more superior to the Leontief Input-Output models. Finally, CGE models have the ability to capture complex interactions that occur in the economy in response to a policy change.

3. Agro-processing and tax incentives in Zambia

3.1 Introduction

In this chapter, an overview of the Zambian economy is given focusing on macroeconomic indicators, primary agriculture and agro-processing sectors as well as the tax policy in Zambia. The analysis begins with macroeconomic indicators where trends in GDP annual growth rates, inflation, export performance, Zambian Kwacha performance and foreign direct investment are discussed. Then in section 3.3 sectoral analysis of primary agriculture is done with a focus on the sector's contribution to GDP, crops grown and livestock kept and trends in production yields of selected crops.

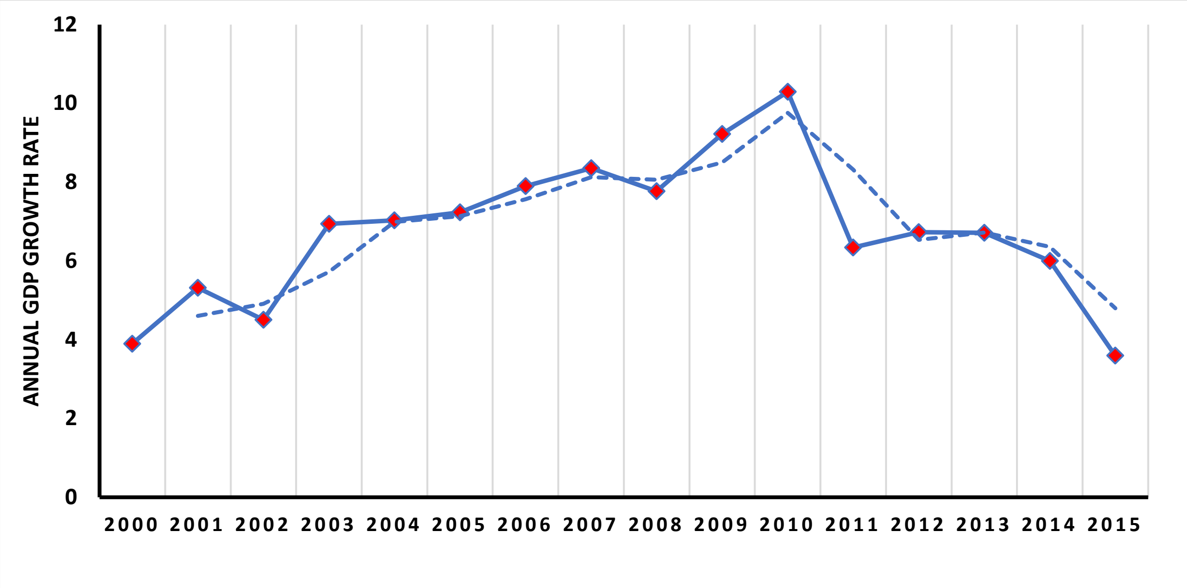
An overview of the agro-processing sector is given in section 3.4 and gives a discussion on the following subsectors: cereal milling, sugar, horticulture, wood, cotton and tobacco while section 3.5 looks at opportunities and potential in the sector. The final section 3.6 describes in brief Zambia's tax policy, looks mainly on the current tax incentives provided under the Zambia Development Agency Act, and concludes by giving trends in tax revenue performance.

3.2 Macroeconomic indicators

3.2.1 Trends in gross domestic product annual growth

The Zambian economy has in the past decade experienced steady annual growth in its gross domestic product. Figure 3-1 shows that from 2000 to 2015, the economy grew by an average of 6.7 percent per annum. In 2001, the annual GDP growth rate increased to 5.3 percent from 3.9 percent in 2000 and continued to rise over the years until it reached 8.4 percent in 2007. Due to the global financial crisis of 2008, the economy again slowed down and the annual GDP growth rate reduced to 7.8 percent. It increased in 2009 and 2010 reaching 9.2 percent and 10.3 percent respectively. Political factors because of changes of government from the Multi Party Movement for Democracy (MMD) to the Patriotic Front (PF) brought about uncertainty among investors, which contributed to the decline of the annual GDP growth rate to 6.3 percent in 2011. It averaged 6.4 percent since then until 2014 before sharply declining again in 2015. According to the MFNP (2015) the Zambian economy grew by only 3.6 percent in 2015. The slow growth is attributed to the general decline in global growth that reduced the demand and hence the international prices of copper and other commodities. Other contributing factors include adverse weather conditions caused by El Nino and electricity deficits, which has further slowed down production in many sectors of the Zambian economy. Accordingly, these challenges caused by the external shocks have not improved in 2016 and as such, the economy is projected to grow at around 3.7 percent.

Figure 3-1: Annual growth in GDP from 2000 to 2015



Source: World Bank (2016)

Table 3-1 shows GDP contribution by sector (both at current and constant prices) from 2011 to 2014. In 2011, mining accounted for 12 percent while agriculture and manufacturing stood at 9.6 percent and 7.7 percent respectively. By 2012, agriculture and manufacturing remained stable and increased slightly to 9.7 percent and 7.8 percent respectively while the mining sector dropped to 9.5 percent. In terms of GDP at constant prices the mining sector contribution dropped to 9.7 percent in 2014 from 10.4 percent in 2013 while the agricultural sector slightly increased to about 8.8 percent in 2014 from 8.7 in 2013. In real terms, agriculture's contribution to GDP declined more compared to nominal changes. This difference in current and nominal values can be attributed to higher exchange rates against major international currencies such as the US dollar and means that prices increased faster than changes in quantity. In this regard it implies that the higher values in the sectors contribution to GDP at current prices was mostly driven by increased prices caused by higher exchange rates as opposed to increases in output.

Table 3-1: Percentage shares in GDP by economic activity from 2011 to 2014

Current Prices	**2011**	**2012**	**2013**	**2014**
Agriculture, Forestry and Fishing	9.63%	9.73%	9.09%	8.86%
Mining and Quarrying	12.02%	9.48%	8.28%	6.50%
Manufacturing	7.66%	7.83%	7.71%	7.51%
Constant Prices (base year 2010)	**2011**	**2012**	**2013**	**2014**
Agriculture, Forestry and Fishing	10.03%	10.04%	8.71%	8.75%
Mining and Quarrying	11.48%	10.47%	10.38%	9.65%
Manufacturing	8.02%	8.05%	7.89%	7.61%

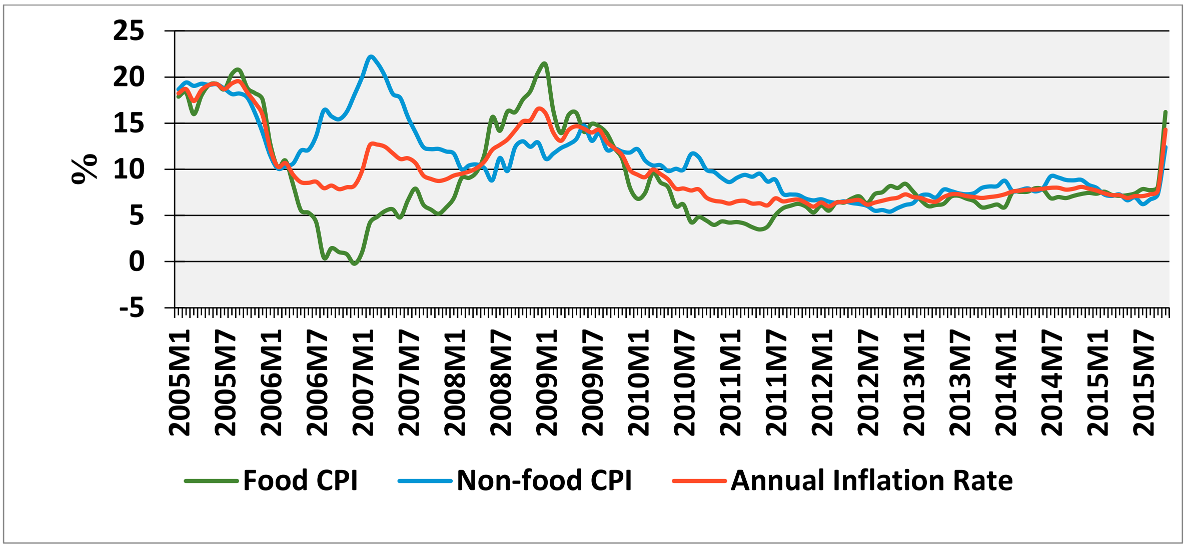
Source: CSO (2014)

3.2.2 Food and non-food inflation

Inflation is a measure of changes in consumer prices for a standard basket of goods. From 2005 to 2016, Zambia's average annual inflation was estimated at 9.66 percent (CSO, 2015). In 2012, annual inflation was recorded at 7.3 percent and because of a decline in food inflation; it slowed down to 7.1 percent in 2013. Due to Kwacha depreciation and increases in fuel prices and electricity tariffs, annual inflation rose to 7.8 percent in 2014. With increases in exchange rates food inflation has also increased from 7.2 percent during the first quarter of 2015 to 8.1 percent during the second quarter and by the end of 2015 it dramatically rose to a double digit record of 21.1 percent (MFNP, 2015). As a way of mitigating the continued inflationary pressure and volatile exchange rate, a tight monetary policy was put in place by the Bank of Zambia. This policy involved an upward adjustment of the statutory reserve ratio to 18 percent from 14 percent. In addition, open market operations were carried out which provided commercial banks with short-term loans so as to relieve pressure off the interbank money market. The weighted average interbank rate was increased from 11.9 percent in 2014 to 14.6 percent by the end of June 2015 (BOZ,2015). As of February 2016, inflation reached its all-time high record of 22.9 percent. The sharp increase in inflation can be attributed to a number of economic and political factors such as the sharp depreciation of the Kwacha against major international currencies, increased domestic costs of production caused by persistent rationing of power. Being an import-based economy it has become increasingly expensive to import goods into the country leading to high consumer prices of both food and non-food items. Figure

3-2 shows the trends in food and non-food consumer price indices and annual inflation rates from 2005 to 2015.

Figure 3-2: Trends in inflation from 2005 to 2015

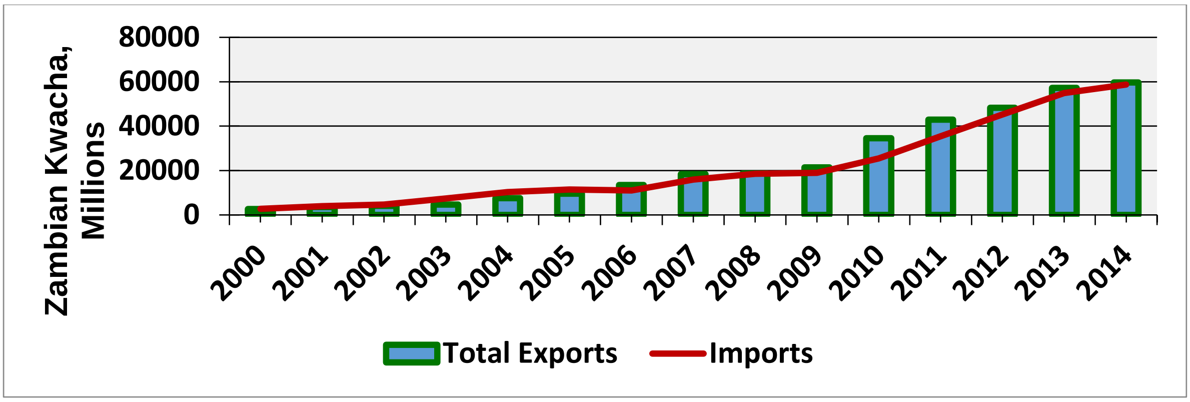


Source: CSO (2014)

3.2.3 Zambia's exports performance

Zambia's exports have been on the rise since the early 2000's (see figure 3-3) and as stated by (Fessehaie *et al.*, 2015) this growth in exports have been driven by copper exports which averaged 70 percent of the total exports between 2003 and 2013. As can be seen in figure 3-3, total exports from Zambia has been steadily increasing from 2000 to 2014.

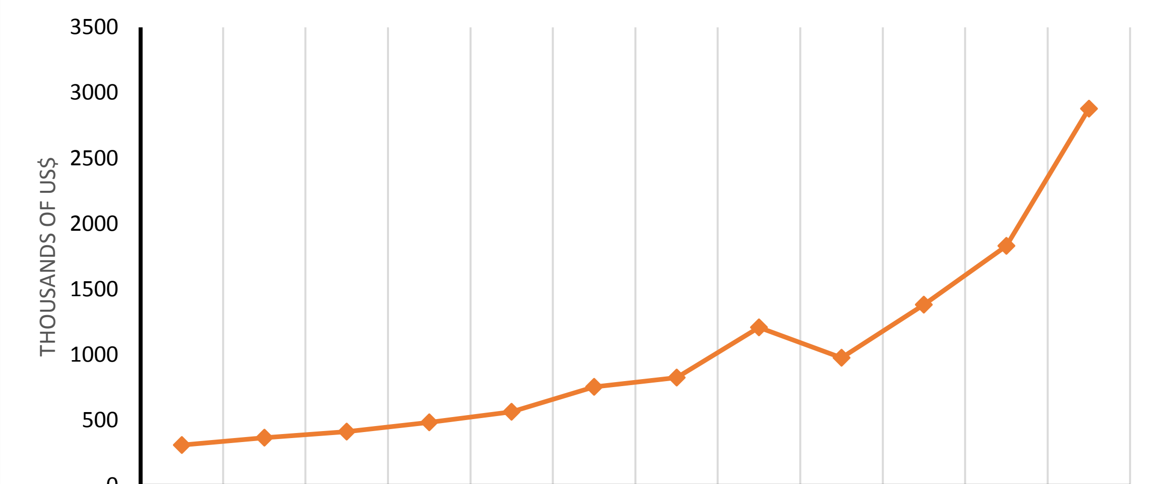
Figure 3-3: Trends in total exports and imports from 2000 to 2014, nominal values (K' millions)



Source: CSO (2014)

In addition to copper, Non-Traditional Exports (NTEs) have also performed well over the past years (refer to figure 3-4). According to the Zambia Development Agency (2014) data there has been a positive trend in NTE's and from 2008 to 2013, these exports have increased threefold. Fessehaie *et al.*, (2015) attributes this improved performance in NTE's to the manufacturing sector's increased abilities and competitiveness.

Figure 3-4: Trends in Zambia's non-traditional exports from 2001 to 2012 (USD'000)



	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Series 1	312	368	415	485	566	757	827	1209	979	1382	1833	2878

Source: ZDA (2011)

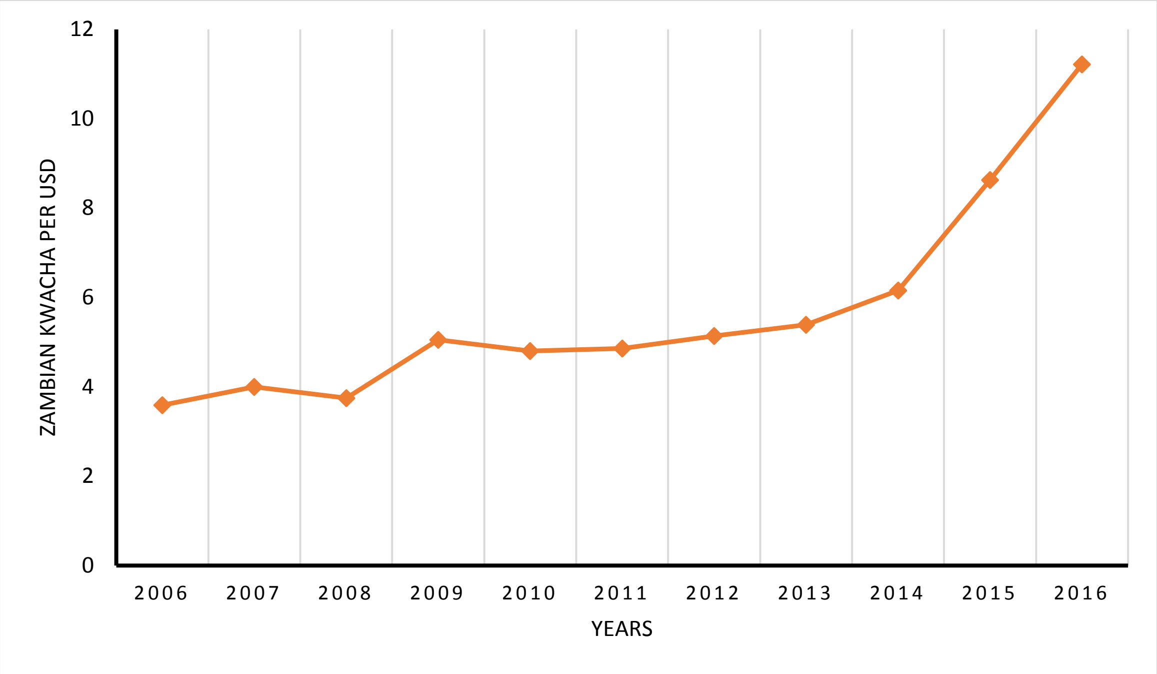
3.2.4 Zambian Kwacha performance

Since 2013, the Zambian Kwacha has experienced depreciation against most international currencies such as the US dollar, Pound Sterling and Euro. For example, due to reduced supply of US dollars into the Zambian economy following low prices of copper, the Kwacha continued to depreciate against the dollar and as such by the end of the first half of 2014, it depreciated by 13.6 percent compared to end of 2013 trading at ZMW6.2601/US$. The Bank of Zambia intervened through its monetary policies and the Kwacha stabilized in the second half of 2014. However, copper, which is the country's major source of foreign exchange, continued to experience some external shocks mainly the slowdown of China's economy leading to lower prices on the international markets. And by the end of the first half of 2015, the Kwacha had sharply depreciated by 15.6 percent against the US dollar (Shula, 2015). In September and October 2015, it depreciated by 24 percent and 20 percent respectively. Again the central bank intervened by selling foreign exchange to the domestic market, a move aimed at stabilizing the

Kwacha. The move paid off as the Kwacha strengthened against the US dollar by 8.6 percent by the end of 2015 and by February 2016, it stabilized to ZMW11.3/US dollar from ZMK10.98/US dollar in December 2015 (MFNP, 2015).

Similar trends were observed in the World Bank monthly and yearly data as indicated in figure 3-5. These figures also show a sharp depreciation of the Zambian Kwacha against the US dollar especially in the period 2014 to 2016.

Figure 3-5: Trends in Zambia's official exchange rates, local currency per US dollar from 2006 to 2016 (annual data)



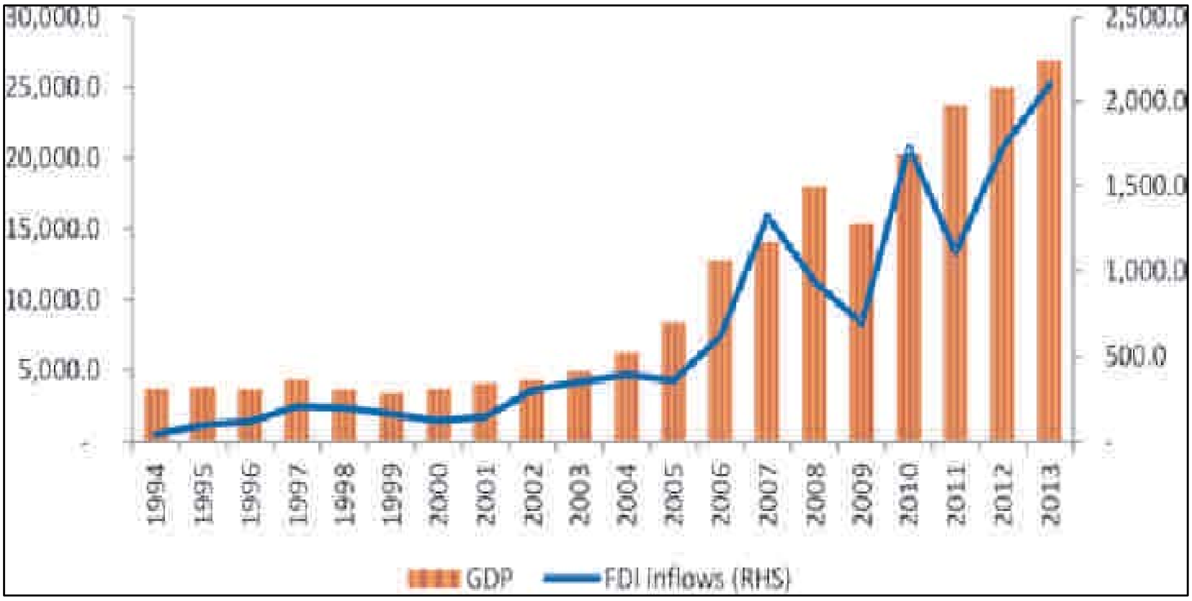
Source: World Bank (2016)

3.2.5 Foreign direct investments in Zambia

Zambia has experienced increased flow of foreign direct investment (FDI) into its economy since 1991. In some years, foreign direct investment inflow declined such as between 2008-2009 due to the global financial crisis. FDI also declined in 2011 and according to the GRZ (2014), uncertainty among investors as a result of change of government from the Movement for Multiparty Democracy (MMD) to the Patriotic Front (PF) government was the cause (refer to figure 3-6). It is apparent that FDI has had a positive impact on the economic growth of Zambia. In nominal terms, GDP grew to around USD 30 000 million in 2013 from less than USD 5 000 million in 1994. According to the Ministry of Finance and National Planning

(2015), FDI inflow was estimated at USD1 582.7 million in 2015 representing a 6.3 percent growth compared to 2014.

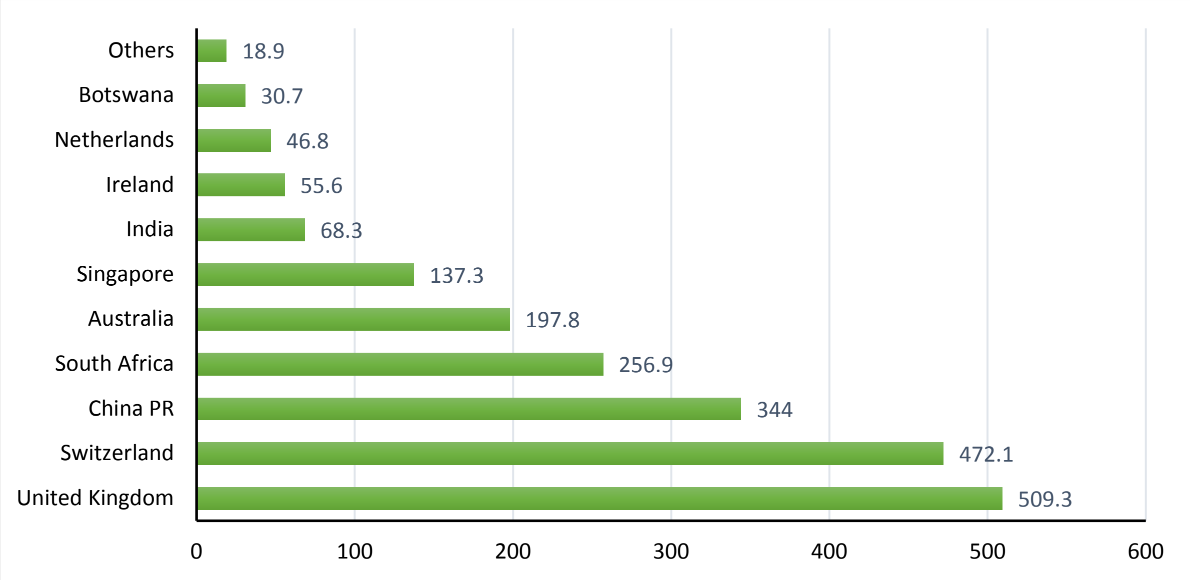
Figure 3-6: Trends in foreign direct investment flows into Zambia from 1994 to 2013



Source: GRZ (2014)

In 2013, FDI into Zambia originated from a number of countries. According to the survey conducted by GRZ (2014) major sources of Zambia's FDI included Canada, the United Kingdom, China, Australia, South Africa and Switzerland. Collectively these countries accounted for 75.9 percent of the FDI stock in Zambia. Other countries contributed 13.6 percent and included Ireland, Netherlands, Bermuda and Brazil (figure 3-7). In 2014 Canada, the United Kingdom, China, Australia, South Africa continued to dominate with Ireland stepping up as a major source as well and collectively these countries accounted for 83.2 percent of Zambia's stock of foreign direct investment. On the other hand, the Netherlands, Mauritius and Bermuda accounted for only 7 percent in the same year. The mining sector has been the dominant recipient of FDI although current statistics indicate a rising trend investment in the government priority and growth sectors such as agriculture, tourism and manufacturing (MFNP, 2015).

Figure 3-7: FDI inflows by source of country (USD millions), 2013



Source: GRZ (2014)

3.3 Overview of Zambia's primary agricultural sector

Zambia is blessed with abundant natural resources that include vast agricultural land and in addition, Zambia has favorable climatic conditions that allows growth and cultivation of a wide array of crops. Zambia's total surface area is approximately 752,614 km square of which 58 percent is classified as arable land with potential to support agricultural production. According to the ZDA (2011) only 14 percent of this land is currently utilized for agricultural production. The importance of agriculture in Zambia cannot be over emphasized as it provides food and fiber needed for survival by households. In addition, agricultural produce is a source of raw materials used by the agro-processing subsector and manufacturing in general. Despite its importance, the potential has not been fully utilized. The government of the Republic of Zambia has in the past provided incentives ranging from subsidies to tax incentives towards agriculture as one of the priority sectors for growth and job creation.

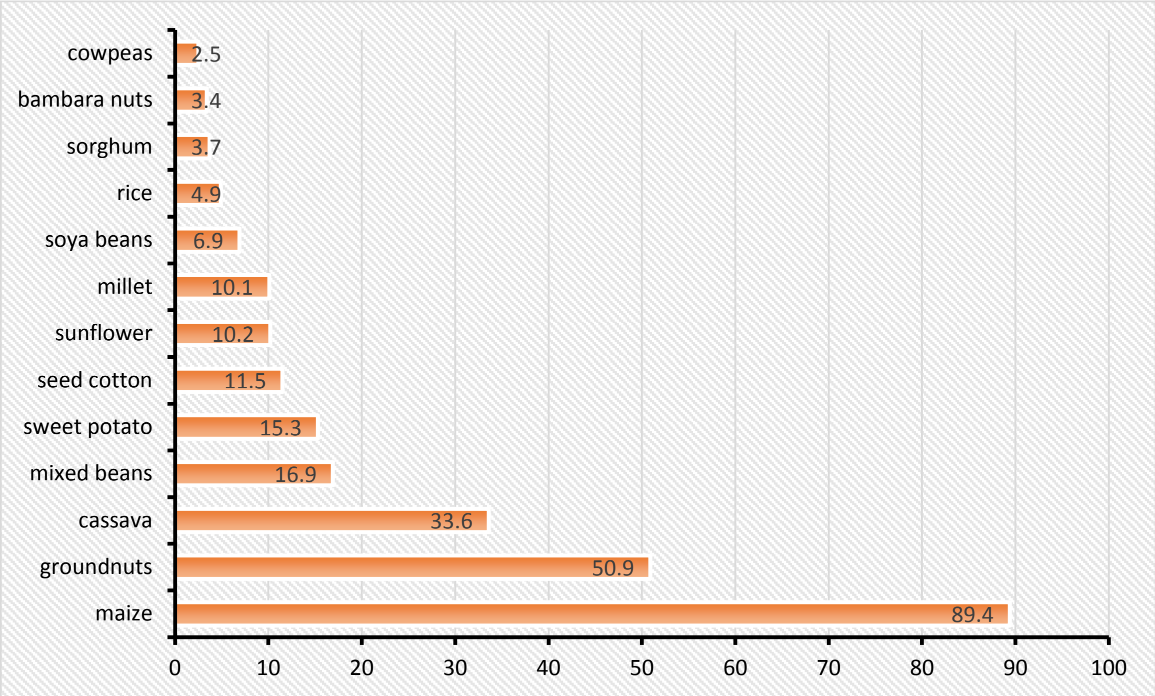
Relative to other sectors, agriculture's contribution to the Zambian economy in terms of GDP is much lower. According to CIA (2016) estimates of 2015, agriculture contributed only 8.6 percent while services and industry sectors accounted for 60 percent and 31.3 percent respectively. Using farm size as criteria the agricultural sector is divided into three categories:

1. Large scale farmers >40 hectares of land
2. Medium scale farmers 10-40 hectares of land

3. Small scale farmers 1-10 hectares of land

The small-scale farmers drive Zambia's agricultural sector and account for approximately 92 percent of all the farmers while the large scale and medium scale farmers collectively account for only 8 percent. Zambian farmers grow a number of crops grouped as grains, oilseeds and high value crops. Maize remains popular among farmers, as it is a dominant staple food in Zambia. According to IAPRI (2015) maize was the major crop grown by households and accounted for 34 percent seconded by groundnuts that accounted for 20 percent while cowpeas accounted for 13 percent. Other crops of importance among households are shown in figure 3-8. The Central, Eastern and Southern provinces are the leading producers of maize and account for approximately 75 percent of total production.

Figure 3-8: Percentage of Zambian households growing each crop in 2015



Source: IAPRI (2015)

In terms of crop production at macro level, there has been improvements since 2006. Table 3-2 shows the trend in production of selected major crops from 2006 to 2014. Maize production has over the years steadily increased recording 3.4 million metric tons in 2014 from 2.5 million metric tons in 2013. The percentage of households growing maize in 2015 (national average) was recorded at 89.4 percent. Groundnut production increased from 106,791 metric tons in 2013 to 143,591 metric tons in 2014 while soya beans and wheat output reduced from 261 thousand metric tons to 214 thousand metric tons and 273 thousand metrics to 201 thousand metric tons respectively during the same period. Production of millet and mixed beans slightly increased in 2014 by 6,000 metric tons and 5,000 metric tons respectively while sorghum output reduced from 14,971 metric tons in 2013 to 11,557 metric tons in 2014.

Table 3-2: Agricultural production for selected crops (Mt) from 2006 to 2014

	Maize	***Ground nuts***	***Soya Beans***	***Wheat***	***Millet***	***Mixed Beans***	***Sorghum***
2006	1,424,439	84,010	57,815	53,479	48,159	27,697	21,048
2007	1,366,158	55,215	55,194	115,843	21,707	24,164	12,773
2008	1,211,566	70,527	56,839	113,242	33,934	44,463	9,992
2009	1,887,010	120,563	118,794	195,456	48,967	46,729	21,829
2010	2,795,483	163,733	111,887	171,274	47,994	65,267	27,732
2011	3,020,379	278,775	116,539	237,332	41,602	51,924	18,458
2012	2,852,687	113,025	203,038	253,522	28,446	55,301	15,379
2013	2,532,800	106,79	261,063	273,584	23,942	56,411	14,971
2014	3,350,671	143,591	214,179	201,504	30,504	61,749	11,557

Source: CSO (2014)

Table 3-3 indicates the percentage of households at national level that sold own grown crops in 2015. The statistics show that for most crops grown, the households sold a good proportion on the market. As shown in table 3-3, 99.1 percent of households grew and sold cotton while 83.6 percent sold their soya beans on the market. These two crops are among the cash crops hence the relatively higher proportion of household reported to have sold the crops. Other crops such as maize, groundnuts and mixed beans also performed fairly well with the number of households participating in the market at 52.5 percent, 56.1 percent and 67.3 percent respectively.

Table 3-3: Percentage of households at national level selling selected own grown crops in 2015

Crop	**% of households that grew and sold the selected crops**
Maize	52.5
Sorghum	14.6
Millet	43.5
Groundnuts	56.1
Seed cotton	99.1
Mixed beans	67.3
Soya beans	83.6

Source: IAPRI (2015)

Livestock and fisheries are also important subsectors of primary agriculture in Zambia. In addition to crop production, the livestock subsector in Zambia continues to be an important contributor to the country's GDP. It is reported for example that in 2009 and 2010 the livestock subsector contributed 6.4 percent and 7.4 percent respectively to Zambia's GDP (ZDA, 2011). On average, it supports 46 percent of rural households in Zambia and accounts for 39.2 percent of their income. RMC (2010) reports that the poultry subsector has been on the rise in Zambia and production has improved over the years owing to emerging producers in urban areas of Lusaka, the Copperbelt and others. According to IAPRI (2015), over 80 percent of rural smallholder households owned chickens, followed by goats that accounted for 35 percent. Results also showed that slightly over 31 percent of households owned cattle while only 16 percent were reported owning pigs in 2015. Exports of poultry products such as eggs and day-old chicks to neighboring countries have also been on the rise. The potential in the fisheries subsector has not been utilized as much compared to other sectors and as such has poorly performed in the recent past. Contributing factors include among other things under-capitalization, inadequate extension services, and inadequate investment by the private sector and poor management of fisheries.

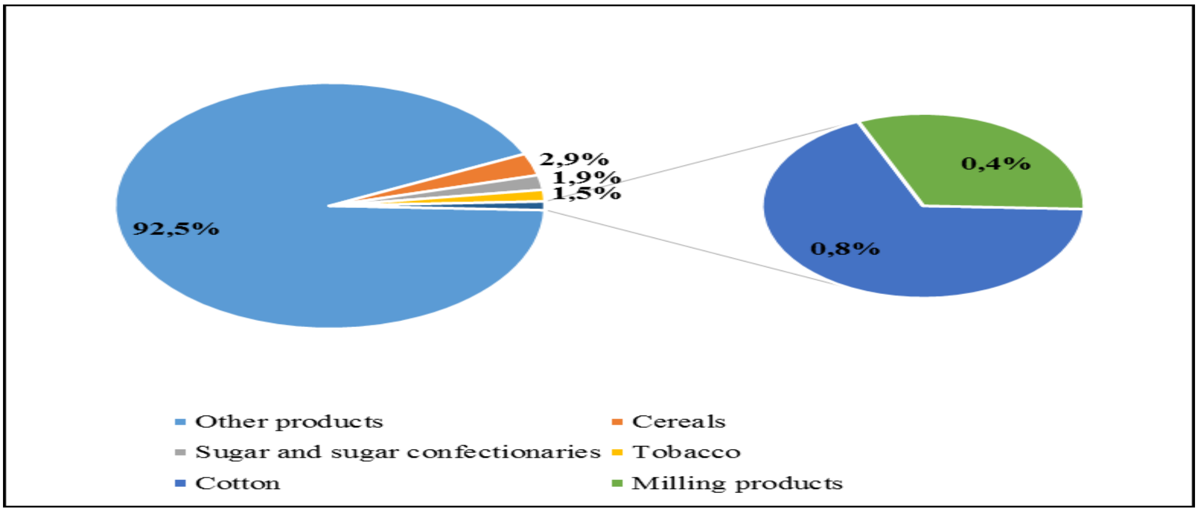
3.4 Overview of Zambia's agro processing subsector

According to Fessehaie *et al.*, (2015) agro-processing in Zambia involves the transformation of resources emanating from agriculture (crops and livestock), fisheries and forestry. Seshamani, (2006) further describes agro-processing as a process of transforming agricultural raw materials into products that can be sold on the market. In Zambia agro-processing involves a number of activities that process and transform the following agricultural produce; fruits and vegetables, honey, oil, sugar, coffee, tea, mushrooms and many more into refined products that are eventually sold on the market (domestic sales and exports) or consumed by primary producers (households) themselves. There is a clear indication suggesting that agriculture and agro-processing form strong linkages within rural communities (Hirschman, 1958, Alemu, 2016, Dürr, 2016). Agriculture provides the raw materials used as intermediate inputs in the agro-processing sector while agro-processing acts as a market for those involved in primary production. The income earned from selling agricultural produce can then be re-invested into further production as owner's equity or the rural households can use it for other purposes. According to UNCTAD (1997) agro-processing is a very diverse industry for the following reasons:

1. It constitutes primary processing activities such as sorting, grading and packaging of various agricultural produce. Specific examples include; cotton ginning, saw milling, flour milling, leather tanning, oil pressing and paper production.
2. It includes processing of both food and non-food items. Classification of agro-processing according to the UN International Standard Industrial Classification of All Economic Activities (ISIC) cuts across the following:
   - Food, beverages and tobacco
   - Textile, wearing apparel and leather industries
   - Wood and wood products, furniture
   - Paper and paper products
   - Rubber products
3. Agro-processing forms strong linkages with a number of agricultural subsectors activities and inputs largely due to the technological innovation process involved.

Despite this obvious positive relationship, empirical evidence shows that there has been little investment in value added activities of agricultural products and as Muyunda (2009, cited in RMC, 2010) states only 30 percent of primary agricultural produce in Zambia are sold to the agro-processing subsector in developing economies compared to 98 percent in the counterparts. This combined with other factors such as lack of proper financing has contributed to the slow growth of the agro-processing sector. Data from Trade Map (2016) revealed that the top five exports of agricultural and agro-processed product groups from Zambia to the rest of the world were cereals, sugar and sugar confectionaries, tobacco and tobacco products, cotton and its products and milling products. As shown in figure 3-9, collectively these five product groups accounted for 7.5 percent of the total exports with cereals having the highest share of about 3 percent while sugar and sugar confectionaries and tobacco and manufactured tobacco substitutes accounted for about 2 percent and 1.5 percent respectively. This is underperformance especially if compared to some neighboring countries. For example, Zimbabwe's and Malawi's tobacco and manufactured tobacco substitutes exports for 2015 were valued at USD 894 million and USD 496 million representing 2.3 percent and 1.1 percent of tobacco's world exports respectively. In addition, Zimbabwe's tobacco sector has been stable since 2011 with average annual growth in value of 5 percent. On the other hand, Zambia's tobacco exports for 2015 were valued at USD 106 million and accounted for only 0.3 percent of the world tobacco exports. The Zambia's tobacco sector was stagnant from 2011 to 2015 recording an annual growth in value of zero percent while between 2014 and 2015 the annual growth dropped by 26 percent.

Figure 3-9: Export share of the top five agricultural and agro-processed products in 2015



Source: Trade Map (2016)

3.4.1 Cereals and milling products

In Zambia, only a few cereals are transformed through the value addition process into refined milling products. For example, maize, which is the major staple crop for the majority of Zambians, is processed into maize flour locally known as mealie meal. The maize can be either more refined or less refined to produce breakfast and roller meal respectively. The industrial refining of maize is mostly concentrated in urban cities of Lusaka and Copper belt provinces. Cassava is another agricultural produce that is processed into flour. Unlike maize processing, cassava value addition is still underdeveloped in Zambia and uses a series of small hammer mills to produce flour. The consumption of this flour varies from person to person with some people cooking it into *nshima* while others prefer mixing it with maize flour. The major source of dried cassava is from the Luapula province and supplies 60 percent of it to the Copper belt and Lusaka provinces as well as Chembe border market (Haggblade & Nyembe, 2008).

Wheat is another important crop grown on a large-commercial scale and ranks third as the most consumed staple food in Zambia and as observed by the World Bank (2016) the sector has experienced growth in production and processing. The industry has been able to produce enough for the domestic market with increasing surplus exported to the regional markets. This growth might however come because of import protection that is justified on infant industry argument.

Other cereals produced in Zambia include sorghum, rice, barley and millet. The main importing countries for cereal exports are Zimbabwe, Malawi and Tanzania accounting for 46 percent, 30 percent and 10 percent respectively (World Bank, 2014b). Eight large commercial millers dominate the milling industry in Zambia. These firms are well capitalised and highly mechanised hence; they tend to operate more efficiently relative to the small-scale millers. The main milling products produced are meal, flour and stock feed though some companies process other products such as cooking oil.

Sutton and Langmead (2013) observe that the National Milling Corporation (Z) Limited, which is a US-owned firm, leads the industry. The firm processes wheat, maize and soya beans and has a market share of 25 percent and 30 percent flour and mealie meal (maize meal) respectively. It also specializes in oil seed crushing and bakery. In addition, the firm also produces animal feed making it the second largest producer in Zambia. Apart from the domestic market, the firm also exports its products mainly to the Democratic Republic of Congo. Figure

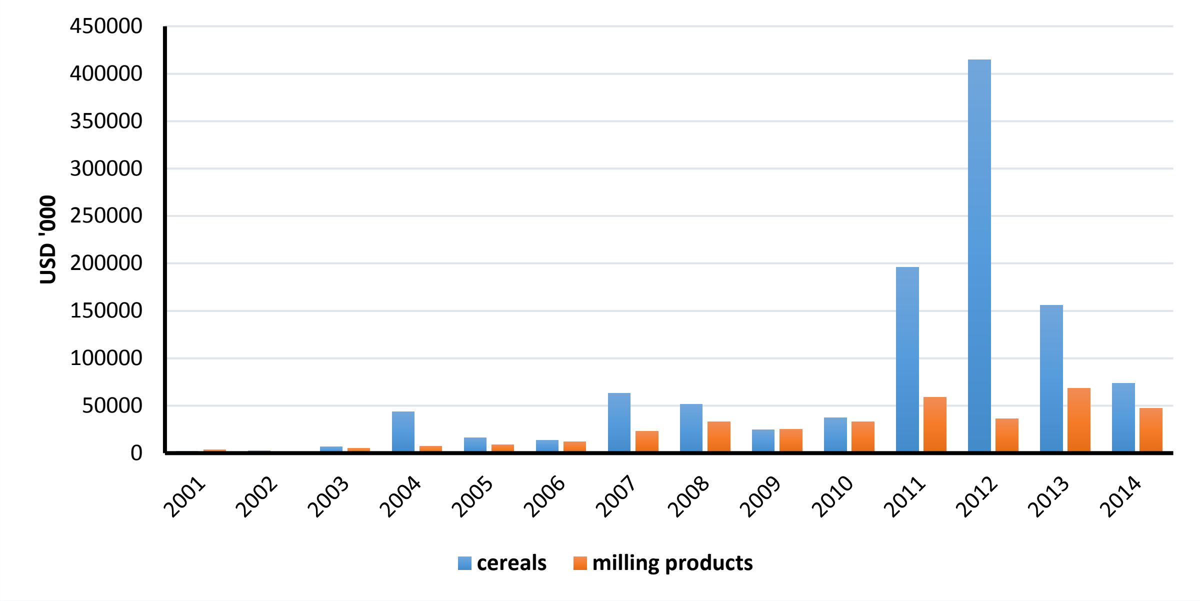
3-10 indicate that Zambia has had a positive trade balance in terms of milling products and that both exports and imports fluctuate from 2010 to 2014.

Figure 3-10: Zambia's exports and imports of milling products from 2010 to 2014

Source: Trade Map (2016)

Figure 3-11 is a comparison of raw cereals and milling products exports for Zambia from 2001 to 2014. The figure shows that Zambia has been exporting more unprocessed cereals relative to processed milling products for the past decade. In 2011 and 2012 for example Zambia's raw cereals exports were valued at USD 195.883 million and USD 414.825 million compared with exports of milling products which were valued at only USD 59.034 million and USD 36.122 million respectively. The only exception occurred in 2001 and 2009 where exports of milling products exceeded exports of raw cereals by USD 1.7 million and USD 673 thousand respectively. These findings therefore reveal that despites good performance recorded in the export of raw cereals such as maize, the country has not done well in as far as value addition is concerned.

Figure 3-11: Comparison of Zambia's exports of cereals and milling products from 2001 to 2014

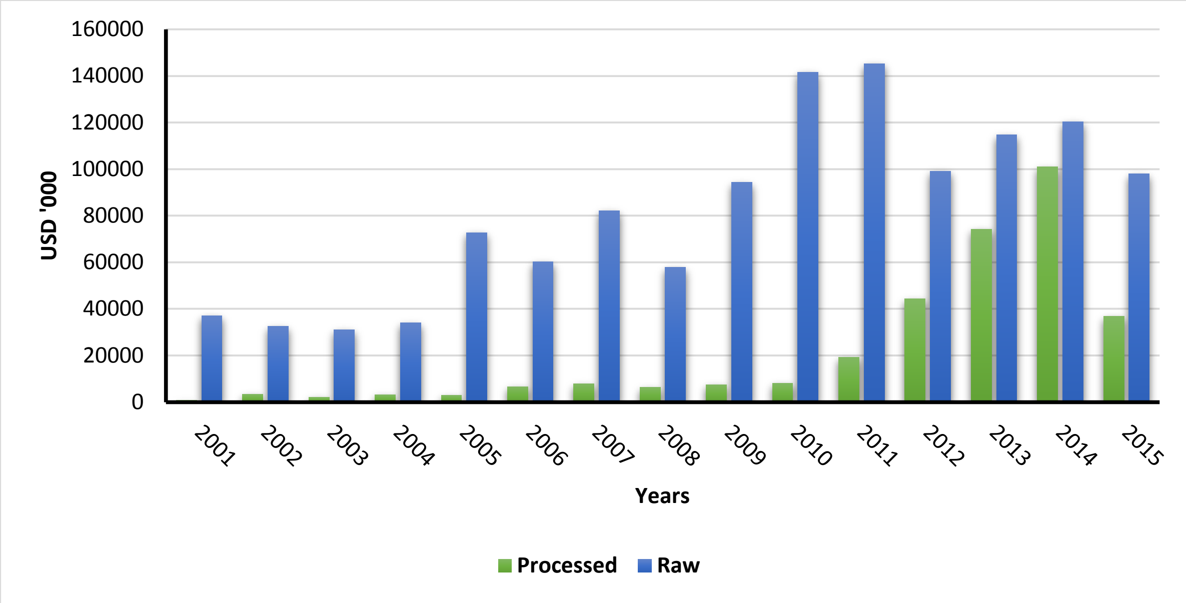


Source: Trade Map (2016)

3.4.2 Sugar industry

The sugar industry is yet another important subsector of the Zambia's agricultural sector that contributes about 4 percent to GDP and provides employment for over 11,000 workers (Sutton and Langmead, 2013). The Zambia Sugar company, a subsidiary of the South Africa's Illovo Sugar group (holding 82 percent shares) is the dominate firm that controls over 90 percent of the domestic market and produces and exports sugar in Zambia. The firm produces about 380,000 tons of both refined and unrefined sugar. Other processed products include caster sugar, syrup and speciality sugar. Only 40 percent of the sugar and other products are sold locally of which 75 percent goes to households and the remaining 25 percent is sold to firms producing beverages and food (industrial use). The raw sugar exports have remained steady recording USD145.3 million in 2011 and slightly dropping to USD120.4 million in 2014 (figure 3-13). However, in 2015 raw sugar exports were estimated at about USD98 million while exports of value added sugar products were valued at USD36.8 million. The major trading partners were DRC accounting for 50.6 percent and South Africa at 21.2 percent while Kenya and Mauritius shares in Zambia's sugar exports were 7.4 percent and 6.4 percent respectively (TradeMAP, 2016).

Figure 3-12: Zambia's raw sugar and sugar products exports from 2001 to 2015



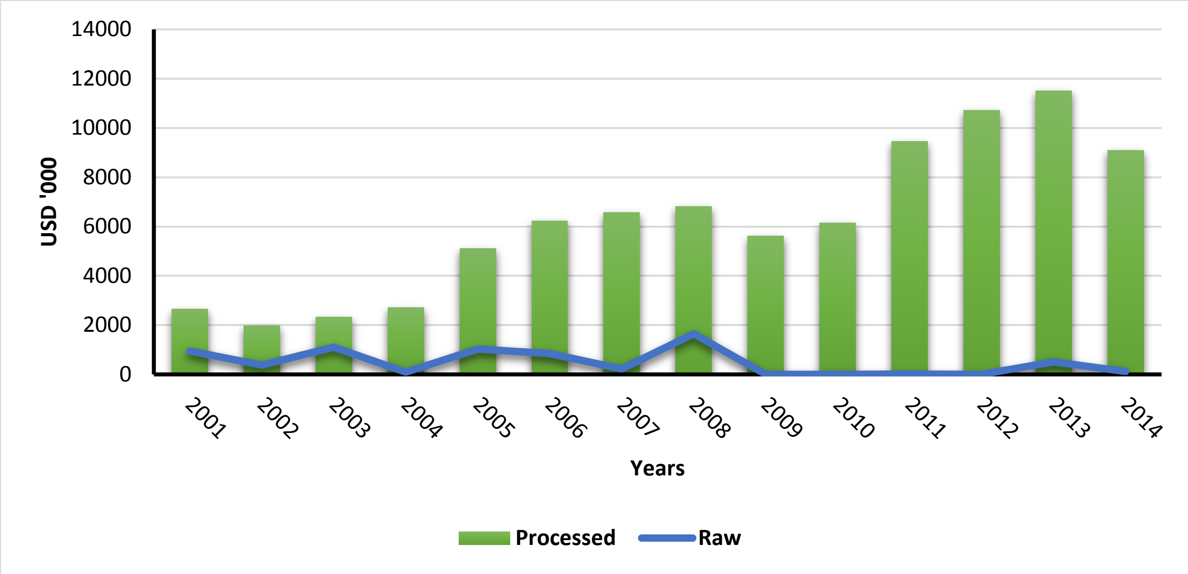
Source: Trade Map (2016)

Three quarters of the sugar produced and exported by Zambia are for household direct consumption as well as for industrial purposes sold as bulk commodity. There has been growing demand of raw sugar and value added products thereof from within the SADC region. Figure 3-12 shows export trends and comparison of raw sugar and processed sugar products for Zambia from 2001 to 2014. As can be seen Zambia exports more unprocessed sugar compared to exports of sugar products. On average from 2001 to 2015, Zambia exported over USD 81 million worth of raw sugar per year while exports of sugar products were valued at about USD 22 million per year within the same period.

Despite the growing market for sugar products in Zambia and the SADC region as a whole, Zambia has not taken advantage of this potential to speed up the value addition of sugar. This can be evidenced by relatively small shares of exports of value added sugar products as shown in figure 3-12 and relatively large shares of imports of sugar products shown in figure 3-13. On average Zambia imported over USD 6.2 million of processed sugar products per year compared to imports of raw sugar valued slightly over USD 494 000 per year from 2001 to 2014.

The analysis shows that Zambia exports more unprocessed sugar relatively to value added sugar products. Again, the value addition of sugar in Zambia is still under performing and the data shows that the country imports more sugar products than it produces domestically.

Figure 3-13: Zambia's raw sugar and sugar products imports from 2001 to 2014

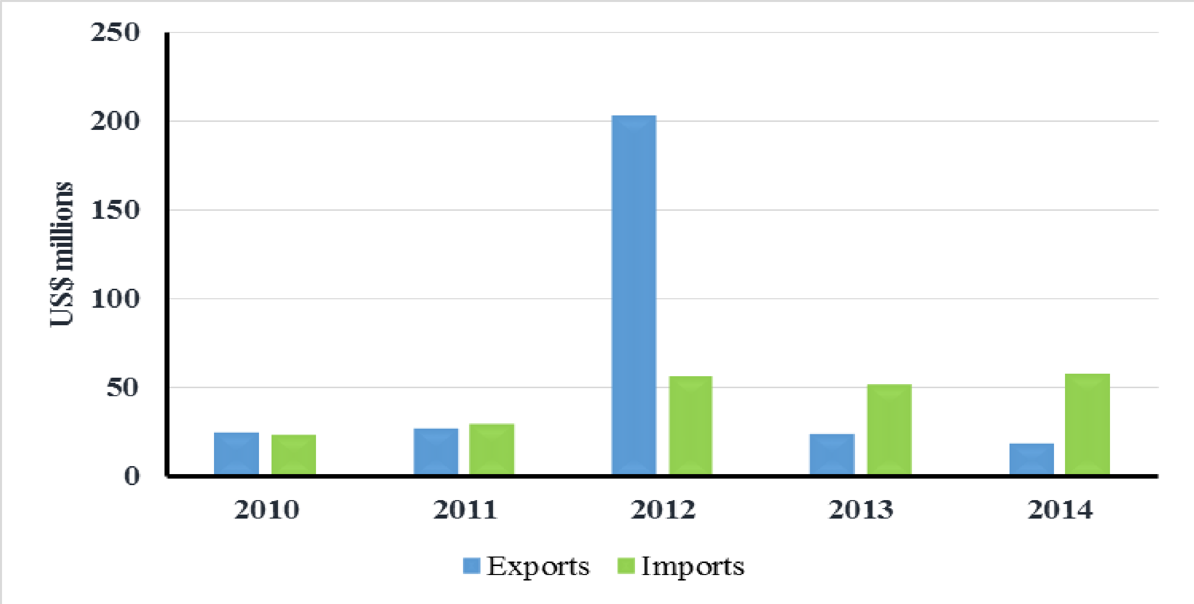


Source: Trade Map (2016)

3.4.3 Wood processing

The wood industry, which was in heavy decline since the 1990s, has performed better since the mid-2000s. Its performance is largely driven by the construction boom in the domestic market that takes up 70 percent of output, mainly sawn wood and in the DRC (Dinh, 2013). With a labor force of 47,000 people, the wood industry is a more important source of employment than copper and steel fabrication put together. Despite this and the presence of a small number of dynamic exporters of value added products, the perspective for the industry is weak, given low labor productivity and capacity utilization constraints, high wood price, low levels of investment, and a largely informal structure. The paper industry has also been performing better since the late 2000s. This industry has been mainly focused on the domestic market for tissue paper, paper serviettes, exercise books, polythene products and PET packaging (Sutton and Langmead, 2013). It is however import-intensive, relying on South Africa, China, Europe and India for raw materials and intermediate products. In terms of value added, both wood and paper industries are likely to be small (Fessehaie *et al.*, 2015).

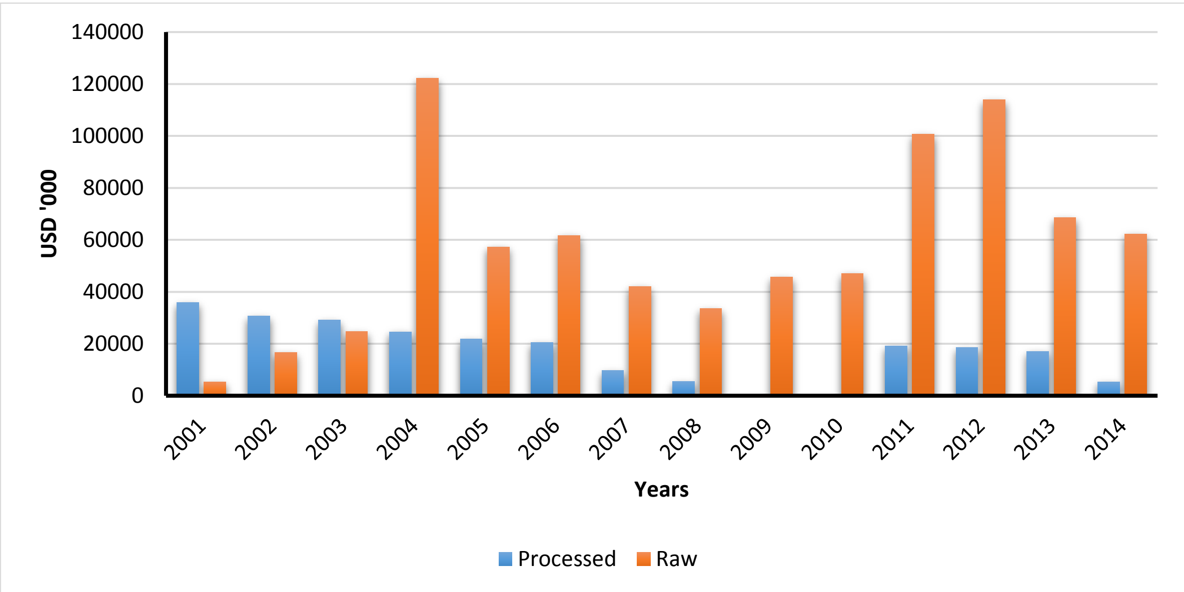
Figure 3-14: Trends in exports and imports of wood and wood products (2010-2014)



3.4.4 Cotton industry

The cotton subsector is vital to the Zambian economy as it is estimated to support 21 percent of the local population. Relative to other subsectors such as tobacco and small-scale sugar, the cotton industry contributes more to job and wealth creation due to the substantially large numbers of farmers that participate in the cotton value chain.

Figure 3-15: Zambia's exports of raw cotton and processed cotton from 2001 to 2014

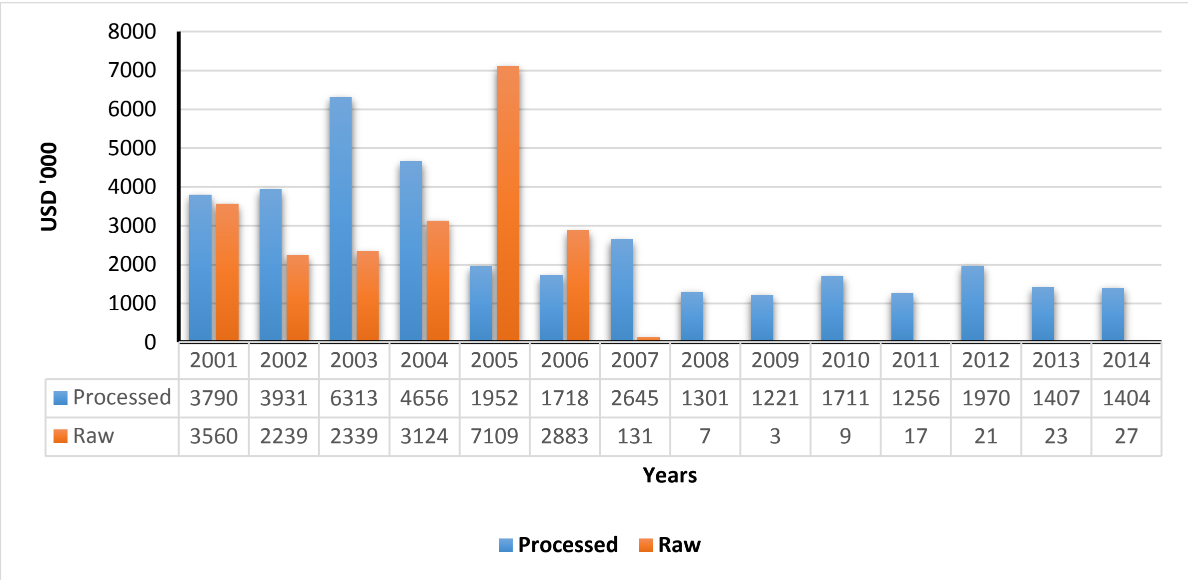


Source: Trade Map (2016)

Substantial income is generated throughout the cotton value chain that includes input distribution, extension services provision by companies, cottonseed ginning, exportation of lint and raw cottonseed and processed oil and soap production. To ensure high quality, Zambian cotton is handpicked and as a result, its demand on the international market is higher.

Figure 3-15 shows the trend in the exports of raw cotton and value added cotton products from 2001 to 2014. As can be seen since 2004 the export of raw cotton has been steadily growing while processed cotton exports have not been doing so well. In 2004, for example raw cotton exports were recorded at US$122 million compared with processed cotton exports that were valued at only US$24.6 million. Similar trends were observed in later years such as in 2014 were the exports of raw cotton amounted to US$62 million against processed cotton exports that were recorded at US$5.3 million.

Figure 3-16: Zambia's imports of raw cotton and processed cotton from 2001 to 2014



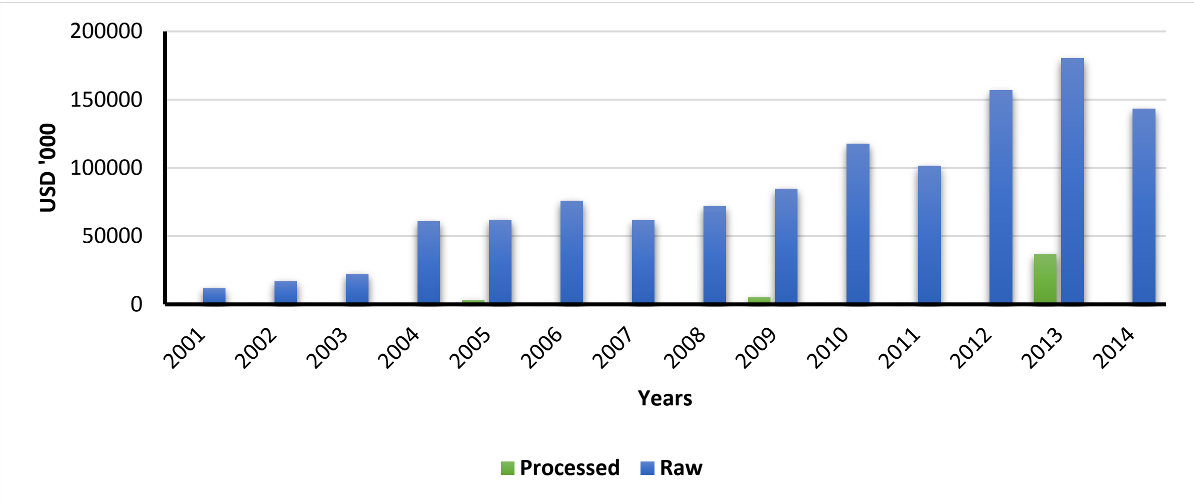
Source: Trade Map (2016)

From 2007, the imports of raw cotton into Zambia drastically declined to USD 131,000 from USD 2.9 million in 2006. This was due to amongst other factors, high domestic production levels that led to increased exports of raw cotton as indicated in figure 3-15. However as can been seen in figure 3-16, the relative shares of imports of processed cotton has remained steady during the same period that imports of raw cotton has been declining. Imports of processed cotton increased from USD 1.7 million in 2006 to USD 2.6 million in 2007. As of 2014, imports of processed cotton were recorded at USD 1.4 million compared to raw cotton imports that recorded only USD 27,000. It can be concluded therefore that despite positive trends in exports of raw cotton, Zambia has continued to rely on imports of processed cotton products. The direct implication of this is that the value addition of cotton subsector is still underdeveloped relative to primary production of cotton. In addition, over the 10-year period, cotton exports have grown at averaging 5 percent per annum. This represents the lowest growth rate among the Non-Traditional Exports according to ECIAfrica (2012) and KPMG (2014).

3.4.5 Tobacco industry

Tobacco and manufactured tobacco products trends in exports from 2001 to 2014 are shown in figure 3-17. Since 2001 Zambia's exports of raw tobacco has been increasing steadily recording US$16.9 million in 2002 and increasing to US$75.7 million in 2006 before dropping to US$61.4 million in 2007. The exports of raw tobacco again increased from US$71.7 million in 2008 and reached its peak recording US$180 million in 2013. On the other hand, over the 14-year period, exports of processed tobacco products have been relatively poor having recorded the highest in 2013 valued at only US$36.7 million compared to US$180 million worth of raw tobacco exports in the same year.

Figure 3-17: Trends in raw tobacco and processed tobacco exports for Zambia from 2001 to 2014

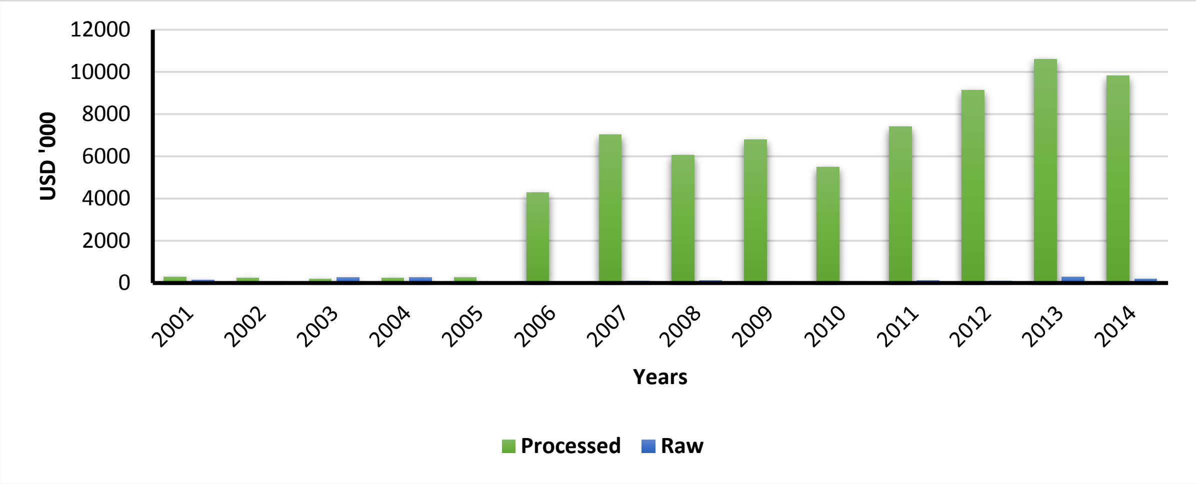


Source: Trade Map (2016)

Malawi imports about one third of tobacco for marketing while the rest is exported to high demand markets such as china, UAE, Zimbabwe and Europe. From figure 3-18, it can be seen that the imports of processed tobacco products into Zambia has been on the rise since 2006.

On average between 2006 and 2014 Zambia imported processed tobacco products valued at US$7.4 million compared to US$110 000 of raw tobacco imports per year.

Figure 3-18: Trends in raw tobacco and processed tobacco imports for Zambia from 2001 to 2014



Source: Trade Map (2016)

3.4.6 Further arguments for agro-processing

Table 3-4 shows the trade indicators (i.e. exported value, trade balance and annual growth in value) for the selected export products from Zambia. It can be seen that in 2015 Zambia's total exports were valued at about US$7 billion and had a trade deficit of US$1.4 billion. The average annual growth in value of total exports between 2011 and 2015 was -5 percent while between 2014 and 2015 annual growth in total exports reduced by 28 percent.

In terms of agricultural and agro-processed products, the trend is mixed. For example, a comparison of cereals and milling product exports shows that while the former grew by 177 percent between 2014 and 2015, milling products fell by 46 percent. Whether this growth in cereals was a coincidence or whether it is sustainable depend on a number of factors considering that the same cereal subsector's growth has been decreasing by 15 percent per year from 2011 to 2015. A substantial margin is also observed for exports in which cereals accounted for over US$204 million compared with US$25.5 million recorded for milling products in 2015. With regard to the sugar subsector, statistics show that the annual growth of raw cane sugar increased by 20 percent per year between 2011 and 2015 and 24 percent per year between 2014 and 2015. Refined sugar on the other hand underperformed in 2015 relative to raw cane sugar as evidenced by exported values shown in table 3-4.

Similar trends are observed in the tobacco subsector. Manufactured tobacco performed relatively well in 2015 compared to unmanufactured tobacco as measured by the annual growth in value which grew by 238 percent per year between 2014 and 2015 and by 169 percent per year between 2011 and 2015. However, Zambia exported only US$18.1 million worth of manufactured tobacco compared to US$88.2 million recorded for unmanufactured tobacco. Therefore, despite the positive annual growth in value recorded by manufactured tobacco, more work needs to be done to ensure that this trend continues and that more tobacco is manufactured and exported. Table 3-4 provides a summary of how other high value tobacco products performed in 2015.

Table 3-4: Trade indicators for selected export products

	Exported value in 2015 (US$'000)	Trade balance 2015 (US$'000)	Annual Growth in value 2011-2015 (% p.a)	Annual Growth in value 2014-2015 (% p.a)
All products(Total)	6,983,184	-1,437,540	-5	-28
Other products				
cereals	204,628	174,105	-15	177
milling products	25,498	10,058	-13	-46
Raw cane sugar (obtained without centrifugation)	51,533	51,480	-16	-16
Raw cane sugar	46,441	46,435	20	24
Cane or beet sugar and chemically pure sucrose	17,134	16,862	30	29
Refined cane or beet sugar	22	14	-	-
Unmanufactured tobacco	88,205	88,013	-4	-5
Manufactured tobacco	18,134	18,131	169	238
Cigars, cheroots, cigarillos and cigarettes of tobacco	140	-8431	-15	24
Raw cotton	46,802	46,790	-19	-5
Carded or combed cotton	6,765	6,714	-29	-25
Cotton yarn	190	145	-15	69
Woven fabrics of cotton (>85% cotton)	21	-487	-	-
Woven fabrics of cotton (>85% cotton)	21	-487	-	-

Source: Trade Map (2016)

In 2015, raw cotton exports amounted to US$46.8 million and recorded a positive trade balance of US$46.79 million while carded or combed cotton exports were valued at US$6.77 million and trade balance of US$6.7 million. On the other hand, woven fabrics of cotton (containing more than 85 percent of cotton by weight) recorded a trade deficit of US$487 000 and exports amounted to US$21 000 in 2015.

The statistics have clearly shown that most value added products such as cotton yarn and woven fabrics of cotton, high value tobacco products (such as cigars), refined sugar as well as some milling products are underperforming in terms of export values and annual growth relative to their raw and unprocessed counterpart products. Given the abundant agricultural resources, that Zambia is endowed with there is great potential to provide raw materials for value addition and food processing hence ample room for growth of the Non-Traditional Exports through improvements in the agro-processing sector.

As Fessehaie *et al.,* (2015) points out creating value chains and hence processing of agricultural products faces a number of challenges in Zambia such as high transportation costs, stiff competition and firm capabilities as well as restrictive regulations at both regional and national level. Zambia imports most goods inclusive of processed food from South Africa and other countries in the region. These imports originate from firms that have expertise, that are well established, and whose products are perceived by customers to be of higher quality than the locally processed foods. As a result, firms domicile in Zambia, especially indigenous ones, find it extremely hard to compete on the market that is so liberated. Fessehaie *et al.,* (2015) further suggest the need for targeted interventions in order to improve the performance of local firms given the stiff competition and other challenges that they face in processing of agricultural products. Indeed, there has been recent developments by the government of Zambia to promote private investment into growth sectors such as agriculture. As described in the latter sections the government has over the past years put up initiatives aimed at encouraging investment through a number of policy instruments such as the granting of tax incentives to deserving firms.

3.5 Opportunities and potential

Not much of Zambia's agro-processing potential has been utilized and as such, there are plenty of opportunities in the industry. Favorable climatic conditions, availability of arable land and access to vast water resources in Zambia enables cultivation and production of a wide range of crops, livestock, fisheries and forestry products. This implies that Zambia has potential to support the agro-processing sector as it produces adequate outputs that can be used as intermediate inputs in the value addition process. However, these primary agricultural produce are sold on either the local market or international markets as exports mostly in their raw and unprocessed form. As a result, the agro-processing sector has remained underdeveloped for many years relative to other countries like South Africa for example. As stipulated by Zambia Development Agency (2014) Zambia offers investment opportunities in a number of agro-processing subsectors. The cereal-milling subsector is one example that involves a number of activities such as animal or stock feed production, cassava processing (food and other industrial products) and grain milling (rice, maize, and wheat). Other subsectors include sugar refinery, cotton spinning, tobacco processing, and many others.

In addition to the vast activities for investment, Zambia offers a growing market for processed agricultural products. This is so due to urbanization and the growing incomes of the middle class population. Fessehaie *et al.*, (2015) reports that in countries such as Zambia, Namibia and South Africa the consumption of processed foods and beverages is higher among urban households in absolute terms and that this positive trend is likely to replicate in other African countries within the region so long as they maintain growth rates in income and urbanization. They further state that in relative terms lower income groups as well as rural households tend to spend most of their incomes on food and beverages. Zambia has also over the recent years experienced the mushroom of regional supermarkets such as Pick and Pay, Shoprite, Choppies and Food Lovers mostly from South Africa and have opened branches in many parts of the country. Linked to the supermarkets has been foreign direct investment in the food outlets and restaurants such as Hungry Lion, KFC, and Debonaires etc.

All of the products listed above present great opportunities and if value chain networks can be established successfully to include the local primary producers, it can have positive impacts on agricultural growth and productivity as well as enhancing of household incomes. Most neighboring countries such as DRC, Namibia and Botswana, including South Africa, are faced with challenges in their respective agricultural production relative to Zambia (Fessehaie *et al.*, 2015). They then represent potential export markets for value added products.

There is need therefore to strengthen linkages between urban demand and agro-processed products that includes processed food and to create value chain networks especially around supermarket retail shops. Zambia is increasingly becoming urbanized and this provides potential for enormous demand for processed food. The urban annual population growth has increased from 1.4 percent in 1990's to about 4.4 percent in 2013 World Bank (2016b). Zambia has also seen growth in the urban middle class, which are associated with high demand of processed foods and beverages. The demand for dairy products has tripled because of growing urbanization. Sutton & Langmead (2013) give a classic example of the impact of urban population growth on the demand for processes foods. Accordingly, for Parmalat which is the largest processor of dairy products in Zambia, to meet the growing local demand for fresh milk it has to reconstitute about 200,000 liters of milk per month. The distribution channel of these dairy products is mostly through supermarkets of varying sizes as well as small retail chains in urban areas. This is a possible explanation as to why there has been substantial imports of processed foods into Zambia. Indeed, tapping into this demand would act as an advantage to encourage both domestic and foreign investment into primary production and processing of such agricultural products as wheat, sugar, soybean and poultry.

In addition, the government of Republic of Zambia do acknowledge the important role of agro-processing to economic growth, poverty alleviation and income distribution. As such through the Zambia Development Agency, the government offers tax incentive packages to firms willing to invest in Zambia's growth sectors such as agro-processing sector.

3.6 Tax policy in Zambia

3.6.1 Zambia's current tax incentives

Tax revenue make up a major component of government budget revenue that is used to support the various development activities in a country as well as provision of essential services such as health and education. For example, in 2014 tax revenues were recorded at K 27 631.3 million which represented 3.6 percent above the Parliament target of K26 675.9 million. The promoters of investment argue that it is necessary for government to provide some sort of incentives that will attract domestic and foreign investment. It is said that the more investment a country has the more revenue it collects in the form of taxes. Nevertheless the extent to which incentives attract foreign investment is still under debate by many scholars (Fumpa and Imakando, 2015). Within the agricultural and manufacturing sectors, the government offers the following tax incentives (Zambia Development Agency, 2013):

Tax incentives in primary agriculture and agro-processing

1) VAT-able firms are allowed to claim input tax for a period of 5 years prior to commencement of production;
2) The Corporate Income Tax rates on income generated from farming and agro-processing and Non-Traditional Exports have been reduced to 10 percent and 15 percent respectively. It should be noted that the standard rate for Corporate Income Tax in Zambia is 35 percent (Mvula, 2015);
3) Firms specializing in exports of agricultural products and suppliers qualify for zero rating;
4) Firms or businesses importing selected agricultural equipment and machinery are granted VAT deferment on these goods;
5) The importation of irrigation equipment is import duty free with some farming equipment imports at reduced duty rates;
6) Hammer mills of HS Code 8436 1000 are zero-rated;
7) For the farms that invest in stumping and clearing as well as works aimed at preventing soil erosion and conserving water; construction of borehole and wells, aerial and geophysical surveys shall receive 100 percent full cost of such activities in the form of a farm works allowance;
8) Farm businesses are exempted from paying taxes on dividends for a period of 5 years from the time the firm commences its operations;
9) Any person or business that invests in the growing of tea, coffee, bananas, citrus trees or related plants and trees receive a development allowance at 10 percent of such cost;
10) Pre-mixes that are a source of vitamin additive for animal feed, attract only 5 percent customs duty.

Tax incentives in manufacturing

1) VAT-able firms are guaranteed to claim input tax for a period of 5 years prior to commencement of production;
2) Businesses that import various textile machinery including all woven polyester fabrics etc. enjoy zero percent import duty;
3) Companies specializing in the assembly of motor vehicles, trailers, motor cycles and bicycles are exempted from paying taxes on their declared dividends;
4) Firms or businesses importing selected machinery used in textile and clothing making pay zero percent customs duty;

5) Under the Commercial Exporters Scheme, non-resident businesses are entitled to Zambian VAT refund on export of Zambian products;
6) Businesses in the manufacturing sector are guaranteed to input tax claim for the period of 2 years prior to start of operations;
7) A reduced tax rate of 15 percent is paid on income generated from the manufacturing of chemical fertilizers;
8) A deduction of 10 percent and 5 percent as capital allowance on industrial building (in case of low cost housing) used for manufacturing operations and other industrial buildings respectively;
9) Initial allowance at 10 percent of the full expenditure for those businesses and indeed persons who invest in construction of industrial buildings. This entitlement is valid the years in which the completed building is first brought into use;
10) Investment allowance at 10 percent of the full expenditure for any person who invest in construction of industrial buildings. The allowance is paid the first year in which the building is used for manufacturing;
11) Import duty reduced to 5 percent on intermediate materials such as PVC lining and eyelets used for making shores;
12) Fifteen percent import duty on semi refined wax and cerechlor, tapioca starch with dextrose powder. Tapioca starch is used to make biscuits while semi refined wax and cerechlor are used in the making of paint;
13) Zero percent import duty is paid on a number of textile machinery. The same applies to all woven fabrics of polyester as well as imported gray fabric and sewing threads;
14) Import duty has been reduced to 5 percent on various inputs used in the manufacturing process. Examples are:
    - Crude coconut oil
    - Plates sheets, film, foil and strip of unsaturated polyesters

Recently the Zambia Revenue Authority proposed measures to discourage low quality imports and promote processing through value addition of agricultural and other produce. According to ZRA (2016) highlights on Zambia's 2016 Annual Budget the following were some of the recommendations made: (1) Export duty to be introduced at 40 percent on unprocessed wood while semi-processed wood to be taxed at 20 percent, (2) Customs duty on wood and wood products to be increased to 40 percent.

3.6.2 Tax revenue performance

According to ZRA (2014) the total revenue collected in 2014 was K 27 631.3 million which represented 3.6 percent above the Parliament target of K26 675.9 million. The tax revenue collection performance was relatively better in 2014 as revenue increased in nominal terms from K23 190.8 million collected in 2013 to K27 631.3 (refer to table 3-5). Given this good performance however, some tax types under-performed, as they did not meet the parliament targets. These tax types were company tax, mineral royalty, import VAT withholding tax, excise duties, customs duty and export duty.

Table 3-5: Performance of tax revenue in 2014 (K 'million)

Tax types	Actual	Target	Variance	% Var of target	% of GDP (2010 base)
Total revenue	**27,631.3**	**26,675.9**	**955.4**	**3.6**	**16.6**
Tax revenue	**27,604.2**	**26,642.8**	**961.4**	**3.6**	**16.6**
Income taxes	**13,225.1**	**13,798.0**	**(572.9)**	**(4.2)**	**7.9**
Company tax	3,487.8	4,723.5	(1,235.8)	(26.2)	2.1
Non mining company tax	2,014.3	2,093.8	(79.5)	(3.8)	1.2
PAYE	6,426.9	5,248.3	1,178.6	22.5	3.9
Withholding Taxes	1,543.6	1,583.5	(39.9)	(2.5)	0.9
Mineral Royalty tax	1,766.9	2,242.7	(475.8)	(21.2)	1.1
Excise Taxes	**2,853.9**	**3,113.9**	**(260.0)**	**(8.3)**	**1.7**
Excise Duty	1,994.3	2,163.8	(169.4)	(7.8)	1.2
Rural Electrification levy	45.0	38.0	7.0	18.5	Negligible
Fuel Levy	789.7	861.0	(71.4)	(8.3)	0.5
Carbon Tax	24.9	51.1	(26.2)	(51.3)	Negligible
VAT on domestic goods	**3,157.1**	**404.6**	**2,752.5**	**680.3**	**1.9**
Trade Taxes	**8,368.1**	**9,326.3**	**(958.3)**	**(10.3)**	**5.0**
VAT on imports	6,396.6	6,918.3	(521.7)	(7.5)	3.8
Customs Duty	1,948.9	2,204.6	(255.7)	(11.6)	1.2
Export Duties	22.6	203.5	(180.9)	(88.9)	Negligible
Export Duty on scrap metals	0.2	0.0	0.20	100	Negligible
Export Duty on Cotton seed	0.0	0.0	0.0	0.0	0.0
Export Duty on copper concentrate	22.4	203.5	(181.1)	(89.0)	Negligible
Non Tax revenue	**27.0**	**33.1**	**(6.0)**	**(18.3)**	**Negligible**
Motor Vehicle Fees	27.0	33.1	(6.0)	(18.3)	Negligible

Source: ZRA (2014)

Custom taxes on imports

Custom duty is a tax levied on imported goods and the rates apply. As indicated in table 3-6, the rates of custom duty imposed on various product groups imported into Zambia depends on the nature of these products. The highest rates are applied on finished goods and this shows that the government's effects of promoting value addition. This study will investigate the effects of import tariff increase, with focus on agro-processed commodities, in addition to other policy alternatives such as export taxes and production subsidies.

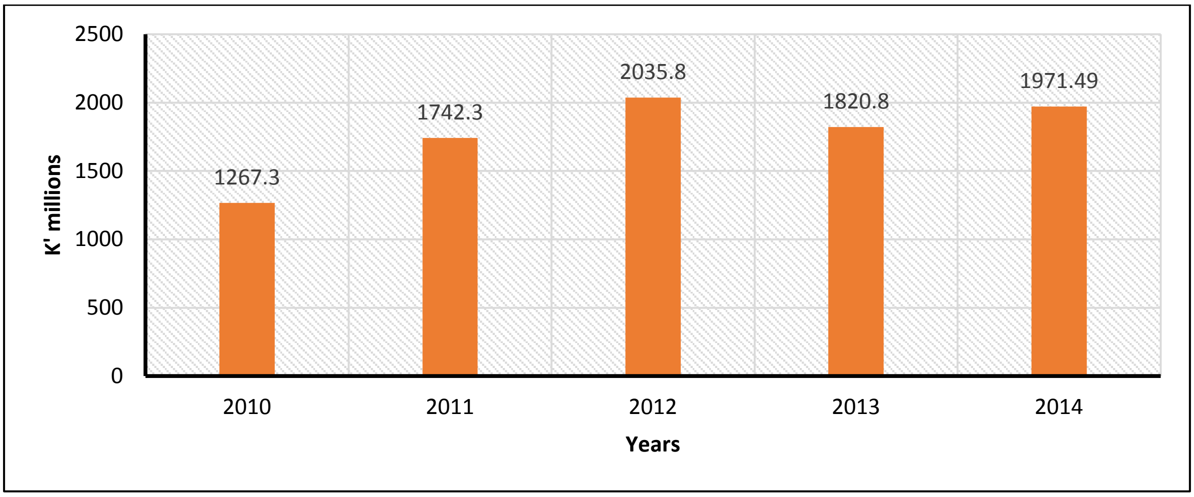
Table 3-6: Customs duty rates on imported goods in Zambia

Category	**Tax rate (%)**
Capital equipment and raw materials	0-5
Intermediate goods	15
Finished goods	25

Source: ZRA (2016)

Figure 3-19 shows the trends in collection of customs and export duty from 2010 to 2014. In 2010, collected taxes in customs and export duty amounted to K 1,267.3 million and rose to K 1,742.3 million the following year. The trend shows that tax collection has remained stable increasing to K 1,971.49 million in 2014 from K 1,820.8 million in 2013.

Figure 3-19: Trends in customs and export duty collection from 2010 to 2014

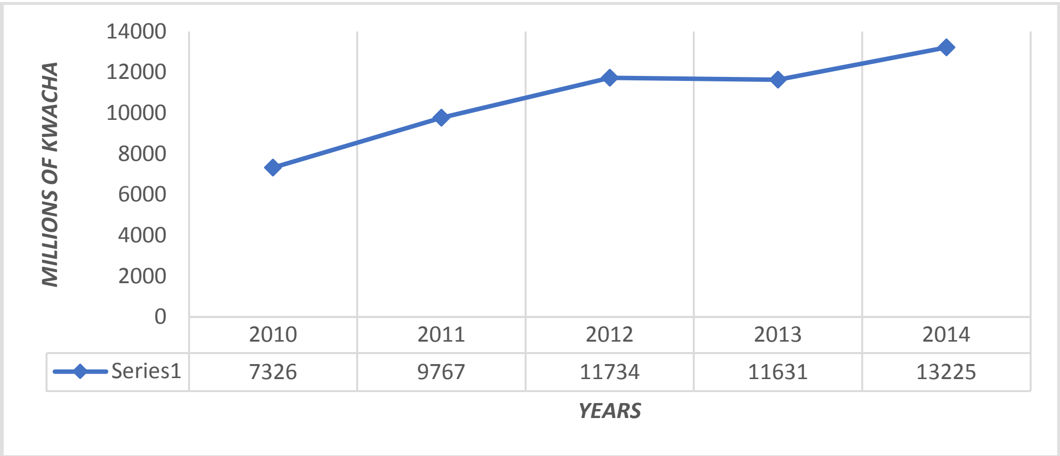


Source: ZRA (2016)

Income taxes

As shown in figure 3-20 the income tax collections have been on the increase since 2010. Income tax collection increased steadily from 2010 to 2012 and slightly declined in 2013. In 2014, the income tax collection picked up and increased from K11 631 million recorded in 2013 to K13 225 million in nominal terms. This increase however was against the parliament target of K13 798.0 million which means that the tax collection under-performed by 4.2 percent in 2014. Among the contributing factors, include the under-target performance of some income tax types listed in the previous section. Of the total income, tax collected Pay As You Earn (PAYE) tax accounted for the biggest share of 48.6 percent followed by Company Taxes at 26.4 percent. Mineral Royalty taxes and Withholding Taxes accounted for 13.4 percent and 11.7 percent respectively.

Figure 3-20: Income tax collection trends from 2010 to 2014 (K'millions)

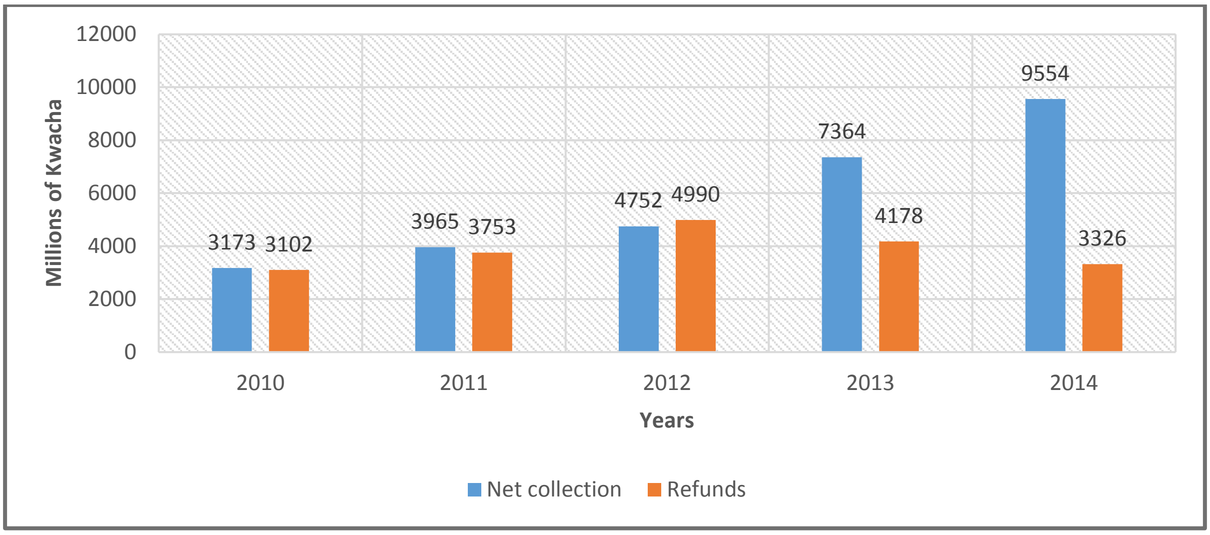


Source ZRA (2014)

Value Added Tax (VAT) and Duties

Value Added Tax collections in Zambia consists of two major tax types: VAT on imports and domestic VAT. The collection is split approximately two-thirds import VAT to one-third domestic VAT. With regard to 2014, performance total VAT collection increased to 34.6 percent from 31.8 percent of the total taxes in 2013. The least contributing tax types to the total tax collection are the Customs and Export duties. For example, they collectively decreased from 7.9 percent in 2013 to 7.1 percent in 2014. ZRA (2014) attributes the underperformance to implementations of the SADC and COMESA regional trade protocols amongst others.

Figure 3-21: Collection and refunds of VAT from 2010 to 2014 (K' millions)



Source: ZRA (2014)

Figure 3-21 is a depiction of the performance of VAT and the VAT refunds from 2010 to 2014. The depreciation of the Zambian Kwacha against major international currencies such as the US dollar negatively affected import volumes, which in turn undermined the performance of import VAT (ZRA, 2014). In 2010, total VAT collection amounted to K3 173 million of which K3 102 million were VAT refunds. Similar trends were observed in 2011 and 2012 and by 2013 total VAT collections increased significantly to K7 364 million from K4 752 million representing a 55 percent increase. VAT refunds however declined from K4 990 million in 2012 to K4 178 million in 2013. The increased VAT collections continued in 2014 amounting to ZMW 9 554 million while VAT refund further declined to ZMW 3 326 million in the same year.

3.7 Summary and conclusions

This chapter reviewed the contribution to GDP by most sectors including agriculture for the period 2011 o 2014. The mining sector continued to dominate during this period. The continued depreciation in the Zambian Kwacha against most international currencies such as US dollar, Pound Sterling and Euro since 2013, has contributed to rising annual inflation, which rose from 7.7 percent in 2014 to double digits at 21.1 percent by the end of 2015. Copper has mainly driven Zambia's total exports and as stated by Fessehaie *et al.*, (2015) copper exports averaged 70 percent of the total exports between 2003 and 2013. However, copper, continues to experience some external shocks recently due to the slowdown of China's economy leading to lower prices on the international markets leading to depreciation of the Zambian Kwacha and foreign earnings problems.

In terms of primary agriculture, crop production at macro level, there has been improvements since 2006. Maize production has over the years steadily increased recording 3.4 million metric tons in 2014 from 2.5 million metric tons in 2013. Livestock and fisheries are also important subsectors of primary agriculture in Zambia. In addition to crop production, the livestock subsector in Zambia continues to be an important contributor to the country's GDP. It is reported that in 2009 and 2010 the livestock subsector contributed 6.4 percent and 7.4 percent respectively to Zambia's GDP.

In Zambia agro-processing involves a number of activities that process and transform the following agricultural produce; fruits and vegetables, honey, oil, sugar, coffee, tea, mushrooms and many more into refined products that are eventually sold on the market (domestic sales and exports) or consumed by primary producers (households) themselves. Empirical evidence however shows that there has been little investment in value added activities of agricultural products and as Muyunda (2009, cited in RMC, 2010) states only 30 percent of primary agricultural produce in Zambia are sold to the agro-processing sector.

Statistics on selected subsectors of agro-processing reveal that most value added products such as cotton yarn and woven fabrics of cotton, high value tobacco products (such as cigars), refined sugar as well as some milling products are underperforming in terms of export values and annual growth relative to their raw and unprocessed counterpart products. Given the abundant agricultural resources, that Zambia is endowed with there is great potential to provide raw materials for value addition and food processing hence ample room for growth of the Non-Traditional Exports through improvements in the agro-processing sector.

Not much of Zambia's agro-processing potential has been utilized and as such, there are plenty of opportunities in the industry. Favourable climatic conditions, availability of arable land and access to vast water resources in Zambia enables cultivation and production of a wide range of crops, livestock, fisheries and forestry products. Despite the growing market for sugar products in Zambia and the SADC region as a whole, Zambia has not taken advantage of this potential to speed up the value addition of sugar. Relatively small shares of exports of value added sugar products and relatively large shares of imports of sugar products can evidence this. On average Zambia imported over USD 6.2 million of processed sugar products per year compared to imports of raw sugar valued slightly over USD 494 000 per year from 2001 to 2014. In addition, the Government of the Republic of Zambia do acknowledge the important role of agro-processing to economic growth, poverty alleviation and income distribution. As such through the Zambia Development Agency, the government offers tax incentive packages to firms or businesses willing to invest in Zambia's growth sectors such as agro-processing sector

4. Methodology and data

4.1 Introduction

In this chapter, the static computable general equilibrium model used in this study is introduced and discussed. Included in the discussion are the price and production structures of the model as well as the elasticity's used in the model. Then the original 2007 Social Accounting Matrix for Zambia, which is a data framework used in this study, is explored. The chapter concludes with a brief discussion on data changes made in order to fit the data to the model.

4.2 The IFPRI standard CGE Model

The analysis is done using a static computable general equilibrium model developed by Lofgren, Thomas and El-said (2002) and used in policy studies by, Lofgren & Robinson (2002), Alshehabi (2013), Bahta, Willemse & Grove (2014), Diao, Somwaru & Tuan (2003) and many others. The model is specified to include both the neoclassical and structuralist modelling approach and has features that reflects the characteristics of developing countries.

Price equations

The equations in the price block link endogenous model prices to other endogenous or exogenous prices as well as non-price variables in the model.

Import price

$$PM_C = pwm_c.(1+tm_c).EXR + \sum_{c' \in CT} PQ_{c'}.icm_{c'c} \qquad 1$$

According to equation 1, the import price, which is given in local currency units (*PM*), is defined as the price at which domestic demanders pay for the imported commodities less the sales tax. Mathematically this price is equal to the import price in foreign currency units (world price) *pwm*, adjusted for import tariffs *(1+tm*), and multiplied by the exchange rate *(EXR)* plus the cost of trade inputs per import unit.

Export price

$$PE_c = pwe_c.(1-te_c).EXR - \sum_{c' \in CT} PQ_{c'}.ice_{c'c} \qquad 2$$

Export price expressed in local currency unit (*PE*) is defined as the price that local producers receive for selling their commodities in the export markets. Equation 2 states that the export price in local currency unit, *PE* is equal to the export price in foreign currency unit, (*pwe)* adjusted for export tax *(1-te)* if any and multiplied by the exchange rate, *EXR* less the cost of trade inputs per export unit. Note that here the price received by domestic producers for selling their commodities in the export market is reduced by the tax and the cost of trade inputs while the opposite happens with import prices.

Activity price

$$PA_a = \sum_{c \in C} PXAC_{ac} . \theta_{ac} \qquad 3$$

Activity price *(PA*) can be defined as the price received by producers for selling the activity's output. This price is obtained mathematically by multiplying the yields per activity unit by the activity specific commodity prices done for all commodities (equation 3).

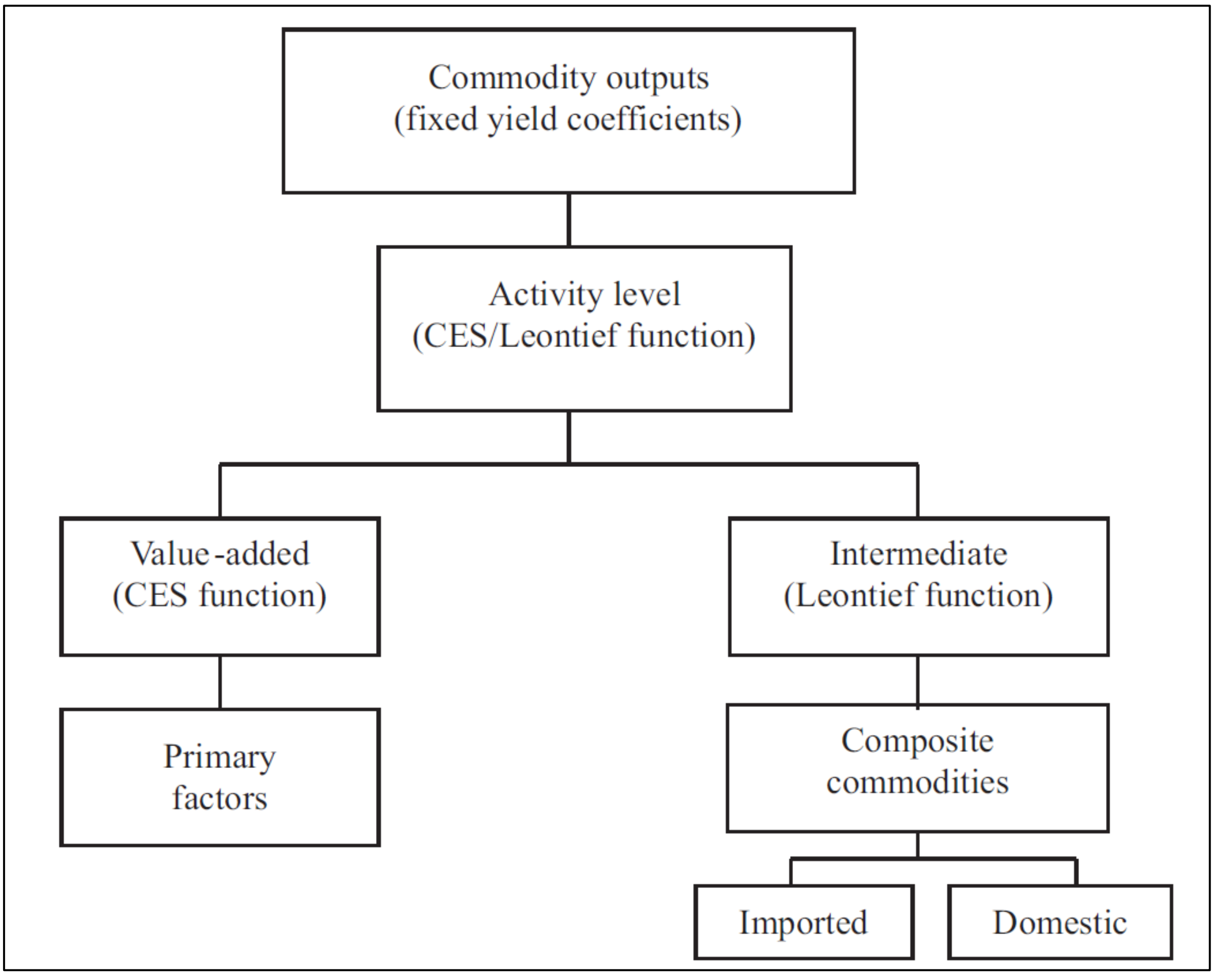
Aggregate intermediate input price

$$PINT_a = \sum_{c \in C} PQ_c . ica_{ca} \qquad 4$$

Aggregate intermediate input price (*PINT*) indicates how much disaggregated intermediate inputs cost for a given unit of aggregated intermediate input. ica_{ca} shows the amount of commodity c (intermediate input) per unit of aggregated intermediate input.

The model assumes that each producer maximizes profits subject to a production technology. The producers take the prices of output, intermediate inputs and factors as given hence assumed to be operating in a perfectly competitive setting. Accordingly, the model specifies a two-level nesting structure for the production technology shown in figure 4-1.

Figure 4-1: Production technology



Source: Lofgren *et al*. (2002:9)

Top nest of the production technology

At the top nest, the model provides an alternative in which case value added is combined with inputs of intermediate goods using either a constant elasticity of substitution (CES) function or a Leontief function. In this study, a Leontief function is used at the top of the technology nest where the quantity of value-added *(QVA)* and intermediate inputs *(QINTA)* demands are Leontief functions of the activity level *(QA)* as show by the equations 5 and 6 respectively.

$$QVA_a = iva_a . QA_a \qquad 5$$

$$QINTA_a = \text{int}\, a_a . QA_a \qquad 6$$

Where iva_a represent the amounts of value-added per unit of activity while $inta_a$ is the amount of aggregate intermediate input per unit of activity.

At the bottom nest

At the bottom nest, technology is specified by a CES function that is used to aggregate primary factors of production *(QF)* to produce value added *(QVA)*. As shown in equation 7 for any given activity, a the amount of value-added produced is a CES function of disaggregated primary factors quantities.

$$QVA_a = \alpha_a^{va} \cdot \left(\sum_{f \in F} \delta_{fa}^{va} . QF_{fa}^{-\rho_a^{va}} \right)^{-\frac{1}{\rho_a^{va}}} \qquad 7$$

Where tva_a is the rate of value-added tax for activity a, α_a^{va} is the efficiency parameter in the CES value-added function while δ_{fa}^{va} is the CES value-added function share parameter for factor *f* in activity a. The quantity demanded of factor *f* from activity a is given by QF_{fa}.

Factor demand is determined by the first order condition. As a decision rule, producers or activities will demand the primary factors at the point where the marginal cost of each factor is equal to the marginal revenue product of the factor. It should be noted that the marginal cost of each factor is equal to the activity-specific factor price and is given on the left-hand side of equation 8.

$$WF_f . WFDIST_{fa} = PVA_a (1 - tva_a) . QVA_a . \left(\sum_{f \in F} \delta_{fa}^{va} . QF_{fa}^{-\rho_a^{va}} \right)^{-1} \qquad 8$$

The average price of factor *f* is WF_f. An exogenous variable for wage distortion factor for factor f in activity a is $WFDIST_{fa}$.

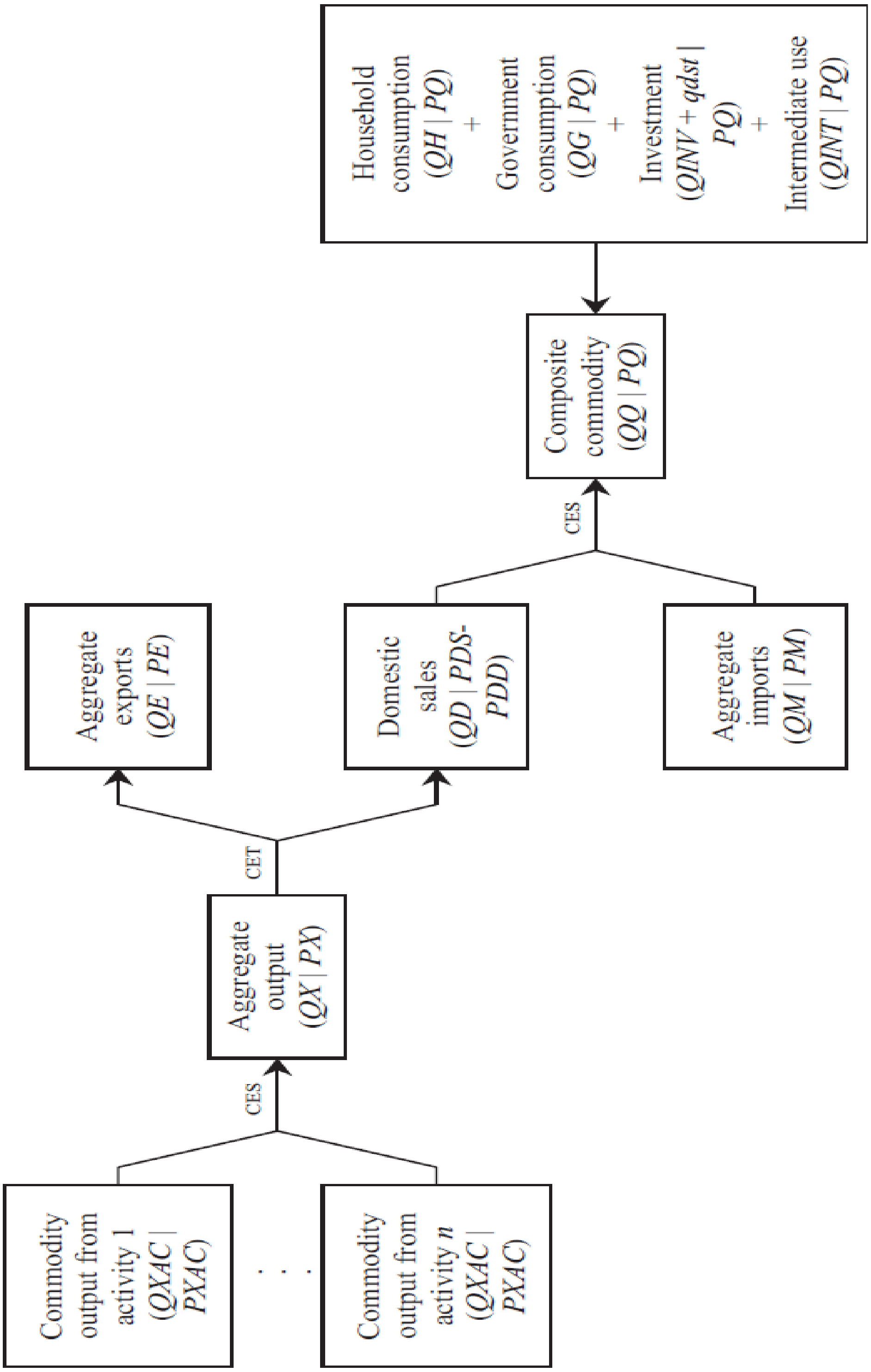
Equation 9 shows the quantity of commodity c that is used as intermediate input (*QINT*) in the production activity a. According to the equation, the demand for commodity c used as an intermediate input in activity ɑ is a function of the aggregate intermediate input quantity for activity *a* determined through a standard Leontief function.

$$QINT_{ca} = ica_{ca}.QINTA_a \qquad 9$$

On the consumption side by households, the model incorporates both marketed commodities as well as home commodities. Marketed commodities include goods purchased by households for consumption valued at market prices while home commodities do not enter the market and as such are valued at activity-specific producer prices. How much of each different commodities households consume for both marketed and home commodities is determined by Linear Expenditure System (LES) demand functions that are derived from a Stone-Geary utility function.[1].

[1] It should be noted however that data used in this study, i.e. the 2007 SAM for Zambia only incorporates marketed commodities and does not include home consumption of non-marketed commodities.

Figure 4-2: Flow of marketed commodities



Source: Lofgren *et al*. (2002:12)

The amount of output that is marketed of commodity c from activity a is given by $QXAC_{ac}$ while QHA_{ach} is the amount of commodity c that is consumed at home by household h. Equation 10 states that the production quantities of commodity c from activity a is determined by multiplying the activity level by yields. Furthermore, these production quantities are allocated to the market where they are sold as marketed commodities and home i.e. consumed by household. Note that equation 10 permits multiple production of commodities by one activity and one commodity to be produced by more than one activities[2].

$$QXAC_{ac} + \sum_{h \in H} QHA_{ach} = \theta_{ac}.QA_{a} \qquad 10$$

The summary of trade and flow of marketed commodities is illustrated in figure 4-2. Generation of aggregate domestic output from different activities for a given commodity is the first stage in the chain. These commodities are assumed imperfect substitutes for one another for a number of reasons such as differences in quality, timing and how far activities are located from one another. Each disaggregated commodity is valued at an activity-specific commodity price that clears the implicit market. Output *QX* is sold at price *PX* and produced using inputs *QXAC* that are purchased at price *PXAC*. The output aggregation function is given by equation 11 below:

$$QX_{c} = \alpha_{c}^{ac}.\left(\sum_{a \in A} \delta_{ac}^{ac}.QXAC_{ac}^{-\rho_{c}^{ac}}\right)^{-\frac{1}{\rho_{c}^{ac}-1}} \qquad 11$$

Where α_{c}^{ac} the shift parameter for domestic commodity aggregation function, δ_{ac}^{ac} is the share parameter for the domestic commodity aggregation function and the domestic commodity aggregation function exponent is given by ρ_{c}^{ac}. According to equation 11, the aggregate marketed production of commodity c is determined by aggregating the marketed output levels from different production activities that produce commodity c via a constant elasticity of substitution function. The decision criteria for the optimal amount of the commodity from each activity source is cast as an optimization problem (equation 12) and occurs where the marginal cost of commodity c from activity a equals the marginal revenue product of commodity c from activity a.

The first-order condition for the output aggregation function is the following:

[2] Although model allows for secondary production, the data for Zambia does not include secondary production.

$$PXAC_{ac} = PX_c.QX_c\left(\sum_{a\in A}\delta_{ac}^{ac}.QXAC_{ac}^{-\rho_c^{ac}}\right)^{-1}.\delta_{ac}^{ac}.QXAC_{ac}^{-\rho_c^{ac}-1} \qquad 12$$

Equations 11 and 12 present the first-order conditions for profit maximization of *QX* at price *PX*, subject to the disaggregated commodity prices, *PXAC* and the aggregation function. As stated in equation 12, this optimal quantity is inversely related to the activity-specific price. In a situation where commodity *c* is produced by only one producer, δ_{ac}^{ac} would be equal to one and as such *QXAC* would be equal to *QX* and *PXAC* equal to *PX*, regardless of the value for the elasticity and the exponent.

The next stage involves the allocation of the aggregated domestic output between domestic sales and exports. Here it is assumed that the suppliers try maximizing sales revenue for any given aggregate output level subject to a Constant Elasticity of Transformation (CET) function.

$$QX_c = \alpha_c^t.\left(\delta_c^t.QE_c^{\rho_c^t} + (1-\delta_c^t).QD_c^{\rho_c^t}\right)^{\frac{1}{\rho_c^t}} \qquad 13$$

Where the constant elasticity of transformation function shift parameter is α_c^t , δ_c^t is a CET function share parameter and ρ_c^t is a CET function exponent. Equation 13 states that the aggregated marketed domestic output is a CET function of export quantity and domestic sales of locally produced output assuming imperfect transformability between exports and domestic sales. It should be noted that this CET function is identical to the CES function, the only difference occurs in the negative elasticity of substitution. The optimal mix between domestic sales and exports is stated in equation 14. The equation is under the implication that a rise in the ratio of export price to domestic price leads to a rise in the ratio of export supply to domestic supply. This entails that due to relatively higher export prices; suppliers will allocate more of their marketed output towards exports since this destination offers higher returns relative to domestic sales[3].

$$\frac{QE_c}{QD_c} = \left(\frac{PE_c}{PDS_c}.\frac{1-\delta_c^t}{\delta_c^t}\right)^{\frac{1}{\rho_c^t-1}} \qquad 14$$

[3] Although it is not realistic to assume that Zambia can export as much as it needs to depending on prices on the international market, simulation results have shown that in this study it does not have a major impact. For all the scenarios, there was a small change in total exports. Refer to the results section.

Suppliers in the international markets face an infinite elastic demand and hence exports are valued at given world prices. The price is however given in local currency and adjusted for taxes and transaction costs. On the other hand, the price received by suppliers of commodities for local sales is equal to the price paid by local buyers less domestic transaction costs per unit of domestic sales.

The sum of household consumption demand, government consumption demand, investment demand and intermediate input use demand make up domestic demand for a given commodity. This domestic demand is met by both domestic output and imports. The model assumes that domestic demanders minimize the cost of obtaining either imports or domestic output subject to imperfect substitutability. As such an Armington, a CES specification (equation 15) is used to aggregate imports and domestic output for a given good into composite commodity.

$$QQ_c = \alpha_c^q . \left(\delta_c^q . QM_c^{-\rho_c^q} + (1-\delta_c^q) . QD_c^{-\rho_c^q} \right)^{-\frac{1}{\rho_c^q}} \qquad 15$$

Where the Armington function shift parameter is α_c^q, δ_c^q is an Armington function share parameter and ρ_c^q an Armington function exponent.

According to equation 15, the import-domestic demand ratio is a function of domestic-import price ratio and is used to determine the optimal mix between domestic output and imports. The equation is under the assumption that if the domestic-import price ratio is increased, the import-domestic demand ratio increases. The interpretation of this is that a higher domestic-import price ratio entails that domestic output is more expensive relative to imports and as such a shift away from domestic output towards imports will take place and vice versa.

In addition to containing features that are representative of developing countries, the model also incorporates other features that have stemmed from many years of IFFPRI research undertakings. These include consumption by households of non-marketed commodities (home consumption), modelling of transaction costs and the ability of an activity to produce more than one commodity and a commodity to be produced by more than one activity. The model allows for separation of transaction costs into domestic, export and import marketing margins.

The model is calibrated to the 2007 Social Accounting Matrix (SAM) for Zambia and implemented in the General Algebraic Modelling System (GAMS).

4.3 Elasticities

Due to lack of econometric estimates of elasticity data, similar figures are assumed as those applied in a study by Fontana (2004). These elasticities were well compared with values used in other studies done in Zambia (Fontana, 2002 and Thurlow and Wobst, 2006) and were found meaningful. The trade elasticities are presented in table 4-1. At the bottom nest, technology is specified by a CES function, with a substitution elasticity of 0.5 in which case the primary factors are combined to produce value added. At the top nest of the production function, the value added produced in the bottom nest is combined with intermediate inputs in Leontief assumption to produce the gross output.

In terms of trade of marketed domestically produced output, the producers in the economy divide their output into domestic sales and exports. The shares of domestic sales and exports is governed by the ratio of domestic prices to export prices. The elasticity of transformation in the export CET function is set at -2.0 in agriculture, -1.5 in industry and -0.8 in services. Likewise, the consumers in the economy will meet their demand by allocating expenditure between domestically produced commodities and imports in shares that depend on the ratio of domestic prices to import prices. The elasticity of substitution in the CES import Armington function are the same as those in the export CET function.

Table 4-1: Trade elasticity values

	CET	**Armington**
Agriculture	-2.0	2.0
Industry	-1.5	1.5
Services	-0.8	0.8

4.4 Database and Calibration

4.4.1 Original SAM

The model is calibrated to Zambia's most recent publicly available dataset, the 2007 Social Accounting Matrix (SAM) developed by the Zambia Institute for Policy Analysis and Research (ZIPAR), working together with the International Food Policy Research Institute (IFPRI) and the United Nations University's World Institute for Development Economics (UNU-WIDER). Note that section 4.4 mainly draws from the manual compiled by Chikuba *et al*., (2013).

The source of information for compilation of the SAM came from national accounts, national supply-use tables, government budgets, household surveys and balance of payments accounts and as such, it reflects relatively well the current structure of the Zambian economy. The original disaggregated SAM contains 44 activities and 44 corresponding commodities of which 15 are agricultural activities, 15 industry activities and the remaining 14 for services. To ease the analysis, the 44 productive activity and commodity accounts are aggregated into 15 accounts that include primary agriculture, agro-processing, manufacturing, mining and others as shown in the table of full set of accounts in the appendix. Based on per capita expenditure quintiles, households are disaggregated into rural and urban. Other important accounts include government, investments and the Rest of the World (ROW). The SAM is therefore a consistent data framework as it captures information on national income and product accounts, supply-use tables and also the monetary transactions between government and institutions and vice versa. Hence the purpose for its construction and development was for it to be used as a tool for conducting impact studies given its unique properties of capturing the economy-wide effects (Chikuba *et al*., 2013).

4.4.2 Zambian economy as portrayed by the SAM

Table 4-2 portrays the structure of the Zambian economy for 2007. This macro SAM contains a number of accounts that include the following:

Value added

The gross domestic product at factor cost value (K 42 990 billion) is given by the factor by activities matrix. This value shows the total value added generated by the primary factors of production i.e. labor, capital and land in the case of Zambian data. It was estimated by summing compensation of employees and gross operating surplus. Information from agricultural and industrial surveys were used to update the Input – Output table that was then used to disaggregate labor and capital value added (Chikuba *et al*., 2013).

Intermediate inputs

The commodities by activities sub matrix shows the value of intermediate inputs (K 55 863 billion) that are used in further production of goods. The technical coefficients that are simply shares of inputs used per unit of output produced were drawn directly from the new Input-Output table. The cost estimates of the various factor and non-factor inputs used in each sector's production process constitutes the technical coefficients. In the Zambian SAM farm budgets were used to estimate the technical coefficients for crop and livestock production while annual financial statements and management accounts provided information for estimating technical coefficients for industrial sectors (Chikuba *et al*., 2013).

Table 4-2: 2007 Macro SAM for Zambia (K'billions)

	Activities	**Commodities**	**Factors**	**Enterprises**	**Households**	**Government**	**Investment**	**ROW**	**Total**
Activities		98,853							98,853
Commodities	55,863	14,244			29,848	6,068	10,148	19,148	135,317
Factors	42,990								42,990
Enterprises			17,480			448		141	18,069
Households			25,510	7,393		1,681		912	35,496
Government		4,112		2,598	2,231			1,794	10,735
Savings				1,807	3,417	2,067		2,855	10,146
ROW		18,108		6,271		471			24,850
Total	98,853	135,317	42,990	18,069	35,496	10,735	10,146	24,850	

Source: Ckikuba *et al*., (2013)

Marketed output (supply matrix)

In the Zambian SAM for 2007, it was assumed that all output was supplied to markets. It is against this background that the value of total marketed output is equivalent to gross output. The gross output in this case is found by summing the intermediate demand and gross domestic product at factor cost (total value added) which equals to K 98 853 billion as shown in table 4-2. The marketed output is given by the activities by commodities sub matrix (Chikuba *et al*., 2013).

Tax accounts

The government by commodities matrix consists of various tax accounts. The tax accounts in the Zambia SAM are sales taxes, value added taxes, import tariffs and export taxes. All these taxes are levied on commodities except direct taxes which are income taxes paid by households and enterprises. Note that the SAM contains no industry taxes. The data source for the compilation of these taxes was the Customs and Excise Department of the Zambia Revenue Authority (Chikuba *et al*., 2013).

Table 4-3: Total tax collection in 2007 (K' billions)

Tax type	**Total collected in 2007 (K' Billion)**	**As % of all taxes**
Export taxes	3.55	0.05
Import taxes	806.29	10.28
Sales taxes	1068.84	13.63
Value added taxes	2204.71	28.11
Direct taxes	3760.72	47.94
Total	7844.11	100

Source: Zambian SAM (2007)

Table 4-3 shows total export taxes, import taxes, sales taxes, value added taxes and direct taxes collected in 2007. As can be seen direct taxes were the highest collection and accounted for 47.94 percent of the total taxes followed by value added taxes which accounted for 28.11 percent. Import taxes were recorded at K 806.3 billion (10.28 percent) while export taxes were the least recording K 3.5 billion (0.05 percent)

The export, import, sales and value added taxes collected on the commodities from various aggregated sectors are shown in table 4-4. Export taxes were only levied on selected manufactured commodities hence the relatively small share of 0.05 percent shown in table 4-3. Again, K 708.66 billion were collected on manufactured commodities as import taxes compared to K 49.88 billion and K 42.06 billion collected on minerals and agro-processed commodities respectively. Overall the manufacturing sector contributed the most to taxes amounting to K 2.653 trillion (33 percent of total taxes) while agro-processing was second recording K 1.131 trillion (14.42 percent).

Fewer taxes were collected on minerals and primary agriculture in general. Total taxes on minerals were recorded at K 49.88 billion while on primary agricultural commodities amounted to K 116.75 billion.[4]

Table 4-4: Taxes collected on commodities from various sectors in the base case for 2007 (K' billions)

Sectoral commodities	Export taxes	Import taxes	Sales taxes	Value added taxes	Total	Proportion of total taxes
Primary agriculture	0	5.64	0	111.10	116.75	1.49%
Mining	0	49.88	0	0	49.88	0.64%
Agro-processing	0	42.06	0	1088.99	1131.05	14.42%
Manufacturing	3.55	708.66	936.97	1004.17	2653.34	33.83%
Construction	0	0	0	0	0	0.00%
Water and electricity	0	0.05	28.38	0.44	28.86	0.37%
Retail and wholesale trade	0	0	0	0	0	0.00%
Hotels and catering	0	0	0	0	0	0.00%
Transport and communications	0	0	96.40	0	96.40	1.23%
Financial services	0	0	0	0	0	0.00%
Business and real estate services	0	0	0.89	0	0.89	0.01%
Government administration	0	0	0	0	0	0.00%
Education	0	0	0	0	0	0.00%
Health	0	0	0	0	0	0.00%
Other services	0	0	6.21	0	6.21	0.08%

Source: Zambian SAM (2007)

Table 4-5 contains information on the various product groups of agro-processing as aggregated in this study. It shows the amount of export, import, sales and value added taxes collected on each product group in 2007. As can be noted export taxes were not levied on all product groups in 2007. In terms of import taxes, textiles and clothing accounted for K 50.35 billion while processed foods and wood and paper accounted for K 28.72 billion and K 16.28 billion respectively. The lowest import taxes were recorded for products such as refined sugar (K 0.059 billion) and processed tobacco products (K 0.373 billion). Overall processed foods

[4] Taxes considered here only include export, import, sales and value added taxes. Direct taxes such as corporate income taxes, mineral loyalty taxes, etc. are not included.

recorded the highest taxes (only those shown in table 4-5) amounting to K 720.34 billion followed by textiles and clothing (K 430.87 billion), beverages (K 359 billion) and meat, fish and dairy products (K 208.62 billion). Tax collections on the reminder of agro-processed product groups are summarized in table 4-5.

Table 4-5: Taxes on agro-processing in the base case for 2007 (K' billions)

Agro-processed products	Export taxes	Import taxes	Sales taxes	Value added taxes	Total
Meat, fish and dairy	0	6.23	0	202.39	208.62
Grain milling	0	7.05	0	90.64	97.69
Sugar refinery	0	0.06	0	104.34	104.39
Food processing	0	28.72	0	691.63	720.35
Beverages	0	6.13	168.35	184.51	359.00
Tobacco curing and processing	0	0.37	29.14	85.27	114.78
Textiles and clothing	0	50.35	0	380.52	430.87
Wood and paper processing	0	16.28	0	10.45	26.73

Source: Zambian SAM (2007)

Household incomes

Table 4-6 shows government direct transfer payments and total incomes for each household group in the base case for 2007. As can be seen, urban households had the largest incomes compared to rural households. For example, urban households in the fifth quintile had the largest share of income recorded at K22 328.45 billion seconded by rural households in the same quintile whose incomes were K4 195.13 billion. In terms of government direct transfer payments in the base case, urban households in the fifth and fourth quintiles had the largest shares recorded at K1 244.12 billion and K81.04 billion respectively. The base values for rural households were relatively lower as indicated in table 4-6.

Table 4-6: Government direct transfer payments to households and household income for 2007 (K' billion)

	Government transfer (base)	**Total income (base)**
Hhd-r1	1.210	1120.90
Hhd-r2	5.116	1861.68
Hhd-r3	16.269	2497.43
Hhd-r4	27.832	2883.92
Hhd-r5	64.740	4195.13
Hhd-u1	0.156	84.76
Hhd-u2	1.433	352.75
Hhd-u3	10.048	1039.90
Hhd-u4	81.038	3684.91
Hhd-u5	1244.121	22328.45

Source: Zambian SAM (2007)

Other accounts

According to Chikuba *et al*., (2013) the 2007 National Account data provided information on total final household consumption, Gross Fixed Capital Formation, exports and government transfers to enterprises and households. Information from the 2006 Living Conditions Monitoring Survey was used to disaggregate households into rural and urban. Gross Fixed Capital Formation included capital investments on machinery and equipment, construction and inventories while total exports included F.O.B goods purchased in ports, service receipts and non-monetary gold. The disaggregation across goods and across services of total export demand was made possible through data from the Zambia Revenue Authority department of Customs and Excise and Balance of Payment accounts. Subsidies, legal costs and statutory expenditure constitutes government transfers to enterprises while social benefits and grants make up the government transfer payments to households (Chikuba *et al*., 2013).

4.4.3 Data changes and aggregation

In the 2007 SAM, the payments by commodities to commodities constitute the trade margins. In the original SAM, the trade margins are aggregated into a single account of transaction costs. The data on mining showed that exports were greater than the sum of domestic production plus export taxes plus transaction costs related to exports. This was due to the re-exporting of mining commodities by the Zambian economy. This was in violation of the assumption of static CGE model used in this study that the sum of exports of a given commodity plus export taxes and export transaction costs may not exceed domestic production as it ignores re-exporting. To solve this problem, two things were done: decrease of the export value and increase of export transaction costs. To decrease the export value, exports and imports of mining were partly netted out. This was done by decreasing exports for mining by some nominal amount and then decreasing imports for mining by the same amount but ensuring that the decrease is less than the original value of imports and not set to zero. To increase the transaction cost value for exports, the single row and column for $trcd$ in the excel file was replaced with three new transaction cost accounts using the names as specified in the set description. The new accounts were domestic, import and export transaction accounts. The disaggregation was based on import, export and domestic production shares of mining commodities calculated from the base data. It was assumed that the higher the share, the higher the transaction costs involved and the exercise was done until the SAM balanced once again.

4.5 Summary and conclusions

Lofgren, Thomas and El-said (2002) developed the static computable general equilibrium model used in this study. The model is specified to include both the neoclassical and structuralist modelling approach and has features that reflects the characteristics of developing countries. These features include (1) the inclusion of household consumption of commodities not marketed, (2) separation of transaction cost accounts and (3) multiple production of commodities by one activity and one commodity to be produced by more than one activity. The first feature is not applicable to this study because the SAM used does not explicitly include an account of home consumption of non-marketed commodities. In addition, the 2007 Zambian SAM does not include secondary production hence the third feature is equally not applicable here. However, in this study three explicit transaction costs accounts are constructed that include domestic, imports and exports, making the second feature relevant to this study. The equations in the price block link endogenous model prices to other endogenous or exogenous prices as well as non-price variables in the model. The model assumes that each producer maximizes profits subject to a production technology and operate in a perfectly competitive setting since prices are taken as given. Accordingly, the model specifies a two-level nesting structure for the production technology: top nest and bottom nest of the production technology. At the top nest, the model provides an alternative in which case value added is combined with inputs of intermediate goods using either a constant elasticity of substitution (CES) function or a Leontief function. In this study, a Leontief function is used at the top of the technology nest where the quantity of value-added (QVA) and intermediate inputs (QINTA) demands are

Leontief functions of the activity level (QA). While at the bottom nest, technology is specified by a CES function that is used to aggregate primary factors of production (QF) to produce value added (QVA).

The model is calibrated to Zambia's most recent publicly available dataset, the 2007 Social Accounting Matrix (SAM) developed by the Zambia Institute for Policy Analysis and Research (ZIPAR), working together with the International Food Policy Research Institute (IFPRI) and the United Nations University's World Institute for Development Economics (UNU-WIDER). The source of information for compilation of the SAM came from national accounts, national supply-use tables, government budgets, household surveys and balance of payments accounts and as such, it reflects relatively well the current structure of the Zambian economy. The original disaggregated SAM contains 44 activities and 44 corresponding commodities of which 15 are agriculture activities, 15 industry activities and the remaining 14 for services. To ease the analysis, the 44 productive activity and commodity accounts are aggregated into 15 accounts that include primary agriculture, agro-processing, manufacturing, mining and others. The original SAM has a number of tax accounts such as export, import, sales and value added. In the base scenario, export taxes were not levied on agro-processed commodities. Import tariffs on the other hand were levied based on nature of products. The finished products attracted the highest tariff of 25 percent, an indication of value-addition promotion by the government. Two adjustments were made to the data that involved disaggregation of the transaction account into three separate accounts for domestic, exports and imports transaction costs. Furthermore, the values of exports and imports of mining were decreased by the same nominal value while export transaction costs were increased in order to fit the data with the static CGE model. The elasticities of production, trade and consumption used in the model draws from the literature (Fontana, 2004) and the model was implemented in the General Algebraic Modelling System (GAMS).

5 Model simulations, results and sensitivity analysis

5.1 Introduction

In this chapter, a brief overview of the model closures is given. The three-macro system closures are the government, external account and Savings-Investment closures. Then a discussion of scenarios run in the model is provided. Four scenarios are built and include: introduction of export taxes on primary agriculture, increase in import tariffs on agro-processed commodities, introduction of a production subsidy on primary agriculture and an increase in government direct transfer payments to all households. The simulation results conclude this chapter and these results are given based on effects of the alternative scenarios on agro-processing and agricultural sectors, incomes and the macro economy. The last section contains results from the sensitivity analysis that involved changing the government closure.

5.2 Model closures

The model provides alternative factor market closures and according to the one used in this study, the quantity of each factor supplied is fixed (or exogenized) at the observed level. To assure that the quantity supplied equals the sum of demand from all activities, an economy-wide wage variable is set to vary freely (or endogenized). The product of an activity-specific wage (distortion) term and the economy-wide wage determines the activity-specific wage paid by each activity.[5] In the model, the Consumer Price Index (CPI) is fixed and acts as a numéraire. This is important given that the model is homogenous of degree zero in prices. That is to say that if the value of a numéraire is doubled, all prices would double while all real quantities would remain unchanged.

As for the macro system closures the CGE model has three macro account closures namely: (1) the government, (2) the external account and (3) the Savings-Investment closures. According to Lofgren *et al*., (2002), the context of analysis and nature of CGE model determine the appropriate choice between the different macro-closures. Given the single period nature of the CGE model, they further recommended a closure that combines fixed foreign savings, fixed real government consumption and fixed real investment for simulations aimed at exploring the

[5] Note that future research needs to be carried out to assess the implications of other market closure alternatives that assume considerable unemployment for a given labor category.

equilibrium welfare changes of alternative policies. Therefore, in this analysis the following closures are applied:

For the government balance, the closure used is GOV-2 where the direct tax rates of households and enterprises are adjusted endogenously to generate a fixed level of government savings. ROW-1 is used for the external account in which the real exchange rate is allowed to vary and the foreign savings and world prices are fixed. This implies that the trade balance and transfers between domestic institutions and the rest of the world are fixed. Finally, for the S-I balance the closures are either savings-driven (in which case the value of investment adjusts) or investment-driven (where the value of savings adjusts). In this study, the closure selected is SI-1 that is investment-driven where real investment quantities are exogenous and assumes uniform MPS rates point change for selected institutions. With this closure, the assumption is that the policies implemented will work in such a manner as to generate necessary private savings enough to finance the real investment that is fixed.

The combination of closures selected in this study is important for a number of reasons. Given that this is a single-period model; such a combination helps to avoid the misleading welfare effects that may be observed as a result of not fixing foreign savings as well as real investment. For example, holding other things constant, if for the simulated period foreign savings increase and investment declines, household welfare would increase and vice versa. Such a result is however misleading as a one-period analysis does not take into account the losses in welfare that may arise in future as a consequence of increased foreign debt and shrinking capital stock. Furthermore, the government consumption is held fixed in the analysis because the direct and indirect welfare effects arising from policy changes are not captured by the model. Hence not fixing government consumption would lead to misleading results.

5.3 Scenarios

Currently, customs duties in Zambia according to ZRA (2016) on imported goods vary depending on among other factors, the nature of the goods. Raw materials and capital equipment attract the lowest rates which can be zero percent and can go up to 5 percent. Rates on intermediate goods is 15 percent while finished product attract the highest rate of 25 percent. The custom duty is charged based on customs value (CIF). In addition, imported goods are subjected to import VAT charged at 16 percent. According to ZRA (2016), the Government of the Republic of Zambia objective is to promote local processing of agricultural commodities. To achieve this, several proposals were made that include the following:

- Increase the customs duty on refined edible oil imported into Zambia to K4 per liter from K2.20 per liter
- Introduce export tax on unprocessed wood at 40 percent and 20 percent on semi-processed wood.
- Increase customs duty on wood and wood products imported in Zambia to 40 percent.

Although these proposed policy changes are targeted at selected commodities, in this study the policy scenarios are applied on the entire agro-processing sector in case of import tariffs and production subsidy while the export tax is imposed on the primary agricultural sector. Though not so realistic, the idea is to estimate the direct and indirect effects which may not be substantial if individual commodities were targeted. In addition, these taxes are simulated at 30 percent which is close to the current 25 percent being imposed. *EXPTAX* denotes a 30 percent export tax on primary agricultural commodities, *TARINC* denotes a fiscal policy move in which import tariffs on agro-processed commodities are set at 30 percent while *SUBSIDY* denotes the introduction of a 30 percent production subsidy on primary agriculture and *TRSFIN* represents a 30 percent increase in government direct transfer payments to all households. These scenarios are motivated by the governments proposal to encourage local processing of agricultural commodities

Scenario 1: Introduction of export taxes (exptax)

Currently firms and persons involved in production and export of primary agricultural commodities enjoy zero export tax on export markets. A 30 percent export tax is introduced on primary agricultural commodities, which are used as intermediate inputs by the agro-processing sector. The aim of the incentive is to promote local agro-processing sector by ensuring adequate supply of raw primary agricultural produce. Theoretically, introducing an export tax would limit exports of unprocessed agricultural commodities and ensure that the domestic agro-processing sector has sufficient intermediate inputs at relatively lower prices.

Scenario 2: Increase in import tax (tarinc)

The other alternative to promoting local processing of agricultural products involves the increase in import taxes on agro-processed goods. Ceteris paribus, raising import taxes makes the imported food and non-food items more expensive relative to domestically produced items. It is argued that this would cause a shift in consumer demand from imports to domestically produced goods hence promoting local production industries. In the base case, import tariff rate was 7 percent. In the simulation therefore, import tariffs on agro-processed products were set at 30 percent to stimulate the effect agro-processing and other sectors of the economy.

Scenario 3: Introduction of production subsidies (subsidy)

The third scenario involved the introduction of production subsidies mainly on primary agricultural activities. These subsidies were indirectly introduced as a negative production tax on primary agriculture at 30 percent. There were no production subsidies in the base case. It is hypothesized that such an incentive would boost production leading to increases in supply of primary agricultural commodities. Players in the agro-processing sector would then obtain intermediate inputs (primary agricultural commodities) at relatively lower prices thereby promote local value-addition.

Scenario 4: Increase government direct transfer payments (trsfinc)

The final scenario involved provision of a financial incentive through an increase in government direct transfer payments to households by 30 percent (indexed by the consumer price index) of the base values. The idea is to investigate the consumption effects of agro-processing commodities as well as income distributional effects of providing direct transfer payments to households.

5.4 Results and discussions

The following section consists of results of the four policy scenarios run in the static CGE model. The effects of these four separate policy scenarios are then compared in terms of their individual impacts on commodity prices as well as their effects on the quantity traded in four closely linked sectors. These sectors include primary agriculture and agro-processing. In addition, the effects of the policy shocks on factor and household incomes including government total income will be presented along with their macroeconomic effects on the Zambian economy.

In the following diagrams, *pexport* and *pimport* denote prices of exports and imports respectively; *poutput* represents the average output price. Finally, the price of composite goods and aggregate intermediate inputs are denoted as *pcomp* and *pintermd* respectively.

Model variable are as follows for prices: export prices, *PE*, import prices, *PM*, intermediate input prices, *PINTA*, composite price, *PQ* and average output price, *PX*. Quantity variables as used in the model are: domestic sales, *QD*, exports, *QE*, imports, *QM* and composite supply, *QQ*.

5.4.1 Sectoral effects of policy experiments

1. Agro-processing sector

Price effects on agro-processed commodities

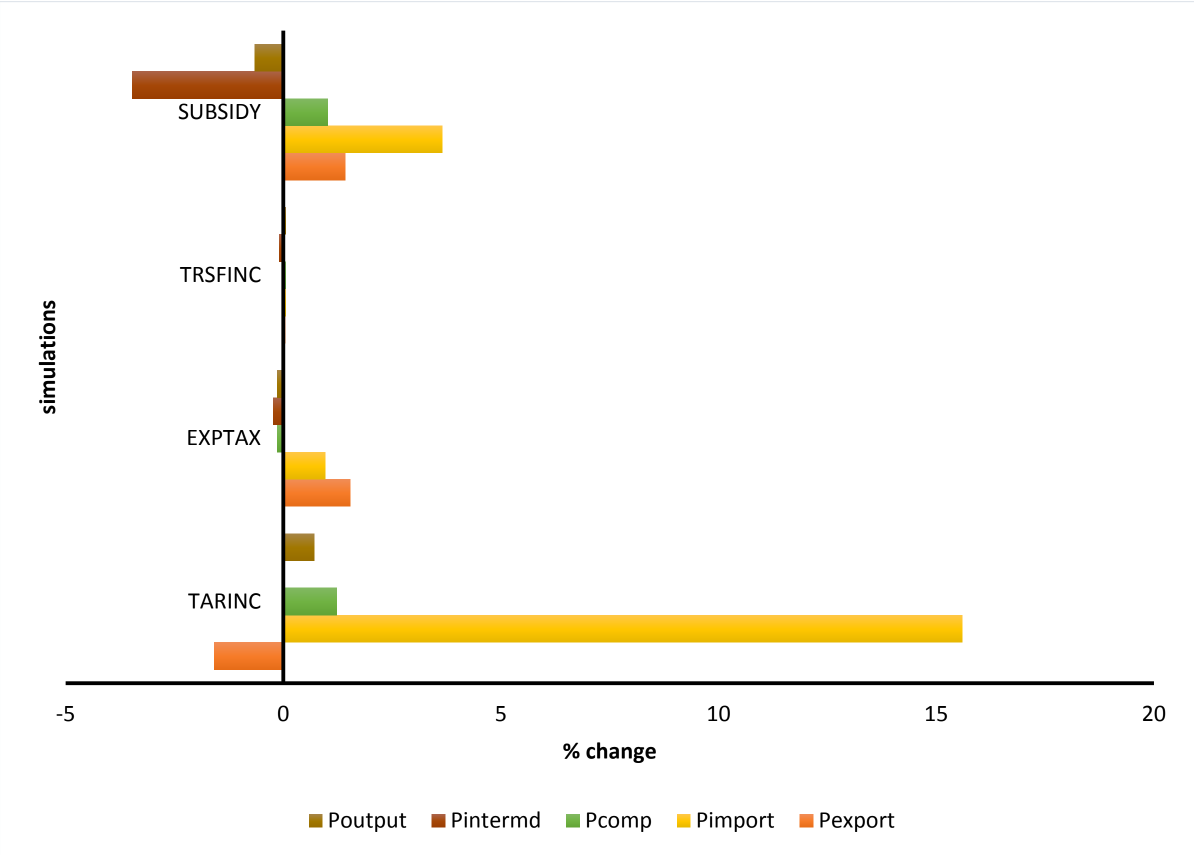
The results from the CGE model simulations shows that 30 percent subsidy scenario leads to the depreciation of the domestic currency by 2.64 percent. Since the import price is a function of exchange rate and import tariffs, *PM* (import prices) increases by 3.6 percent. Similarly, the export prices, *PE* also increase by 1.4 percent as a result of the subsidy and increase in exchange rate. The composite prices, *PQ* on the other hand increase by 1.0 percent while the intermediate input prices, *PINT* and average output prices, *PX* reduce by 3.5 percent and 0.7 percent respectively.

Import tariff increase on the other hand has a bigger effect as it causes a 15.6 percent increase in the import price (*PM*) of agro-processed commodities (Figure 5-1). Notice also that the import tariff policy has the biggest price effect on imported agro-processed commodities compared to other prices. This can be explained as follow: Increasing import tariffs has direct effects on the import price of agro-processed commodities. It is assumed that firms here are profit-maximizing entities and as such, the move to increase import tariffs to 30 percent implies that the foreign firms that supply agro-processed commodities into Zambia will now pay much more in tariffs than before. To cover up this indirect increase in their costs, the firms will raise the price at which they supply agro-processed imports into the country hence the increase in import price observed. As a result, the domestic composite price (*PQ*) also increases by 1.2 percent. Export price (*PE*) of agro-processed commodities on the other hand drops by 1.6 percent. Note that as a result of increasing import tariffs on agro-processed commodities, the exchange rate reduces by 1.43 percent which contributes to the reduction in export prices observed.

A shock on export tax on primary agricultural commodities indirectly increases the exchange rate by 1.22 percent which in turn raises both the export and import prices of agro-processed commodities by 1.5 percent and about 1.0 percent respectively. Therefore, introducing an export tax of 30 percent reduces the price received by exporters of primary agricultural commodities and effectively quantity exported which in turn increases the export and import prices of agro-processed commodities prices as shown in figure 5-1. Note also that the export tax shock on primary agriculture indirectly reduces the price of intermediate inputs (*PINTA*) used in agro-processing by 0.22 percent.

Finally, the simulation results indicate that direct transfer payments to households has negligible effects on trade prices for agro-processed commodities. As shown in figure 5-1, both export and import prices increased by 0.05 percent. The percentage change in exchange rate as a result of the direct transfer payment scenario was small (0.05 percent) compared to the other policies and this explains the small changes in export and import prices.

Figure 5-1: Price effects on agro-processed commodities



Source: Simulation results

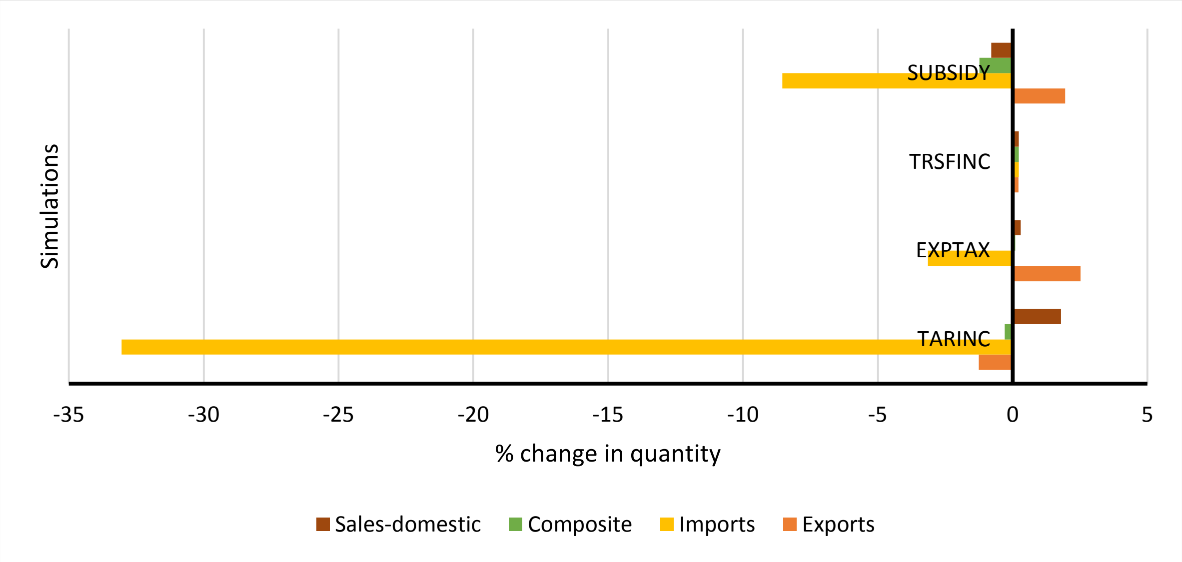
Output effects on the agro-processing sector

Figure 5-2 shows the output effects of the various policy experiments on the agro-processing sector. The 30 percent subsidy on primary agriculture indirectly increases the quantity of exports (*QE*) of agro-processed commodities by about 2.0 percent. This increase is driven by an increase in export price (1.4 percent) necessitated by the increase in the exchange rate of 2.64 percent as shown in the previous section. The quantity imported of agro-processed commodities drop by 8.5 percent as a result increased import prices. While other quantities drop as follows: domestic sales, *QD* (-0.8 percent) and composite supply, *QQ* (-1.24 percent).

The shock on import tariff directly reduces the quantity of imported agro-processed commodities by 33 percent and positively affect the quantity of domestic sales as it increases by 1.8 percent. This is because tariff increase induces consumers to substitute cheaper domestically produced agro-processed commodities for imported goods resulting in a boost in locally produced products. As shown in figure 5-1 export price of agro-processed commodities fall by about 1.6 percent while domestic composite price increase by 1.2 percent because of a shock on import tariffs. This makes the local market more attractive and act as a disincentive to trade in exports hence there is a shift from exporting to domestic trading of agro-processed commodities shown as a fall in quantity of exports by 1.26 percent.

Although imposing export taxes on primary agricultural commodities directly lowers the quantity of exports by 35.8 percent (Figure 5-4), it has minimal effects on quantities of domestic sales of agro-processed commodities. As shown in figure 5-2, quantity of domestic sales of agro-processed commodities only rise by 0.3 percent while composite supply increase by 0.01 percent. However, notable positive effects are observed on export quantities of agro-processing, which increase, by 2.5 percent and imported agro-processed commodities shrink by 3.14 percent. The increase in quantity of exports and decrease in import quantity are driven by increase in their respective prices as shown previously. Increasing direct transfer payments by 30 percent to households led to minimal changes in the prices of agro-processed commodities as stated already. Similarly, minimal changes were observed where the quantities of exports, imports, composite and domestic sales rose on average by 0.2 percent.

Figure 5-2: Effects on the quantity traded of agro-processed commodities



Source: Simulation results

2. Primary agricultural sector

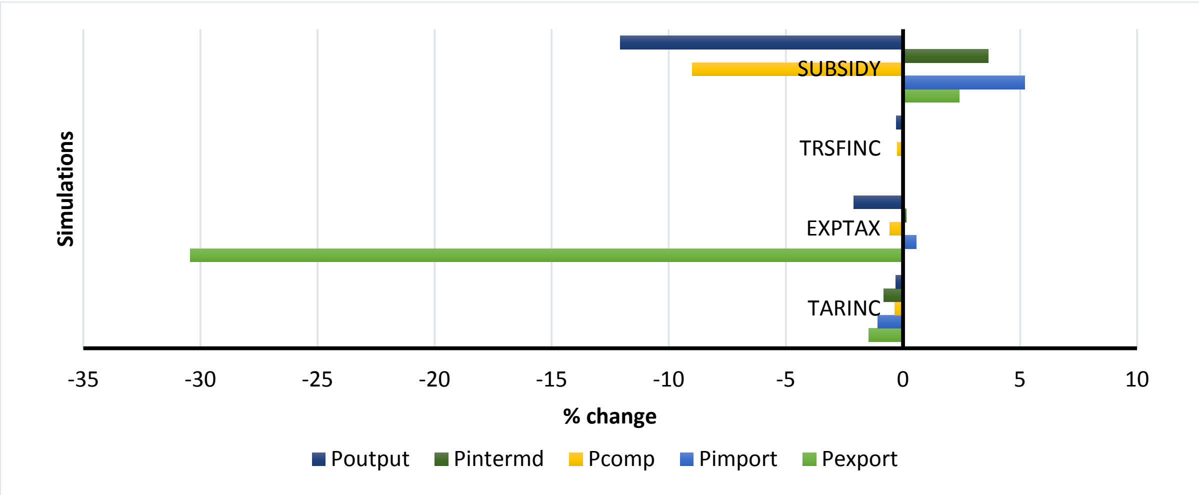
Price effects on primary agricultural commodities

The price effects of the various policy experiments on the prices of primary agricultural commodities are shown in figure 5-3. Introducing subsidy on primary agriculture production reduces the average output and composite supply prices by 12 percent and 8.99 percent respectively and a rise in other prices as follows: intermediate input price (3.6 percent), export (2.4 percent) and import price (5.2 percent). The primary producers pay less in production tax, which effectively reduces the average output price.

The import tariff increase scenario on the other hand, leads to reduction in all the prices of primary agricultural commodities as follows: Export price (-1.46 percent), import price (-1.1 percent), composite price (-0.36 percent), aggregate intermediate input price (-0.82 percent) and average output price (-0.32 percent). The exchange rate reduces by 1.43 percent which contributes to reduction in export and import prices.

Introducing export tax leads to a 30.4 percent reduction in the export price of primary agricultural commodities. This is a direct effect and as such imposing export tax on primary agricultural commodities lowers the price received by exporters. Eventually producers have an incentive of selling their commodities in the domestic market (with no export tax) as opposed to export markets where their prices are reduced. Other prices such as import and intermediate input prices increase by 0.57 percent and 0.14 percent respectively. As indicated in the Figure 5-3 direct transfer payments have notable effects only on average output price which drop by 0.3 percent. Because composite supply is a function of domestic output and export prices, the composite price also reduces by 0.24 percent.

Figure 5-3: Price effects on agricultural commodities



Source: Simulation results

Output effects on primary agriculture sector

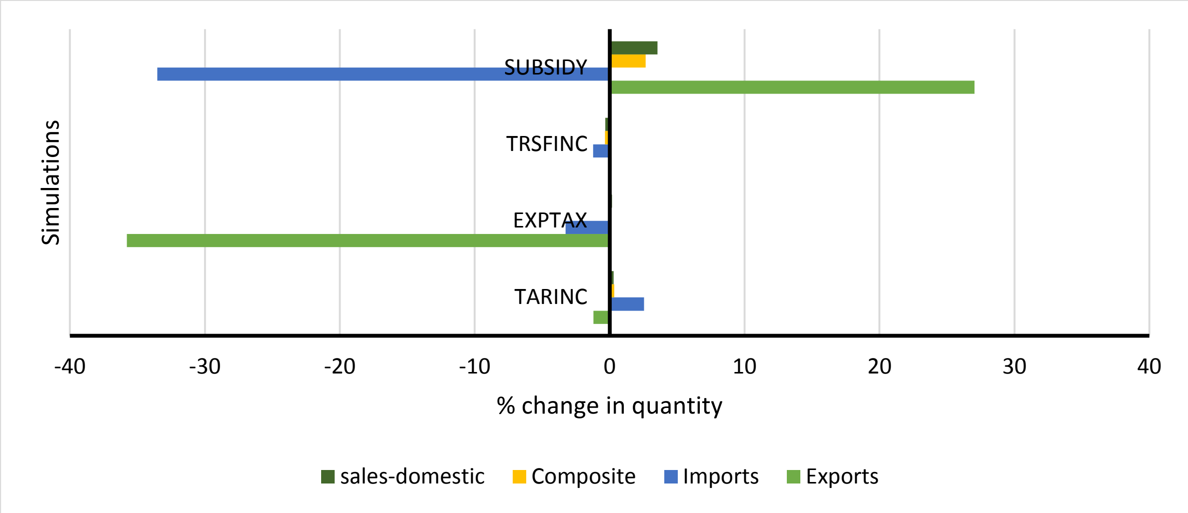
Figure 5-4 shows the effects of the four policy shocks on quantities traded in the primary agriculture sector. The subsidy scenario reduces the quantity of imported primary agricultural commodities by 33.5 percent and increases quantity of exports by 27 percent. The substantial drop in imports of primary agricultural commodities can be attributed to higher import prices and reduced average output and composite prices shown in figure 5-3. Note also that the quantity of domestic sales of primary agricultural commodities rise by 3.5 percent (refer to figure 5-4). This therefore satisfies the economic theory of demand and supply: the higher the price the lower the quantity demanded by the consumers and vice versa.

The import tariff increase leads to a rise in the quantity of primary agricultural imports, domestic sales and composite supply by 2.55 percent, 0.3 percent and 0.35 percent respectively while exports drop by 1.22 percent. These changes are because of indirect effects of increasing the import tariff on agro-processed commodities to 30 percent. Primary agricultural commodities are the major source of inputs in the processing of agricultural products. Therefore, such a policy experiment makes the imported agro-processed commodities more expensive, in this case by 15.6 percent as stated in the previous section. Rational consumers try to maximize their utility and would rather purchase locally produced agro-processed commodities because of relatively lower prices to imported commodities. This then puts pressure on the local agro-processing sector to produce and supply more products to meet this new demand, which further implies more demand for primary agricultural commodities. Part of this demand for intermediate inputs is met domestically observed by 0.3 percent increase in domestic sales of primary agricultural commodities. Note that in the previous section it was found that import price of primary agricultural commodities drop by 1.08 percent due to the import tariff scenario. Firms or producers involved in agro-processing activities would then take advantage of cheaper imported primary agricultural commodities to satisfy the remaining demand for intermediate inputs. This is shown by 2.55 percent increase in imports of primary agricultural commodities. Given all these incentives in the domestic market, the amount of primary agricultural commodities exported fall by 1.22 percent.

On the other hand, a shock on export tax lowers the amount of primary agricultural exports by 35.8 percent. These changes reflect the direct effects of export tax policy on primary agricultural prices illustrated in Figure 5-3. As explained previously, export tax policy reduces the export price, which in turn leads to fall in the amount of primary agricultural export commodities. The implication of this is that some producers or firms pull out of the export business due to reduced prices caused by the export tax hence the decline primary agricultural exports observed.

While provision of direct transfer payments to households increases the quantity of primary agricultural exports by 0.13 percent, it negatively affects the quantity of imports seen by a drop of 1.24 percent while amount of domestic sales and composite supply also reduce but by 0.3 percent.

Figure 5-4: Effects on the quantity traded of primary agricultural commodities



Source: Simulation results

Table 5-1 gives a summary of the four scenarios run in the CGE model and show results of their individual effects on the agro-processing and primary agriculture sectors. In spite of boosting exports of agro-processed commodities by 1.95 percent, the subsidy shock leads to a drop in domestic sales (-0.8 percent). Note also that because of introducing this subsidy on primary agriculture, the decline in imports (-8.55 percent) is relatively larger than the subsequent increase in exports (1.95 percent). The import tariff policy seems to work well in increasing sales of domestically produced agro-processed commodities (1.8 percent) though it reduces the amount of imports by 33.04 percent. This decline in imports of agro-processed commodities can only be meaningful if additional commodities are produced locally otherwise shortages would occur and consumers would have to pay the high prices. On the other hand, imposing export tax on primary agricultural commodities is effective at promoting the local agro-processing sector. As shown in table 5-1 both the quantity of domestic sales and exports increase by 0.29 percent and 2.5 percent respectively while importation of agro-processed commodities drop by 3.14 percent. In this study transfer payments scenario also works relatively well, though mina in stimulating the local agro-processing sector both in terms of sales of domestically produced (0.2 percent) and exported (0.2 percent) agro-processed commodities.

On the primary agriculture sector, the policy of subsidy leads to an increase in quantities of domestic sales and exports by 3.53 percent and 27.04 percent respectively while imports drop by 33.53 percent. The study findings revealed that import tariff policy works well in raising the quantity of domestic sales (0.3 percent) and imports (2.55 percent) of primary agricultural commodities. The quantity of exports of primary agricultural commodities are lowered by 1.22 percent. Export tax policy leads to a substantial drop in quantity of exports of primary agricultural commodities (-35.79 percent) while domestic sales increase by 0.18 percent. Finally increasing direct transfer payments to households leads to an increase in the quantity of exports of primary agricultural commodities by 0.13 percent. The quantities of domestic sales of primary agricultural commodities however reduce by 0.33 percent.

Table 5-1: Summary of the alternative scenarios and their effects on agro-processing and primary agricultural sectors

	Quantity	**Subsidy**	**Tariff**	**Export tax**	**Transfers**
Agro-processing	Domestic sales	-0,80	1,80	0,29	0,22
	Exports	1,95	-1,26	2,52	0,22
	Imports	-8,55	-33,04	-3,14	0,23
Primary agriculture	Domestic sales	3,53	0,30	0,18	-0,33
	Exports	27,04	-1,22	-35,79	0,13
	Imports	-33,53	2,55	-3,27	-1,24

Source: Simulation results

5.4.2 Income effects of policy experiments

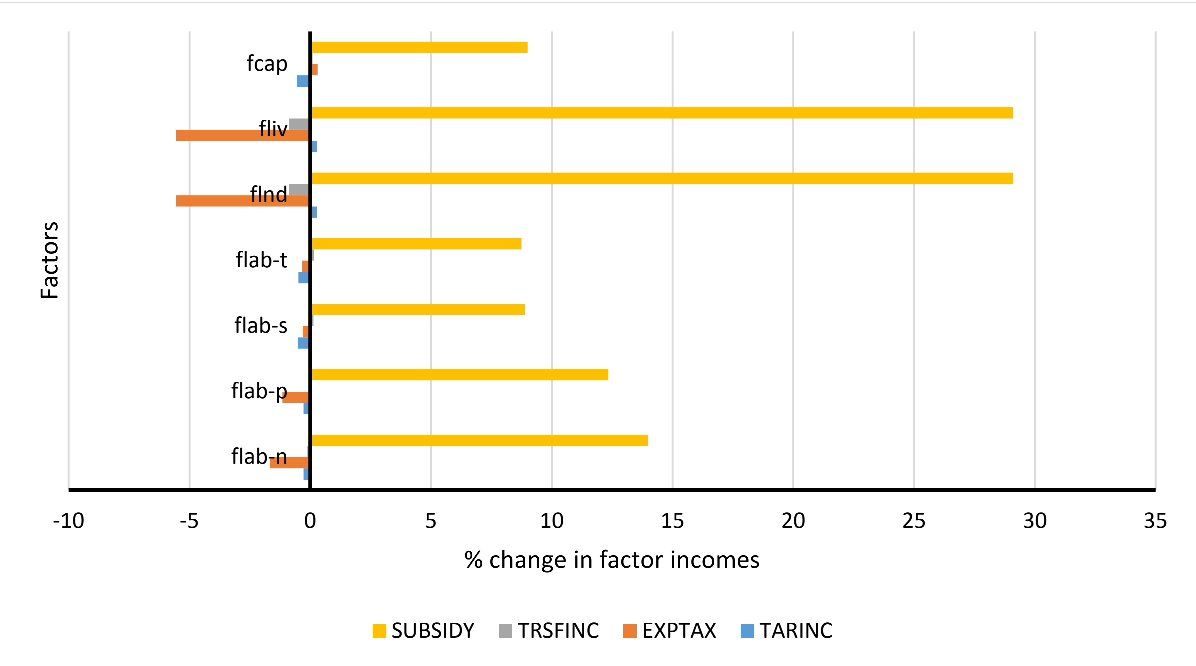
Factor income effects (YF)

The following section is a presentation of simulation results on factor income changes caused by the four alternative policy experiment tools. As shown in figure 5-5, the subsidy increase scenario leads to increase in income from all the factors of production. The largest effects are seen on factor incomes from land and livestock in which case both increase by over 29 percent. Note also that among laborers, those without any form formal education have their wages increase the highest recorded at about 14 percent seconded by those with primary education at 12.34 percent. Factor incomes from laborers with secondary and tertiary education were the least increasing 8.89 percent and 8.74 percent respectively. This is because the main beneficiaries of production subsidies are small scale farmers majority of whom have no formal education or have gone up to primary level while those with secondary and tertiary education tend to venture in non-agricultural activities in the urban areas.

Compared with transfer payments scenario, only factor incomes from capital and labor (secondary and tertiary education level) show positive effects. Capital income increases by 0.1 percent while labor with secondary and tertiary education increase by 0.14 percent and 0.16 percent respectively. Incomes from land and livestock are negatively affected as they both reduce by 0.89 percent. The subsidy scenario is effective in increasing factor incomes because it promotes economic activities (shown in figure 5-4) where the quantities of exports and domestic sales of primary agricultural commodities increased by 27 percent and 3.5 percent respectively. This in turn leads to increased demand for factors of production (land, livestock, capital and laborers) hence the increase in factor incomes observed.

Experimental shocks on export tax has negative effects on most factor incomes such as land (-5.55 percent), livestock (-5.55 percent), labor with no education (-1.67 percent) and labour with primary education (-1.16 percent) and positive effect on factor income from capital (0.3 percent). While shocks on import tariff only positively effects on land (0.28 percent) and livestock (0.28 percent) incomes as shown in figure 5-5. This is because domestic output is little affected by import tariff.

Figure 5-5: Effects of the policy changes on factor incomes (*YFXP*)



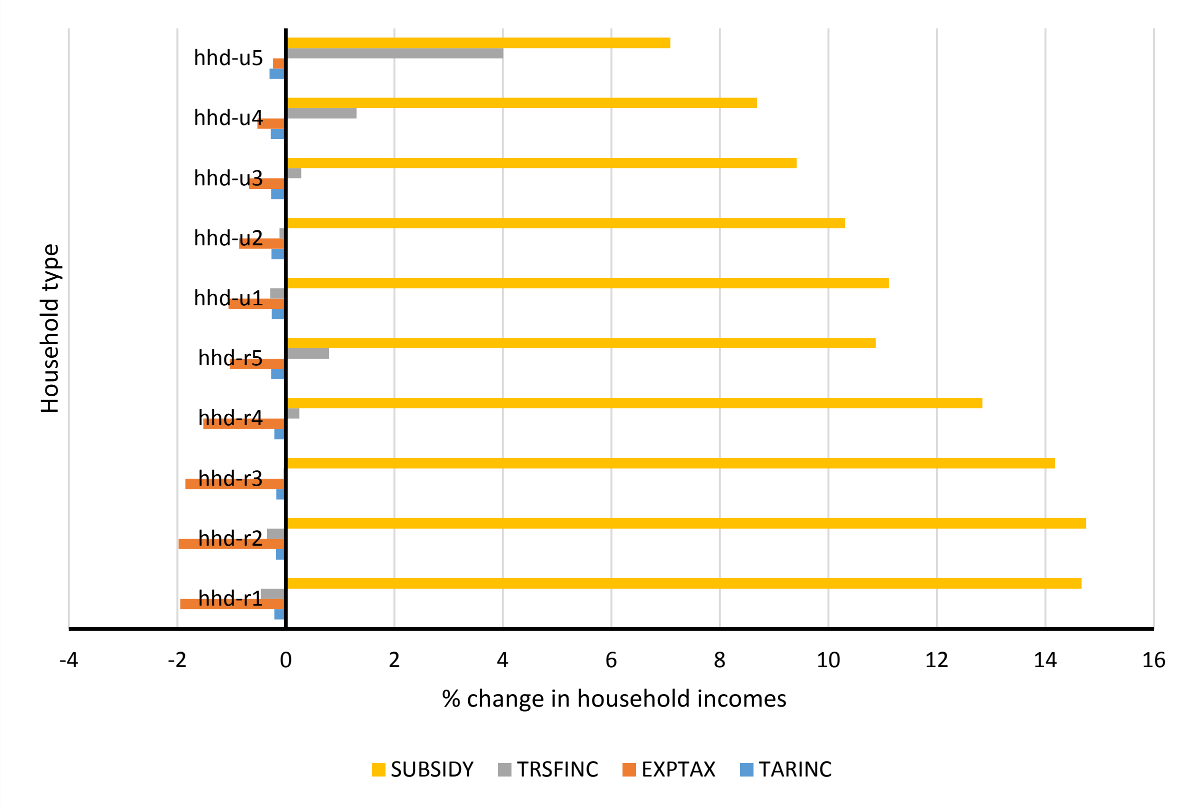
Source: Simulation results

Household incomes effects (YI)

Figure 5-6 shows the effects of alternative scenarios on household total incomes. The households are grouped into two main categories, urban and rural which are further disaggregated into quintiles ranging from one to five. The results from the subsidy scenario show a similar pattern to those observed on factor incomes in the previous discussion. Simulation results show that rural household incomes increase the most with rural household quintiles 1, 2 and 3 at 14.7 percent, 14.8 percent and 14.2 percent respectively. Urban household incomes also increase in a similar fashion ranging from 11.1 percent for urban households in the first quintiles to 7.1 percent for urban household in the fifth quintiles. Again, subsidy leads to these substantial increases in household incomes because the incentive directly benefits households involved in primary production with less spillovers (in terms of unintended beneficiaries). With regards to transfer payments scenario, the biggest effect is seen on urban household category 5 whose final income increase by 4.0 percent seconded by urban household category 4 with an increment of 1.3 percent. Rural household categories 5 and 4 incomes increase by 0.8 percent and 0.2 percent respectively.

Notice that the other policy experiments i.e. export tax has negative effects while import tariff has negative and negligible effects on both urban and rural household incomes as shown in figure 5-6. The negative effects from export tax arise due to the decline in prices received by producers who export primary agricultural commodities, which further reduces the quantity of exports substantially by over 35 percent. This drop in quantity exported implies that with export tax in place producers' incomes reduce.

Figure 5-6: Effects of policy changes on household incomes (*YIXP*)



Source: Simulation results

Welfare effects: Compensating variation in income (CV)

Table 5-2 shows the welfare changes because of changes in prices of commodities for each policy scenario. The measure of welfare used is the compensation variation (CV) in income, which can be defined as changes in income that has to occur in order for the consumer to retain previous utility before an economic change such as price increase or decrease. In the model, CV is measured at simulated prices and incomes. It shows the maximum payment the consumer would be willing to make to avoid having the simulated change undone (i.e. the payment after which the consumer would have been just as well off as without the change. For positive welfare change, CV is greater than zero and vice versa. The changes in welfare are presented in table 5-2 and shows that with the subsidy policy, most households are better off compared to direct transfer payments where positive welfare change occur only to urban households in quintile 5. Results of other policy options are as shown in table 5-2.

Table 5-2: Measures of welfare through compensating variation in income (CV)

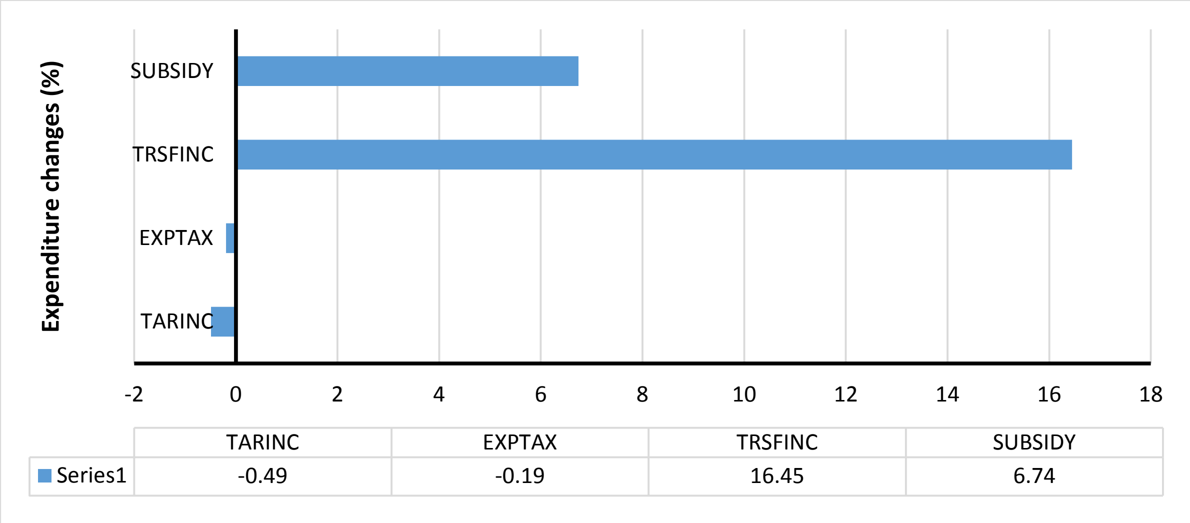
	Tariff	**Export tax**	**Transfers**	**Subsidy**
hhd-r1	-2,86264	-14,1622	-27,3856	77,91823
hhd-r2	-2,69443	-23,6775	-42,6926	129,9967
hhd-r3	-1,07178	-27,1019	-48,2359	157,861
hhd-r4	-4,68484	-26,1164	-52,3381	142,8005
hhd-r5	4,121962	-7,38775	-41,5126	101,7469
hhd-u1	-0,41361	-0,45131	-2,0278	2,104275
hhd-u2	-1,11391	-0,85929	-7,25858	5,193221
hhd-u3	-4,60167	-2,28839	-19,6101	2,666368
hhd-u4	-11,0314	-0,03313	-31,0894	-34,4267
hhd-u5	-11,2324	52,67896	272,4656	-730,016

Source: Simulation results

Government effects

Figure 5-7 shows changes in government total current expenditure for each one of the four-policy scenario. With direct transfer payment scenario government expenditure increases the most by 16.45 percent followed by the subsidy scenario, which leads to 6.74 percent. Since both import tariff and export tax policies involve hike in taxes, government expenditure reduces by 0.49 percent and 0.19 percent respectively.

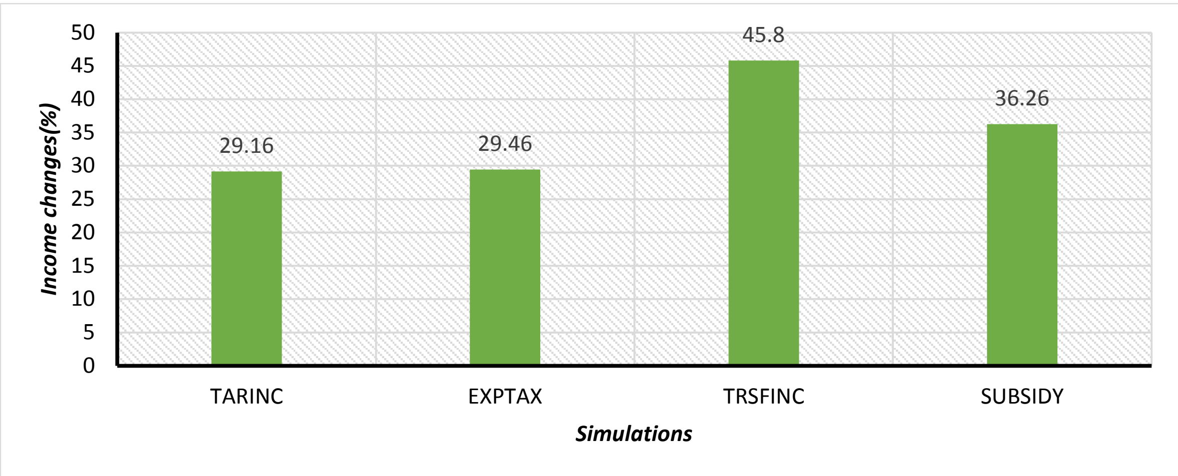
Figure 5-7: Effects of policy changes on total current government expenditure *(EGX)*



Source: Simulation results

Concerning effects on government income, subsidy policy shock leads to 36.26 percent increase in current government incomes while export tax and import tariff shocks raise government incomes by 29.46 percent and 29.16 percent respectively. The biggest effect comes from direct transfer payments in which case government income increase by 45.8 percent (refer to figure 5-8). Note that in all scenarios, the government income increases because as assumed in the government closure, the direct tax rates of enterprises and households endogenously increase as well. This then leads to increased tax revenue hence the increase in government income.

Figure 5-8: Effects of policy changes on total current government income (YGXP)



Source: Simulation results

Programs like the subsidy on primary production and direct transfer payments to household require funding from the government. Table 5-3 represents average changes that occur to direct tax rates for domestic institutions that include all households as well as enterprises. With transfer payment scenario, the direct tax rates for rural households increase on average from around 1 percent to 7 percent while urban households rise from 3 percent to 9 percent.

Table 5-3: Average direct tax rates for domestic institutions (TINS)

	BASE	**TARINC**	**EXPTAX**	**TRSFINC**	**SUBSIDY**
Rural households	1.31%	5.30%	5.01%	7.37%	12.46%
Urban households	2.64%	6.62%	6.34%	8.9%	13.79%
Enterprises	14.05%	18.03%	17.75%	20.10%	25.20%

Source: Simulation results

Direct tax rates for enterprises increase to 20 percent from 14 percent. Increases are also seen with subsidy scenario where direct tax rates rise: rural households (12 percent), urban households (14 percent) and enterprises (25 percent). As a result, government income increases and provides funding for these programs. Note the increase in direct tax rates caused by export tax and import tariff scenarios. It could be expected that an increase in export and import taxes be offset by reduction in other taxes such as direct tax rates on domestic institutions. The closure of fixing government savings that was applied in this study assumes that should there be a loss in government revenue, direct tax rates would adjust upwards to maintain the government surplus. The direct tax rates increase for the import tariff scenario because according to the results, although the quantity of composite goods increase, the purchaser price on the composite goods drops which leads to a reduction in sales tax revenue. This then would lead to loss in government revenue hence the direct tax rates have to increase to correct this. Simulation results show that the export tax increase in the export tax scenario leads to a reduction in household incomes for all household groups including enterprises. This reduction in household income (*YI*) can be attributed to a general contraction of the economy as can be seen in the decline of domestic production (*QA*) for most sectors and the decline in factor incomes (*YF*) for all factor groups. There is a drop in both price and quantity exported of primary agricultural commodities by 30.4 percent and 35.8 percent respectively. The direct tax revenue component is given by the sum of the product of direct tax rate *(TINS*) and income levels of institutions *(YI)*. Since income drops, the direct tax revenue drops leading to reduction in government revenue. As a result, direct tax rates adjust upwards to recover some of the loss in revenue to maintain the base level of government surplus.

5.4.3 Macroeconomic effects of policy experiments

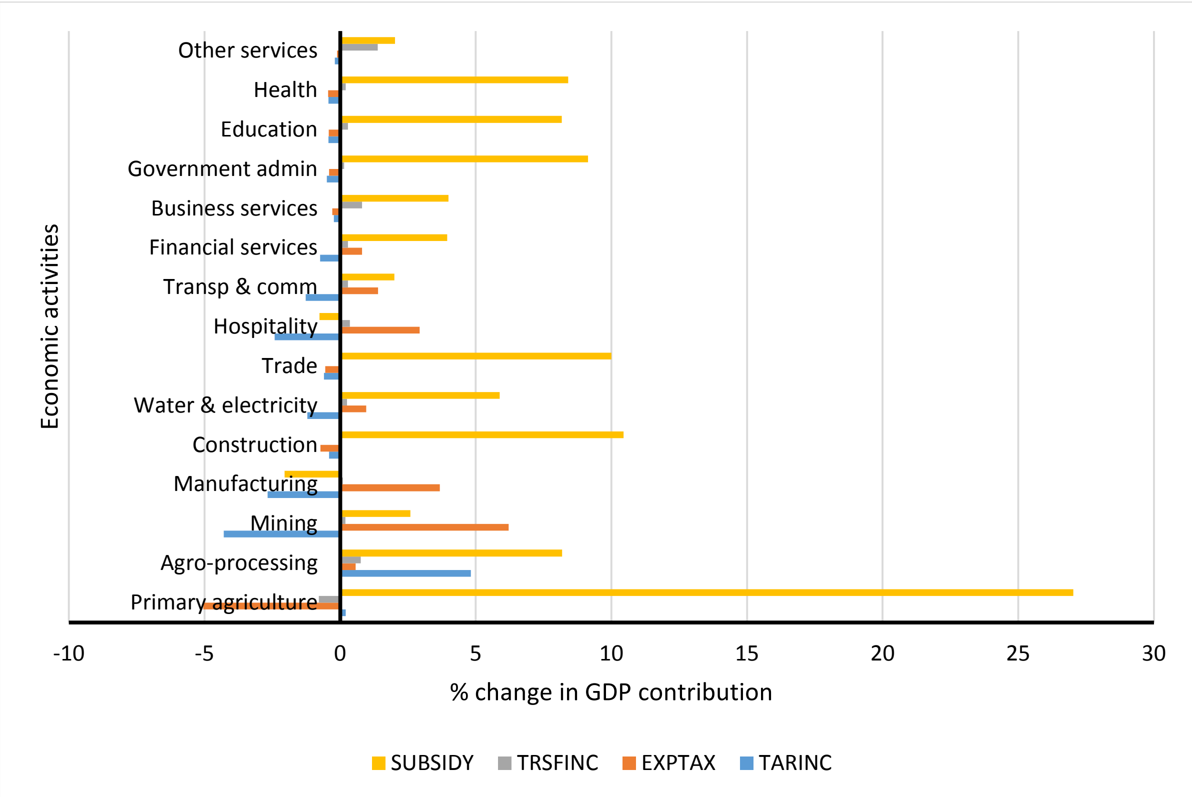
Effects on economic activities contribution to GDP at factor costs

This section provides results on the effects of subsidy, transfer payments, import tariff and export tax scenarios (presented in figure 5-9) on various activities contribution to GDP at factor cost. A policy shock on subsidy improves the performance of all economic activities with an exception of manufacturing and hospitality industries whose contribution to GDP 2.05 percent and 0.76 percent respectively. The largest positive effect is seen on primary agricultural sector whose contribution to gross domestic product at factor cost increases by 27 percent while agro-processing, wholesale and retail trade and construction sectors contribution also increase by 8.19 percent, 10.00 percent and 10.44 percent respectively. Manufacturing activity's contribution to GDP at factor cost on the other hand reduce by 2.05 percent. Essential services such as education and health's contribution to GDP also increase by 8.16 percent and 8.41 percent respectively.

While transfer payments increases agro-processing sector's contribution to GDP by 0.76 percent, it reduces primary agriculture's contribution by 0.79 percent. There are also notable positive changes in other sectors such as hospitality (0.4 percent), transport and communication (0.3 percent), business (0.8 percent) and financial services (0.3 percent) as well as other essential services like education (0.3 percent) and health (0.2 percent). The biggest change is observed on other miscellaneous services with 1.4 percent rise in GDP contribution.

Although the import tariff increase deteriorates the economic performance of most sectors in terms of their GDP contribution, for example mining (-4.30 percent), manufacturing (-2.67 percent), hospitality (-2.42 percent) and transport (-1.27 percent), it is an effective policy tool in boosting the agro-processing sector. Simulation results indicate that the contribution of the agro-processing sector to GDP at factor cost increases by 4.82 percent. Primary agriculture's contribution to GDP reduces by 5.05 percent because of export tax policy while a small increase is observed in agro-processing sector (0.57 percent). The decline in primary agriculture sector's contribution to GDP is because imposing export tax directly reduces the final price received by exporters of primary agricultural commodities, which acts as a disincentive. The effect on agro-processing sector is felt as an indirect effect considering the strong link between the two sectors (output in one used as intermediate inputs in the other).

Figure 5-9: Effects of policy changes on GDP by activity (percentage change from the base)



Source: Simulation results

Macroeconomic effects

Table 5-4 is a representation of macroeconomic effects in nominal terms, of the four policy scenarios described in the previous sections. The effects of import tariff, export tax, subsidy and transfer payment changes on national account variables are presented. These accounts include: absorption (ABSORP), Private consumption demand (PRVCON), government consumption demand (GOVCON), export demand (EXPORTS), import demand (IMPORTS), GDP at market prices (GDPMP), GDP at factor costs (GDPFC2) and net income tax revenue (NETITAX). Their macroeconomic effects are as follows:

The *SUBSIDY* shock: With the exception of net income tax revenue and private consumption, which reduces by 221.56 percent and 0.36 percent, the remainder of macroeconomic indicators increases as follows: absorption (1.98 percent), government consumption demand (8.26 percent), value of export demand (1.52 percent), value of import demand (1.52 percent), GDP at market prices (1.98 percent) and GDP at factor costs (10.96 percent). The net income tax revenue reduces in nominal terms due to reduced production tax collection on primary agriculture, which acts as a production subsidy.

TARINC shock: About the import tariff shock, the opposite results are observed. Here net income tax revenue increases by 2.94 percent while the rest of the macroeconomic indicators reduce: absorption (-0.3 percent), government consumption demand (-0.60 percent), export demand (-2.41 percent), import demand (-2.41 percent), GDP at market prices (-0.30 percent) and GDP at factor costs (-0.43 percent). Similarly, net income tax revenue increase is because of direct effect of the shock in which import tariff collection by the government rises.

EXPTAX shock: With this policy change, three macroeconomic indicators increase: export demand (0.89 percent), import demand (0.89 percent) and net income tax revenue (10.31 percent) while absorption, government consumption demand, GDP at market prices and GDP at factor costs are reduced by 0.18 percent, 0.23 percent, 0.18 percent and 0.60 percent respectively.

TRSFINC shock: Simulation results of the policy change on direct transfer payments to households indicate small but positive effects on all the macroeconomic indicators under consideration. For example, a 0.1 percent increase occurs in government consumption demand, 0.87 percent in export demand and import demand while absorption, GDP at both market prices and factor costs all increased by only 0.02 percent.

Table 5-4: GDP and national accounts (percentage change from the base in nominal values)

	BASE (*billions of Kwacha)*	TARINC (%)	EXPTAX (%)	TRSFINC (%)	SUBSIDY (%)
ABSORP	49467.03	-0.3008	-0.17695	0.0209	1.978808
PRVCON	32964.74	-0.12663	-0.16794	0.005123	-0.36142
GOVCON	5822.383	-0.60248	-0.23251	0.108341	8.260411
EXPORTS	16837.16	-2.41492	0.889295	0.087396	1.516125
IMPORTS	-16847.9	-2.41429	0.889507	0.087372	1.516837
GDPMP	49456.32	-0.30056	-0.17726	0.020894	1.978666
NETITAX	1910.983	2.943422	10.30937	0.061497	-221.555
GDPFC2	47545.34	-0.43094	-0.59874	0.019262	10.96311
EXR	-	-1.42615	1.223731	0.050436	2.635775

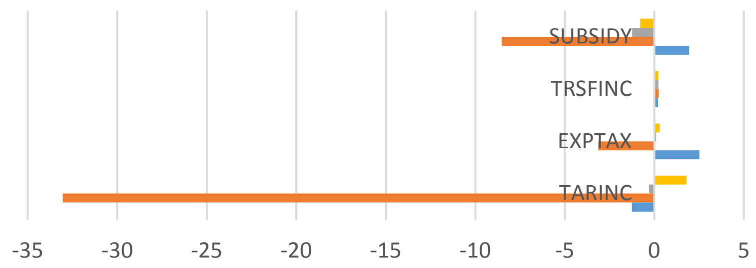
Source: Simulation results

5.4.4 Sensitivity analysis

In the original analysis, the government closure implemented assumes that the government savings are fixed and that direct tax rates of domestic institutions such as households and enterprises are allowed to adjust.

Figure 5-10: Comparison of effects on the quantity traded of agro-processed commodities

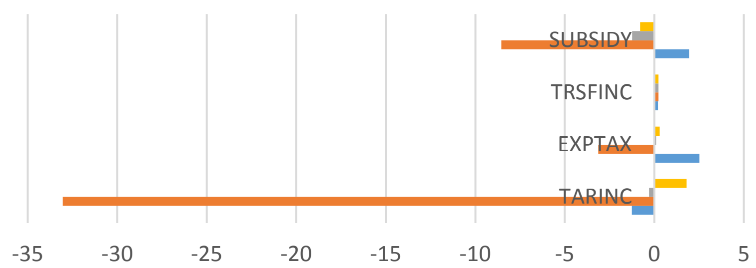
Sensitivity analysis (fixed direct tax rates)



	TARINC	EXPTAX	TRSFINC	SUBSIDY
sales-domestic	1.797204484	0.293682004	0.223401583	-0.796460228
Composite	-0.293514169	0.099397411	0.2243643	-1.238043685
Imports	-33.03741314	-3.132809931	0.240473618	-8.528659707
Exports	-1.259507208	2.515076626	0.210196787	1.938575589

sales-domestic Composite Imports Exports

Original (flexible direct tax rates)



	TARINC	EXPTAX	TRSFINC	SUBSIDY
sales-domestic	1.796732709	0.293300275	0.222793453	-0.795094316
Composite	-0.29430212	0.098648553	0.223135711	-1.237815875
Imports	-33.04278381	-3.139630864	0.228862675	-8.546966789
Exports	-1.255977868	2.518368113	0.215500748	1.952180326

sales-domestic Composite Imports Exports

Source: Simulation results

To see whether results are sensitive to changes in direct tax rates, a different government closure is selected and implemented in the model. This new government closure (GOV-1), assumes that the direct tax rates of households and enterprises are fixed while government savings are allowed to adjust endogenously. Figure 5-10 shows some results from the sensitivity analysis on agro-processing traded commodities. As can be seen, when direct tax rates are fixed only minimal changes occur and results are almost the same with the original analysis (flexible direct tax rate assumption). For example, with the import tariff scenario, quantity of domestic sales of agro-processed commodities increased by 1.7967 percent with flexible direct tax rates and 1.7972 percent with fixed direct tax rates. The difference is very small and all other results show the same thing as can be seen from figure 5-10.

Table 5-5: Differences in percentage changes in household incomes between default and sensitivity analysis

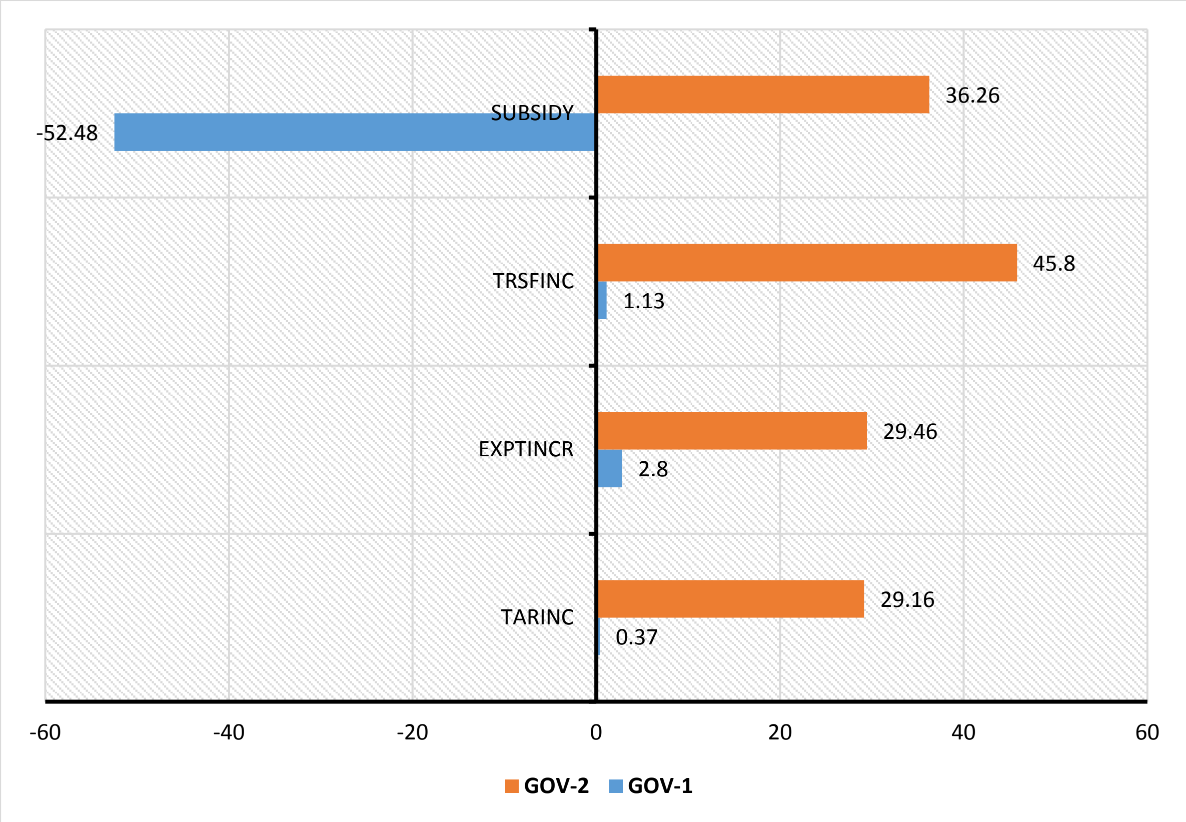
	TARINC	EXPTAX	TRSFINC	SUBSIDY
hhd-r1	-0.00678	-0.00629	-0.0105	-0.01802
hhd-r2	-0.00745	-0.00692	-0.01154	-0.02033
hhd-r3	-0.00896	-0.00829	-0.01384	-0.02585
hhd-r4	-0.0109	-0.01007	-0.01679	-0.03329
hhd-r5	-0.01317	-0.01212	-0.02022	-0.0423
hhd-u1	-0.0125	-0.0115	-0.01921	-0.04001
hhd-u2	-0.01446	-0.0133	-0.02221	-0.04718
hhd-u3	-0.01769	-0.01627	-0.02715	-0.05859
hhd-u4	-0.01836	-0.01687	-0.02815	-0.06127
hhd-u5	-0.02122	-0.0195	-0.03253	-0.07175

Source: Simulation results

As shown in table 5-5, there are small differences between changes in household incomes with fixed direct tax rates and in a situation where direct tax rates are allowed to adjust. For example, with import tariff policy and under fixed direct tax rates, rural households in the first quintile had incomes reduce by 0.221 percent. While in the default case (flexible direct tax rates), their incomes reduced by -0.214 percent and the difference between the two is only 0.007 percent. Other results are as indicated in table 5-5. Similar results are observed for other parameters.

However, implementing government closure with fixed direct tax rate showed huge changes in the total current government incomes. Figure 5-11 provides results that compare total government incomes under two different government closures. GOV-2 is the original (default) government closure that assumes flexible direct tax rate and fixed government savings while GOV-1 is the new closure implemented in the sensitivity analysis. When direct tax rates are fixed, government total income only increases by 1.13 percent under transfer payment scenario compared to 45.8 percent under the default closure. Similarly, with import tariff scenario, government total income rises by 0.37 percent (fixed direct tax rates) compared to 29.16 percent (flexible direct tax rates). Note that with subsidy scenario, while government total income increases by 36.26 percent assuming flexible direct tax rates, it drastically declines by 52.48 percent if direct tax rates are fixed.

Figure 5-11: Comparison of changes in total government incomes for under different closures



Source: Simulation results

5.5 Summary

The subsidy shock involved a 30 percent introduction of production subsidy given to the primary agricultural activities. The aim of this incentive is to promote the agro-processing sector through stimulation of primary agriculture production. It is hypothesized that such a subsidy would lead to increased output of primary agriculture thereby supporting agro-processing through abundant intermediate inputs bought at relatively lower prices. Simulation results show that average output and composite prices of primary agricultural commodities drop by 12 percent and 8.99 percent respectively, which leads to an increase in domestic sales of the same commodities by 3.5 percent. Note that while imports of primary agricultural commodities reduced by 33.5 percent, their exports increased by 27 percent. On agro-processing sector, the indirect effects include the decline in intermediate input price (-3.5 percent) while export price increase by 1.4 percent leading to a rise in exports of agro-processed commodities by about 2 percent. Other positive spillover effects include increase in incomes generated from all factors of production with land and livestock incomes increasing the highest at 29 percent. Incomes of all households also increase with rural households benefiting the most from this subsidy policy. For example, rural household grouped in the first quintiles have their incomes increased by 14.7 percent compared to their urban counterparts grouped in the first quintiles whose incomes increased by 11.1 percent. As a result, there is a positive welfare change among most households with an exception of urban households in the fourth and fifth quintile. The subsidy policy also improves the economic performance of most activities in terms of their contribution to GDP at factor costs with an exception of the manufacturing and hospitality sectors, which drop by 2.02 percent and 0.76 percent respectively. The primary agriculture benefits the most with the sector's contribution to GDP increasing by 27 percent while the agro-processing sector also increase by 8.19 percent. The subsidy policy is therefore effective as it increased quantity of exports of agro-processed commodities and reduced imports by 8.55 percent though quantity of domestic sales dropped by 0.8 percent. However, these gains come at a cost as the net income tax revenue drastically decline by slightly over 221 percent.

With the import tariff scenario, import tariffs on agro-processed commodities are increased to 30 percent. This incentive is designed to restrict the amount of agro-processed commodities imported into an economy with the aim of protecting and promoting domestic infant industries. The results from the simulations show that import price of agro-processed commodities increases by 15.6 percent, which directly reduces the quantity of imports of the same commodities by 33 percent. The domestic composite price and domestic sales increase by 1.2 percent and 1.8 percent respectively. Export price of agro-processed commodities drop by 1.6 percent causing a reduction in amount of exports by 1.26 percent. The policy is therefore not as effective as hypothesized in as far as promoting agro-processing is concerned. The positive change in domestic sales (1.8 percent) is small considering the loss in exports (-1.26 percent) and the drastic decline in imports (-33 percent) which can have negative effects on consumer welfare. Despite this, the policy leads to some small benefits especially in primary agricultural sector where domestic sales of primary agricultural commodities increase by 0.3 percent. Marginal positive changes are observed also in factor incomes from land (0.28 percent) and livestock (0.28 percent) while effects on household incomes where negative and negligible. The government also gains as the net income tax revenue increases by 2.9 percent. Other macroeconomic indicators decline such as government consumption (-0.6 percent), GDP at market prices (-0.3 percent) and GDP at factor costs (-0.43 percent). In addition, the import tariff policy deteriorates the economic performance of most sectors (in terms of their contribution to GDP) as follows: mining (-4.3 percent), manufacturing (-2.67 percent) and hospitality (-2.42 percent). The target sector, agro-processing, is the only one with positive effect where it's contribution to GDP increase by 4.82 percent.

The third incentive, which involves the introduction of an export tax on primary agricultural commodities theoretically, works in similar way as the subsidy policy discussed in as far as promoting agro-processing is concerned. Imposing an export tax restricts exports of raw primary agricultural commodities and in the end help promote agro-processing by ensuring abundant intermediate inputs bought at relatively lower prices. Results show a reduction in export price (-30.4 percent) of primary agricultural commodities. As a result, the quantity of exports of primary agricultural commodities also reduce (-35.8 percent). In terms of the effects on agro-processing sector, the intermediate input price slightly reduces (-0.22 percent resulting in an increase in both quantities of domestic sales (0.3 percent) and exports (2.5 percent) of agro-processed commodities. Despite these small positive changes on quantities of domestic sales and exports of agro-processed commodities, export tax policy negatively affects factor incomes generated by most factors of production: land (-5.55 percent), livestock (-5.55 percent), labor without formal education (-1.67 percent) and labor with only primary education (-1.16 percent). As far as changes to household income is concerned, all households both urban and rural have their incomes reduced due to the export tax policy. In terms of contribution to GDP, the agro-processing sector slightly improves by 0.57 percent while in the primary agriculture sector drops by -5.05 percent. There has to be a trade-off therefore because promoting agro-processing through export tax policy would mean reducing the primary agricultural contribution to GDP by slightly over 5 percent. With an exception of net income tax revenue that increases by 10.3 percent, other macroeconomic indicators such as government consumption, GDP at both market prices and factor costs reduce by 0.23 percent, 0.18 percent and 0.6 percent respectively. Nevertheless, export tax policy works the best relative to other policies as far as promoting agro-processing is concerned.

Although transfer payments to households do not enter directly into the price and production system, they were simulated for comparison with other alternative policies, in terms of effects on the agro-processing sector and economy as a whole. Results show minimal effects on prices and output of agro-processing. As expected for example, the quantities of exports and domestic sales of agro-processed commodities increased by 0.2 percent on average. On primary agriculture, only exports of primary agricultural commodities increase by 0.13 percent while quantities of imports and domestic sales reduce by 1.24 percent and 0.3 percent respectively.

Factor incomes marginally increase capital income (0.1 percent), labor with secondary education (0.14 percent) and labor with tertiary education (0.16 percent). Notable effects were observed on household incomes especially urban households grouped in the fifth and fourth quintiles whose incomes increase by 4 percent and 1.3 percent respectively. Compared with rural households in the same quintiles, their incomes only increase by 0.8 percent and 0.2 percent respectively. On GDP contribution at factor costs, the agro-processing sector improves by 0.76 percent while the primary agricultural sector drops by 0.79 percent. The contribution to GDP by essential service sectors like education and health increase by 0.3 percent and 0.2 percent respectively. Finally increasing transfer payments to households leads to positive though small effects on most macroeconomic variables. Results indicate that government consumption increases by 0.1 percent while demand and GDP at market prices rise by 0.87 percent and 0.02 percent respectively. This policy has cost implications because it leads to an increase in total government expenditure by 16.45 percent.

6. Conclusions and recommendations

6.1 Summary, conclusions and recommendations

Volatilities in the global economy have in recent times negatively affected copper prices and output which has resulted into widening trade deficit, rapid depreciation of the local currency, rising cost of living and anticipated declining economic growth. To promote economic resilience, there is need to diversify the economy away from copper. Hence, government's macroeconomic objective is to promote and accelerate diversification of the Zambian economy towards among other the agriculture and agro-processing sectors (MFNP, 2015). Agro-processing plays a significant role in rural and general economy as a whole. Despite the forward and backward linkages that the agro-processing sector forms with other industries, there is little literature on the general equilibrium effects of providing incentives to this sector. This study therefore aimed at filling this gap by analyzing the economy-wide impacts of financing the agro-processing sector through provision of fiscal and financial incentives.

To do this, four policy scenarios were simulated to examine and compare their effects on the macroeconomic fundamentals and to assess the effects on selected sectors mainly agro-processing and primary agriculture as well as changes in factor and household incomes. A static CGE model developed by Lofgren, Thomas and El-said (2002) was used in the study. This model was calibrated to Zambia's most recent publicly available dataset, the 2007 Social Accounting Matrix (SAM) developed by the Zambia Institute for Policy Analysis and Research (ZIPAR), working together with the International Food Policy Research Institute (IFPRI) and the United Nations University's World Institute for Development Economics (UNU-WIDER). Implementation was done in the General Algebraic Modelling System (GAMS).

The literature reviewed that there is empirical evidence shows that agriculture and related activities support a majority of rural households in developing countries hence both primary agriculture and agro-processing have potential to contribute not only to poverty reduction and food security but also to economic growth and development. It therefore makes logical sense to support these sectors through provision of incentives.

In chapter 3, it was reviewed that the contribution to GDP by most sectors including agriculture for the period 2011 to 2014 declined. The mining sector continued to dominate during this period. In terms of primary agriculture, crop production at macro level, has improved since 2006. Maize production has over the years steadily increased recording 3.4 million metric tons in 2014 from 2.5 million metric tons in 2013. Livestock and fisheries are also important subsectors of primary agriculture in Zambia. In Zambia agro-processing involves a number of activities that process and transform the following agricultural produce; fruits and vegetables, honey, oil, sugar, coffee, tea, mushrooms and many more into refined products that are eventually sold on the market (domestic sales and exports) or consumed by primary producers (households) themselves. Empirical evidence however shows that there has been little investment in value added activities of agricultural products and as Muyunda (2009, cited in RMC, 2010) states only 30 percent of primary agricultural produce in Zambia are sold to the agro-processing sector. Statistics on selected subsectors of agro-processing revealed that most value added products such as cotton yarn and woven fabrics of cotton, high value tobacco products (such as cigars), refined sugar as well as some milling products are underperforming in terms of export values and annual growth relative to their raw and unprocessed counterpart products. Not much of Zambia's agro-processing potential has been utilized and so, there are plenty of opportunities in the industry. Favourable climatic conditions, availability of arable land and access to vast water resources in Zambia enables cultivation and production of a wide range of crops, livestock, fisheries and forestry products. In addition, the Government of the Republic of Zambia, through the Zambia Development Agency, offer tax incentive packages to firms or businesses willing to invest in Zambia's growth sectors such as agro-processing sector.

In as far as promoting agro-processing is concerned, the simulation results suggested that the export tax policy works the best relative to other policies as it decreased the intermediate input price and quantity of imported agro-processed commodities, which led to an increase in both quantities of domestic sales and exports by 0.3 percent and 2.5 percent respectively. The export tax policy however negatively affects most factor incomes and leads to a reduction in all household incomes. In terms of economic activities, it leads to a slight improvement in agro-processing sector's contribution to GDP while that of primary agriculture drops. The subsidy policy is equally effective as it increased quantity of exports of agro-processed commodities and reduced imports by 8.55 percent though quantity of domestic sales dropped by 0.8 percent. Nevertheless, it led to increases in all factor and household incomes with income from land and livestock increasing by 29 percent as well as positive welfare effects on most households. Furthermore, most sectors improve their economic performance such as primary agriculture and agro-processing whose contribution to GDP at factor costs increase by 27 percent and 8.19 percent. The major drawback to this policy is that if direct tax rates were fixed, it could lead to huge losses in government income (52.48 percent) which can be smaller or positive depending on the level of subsidies given and whether direct tax rates are allowed to adjust or not. Concerning the import tariff policy, it is not as effective as hypothesized in as far as promoting agro-processing is concerned. The positive change in domestic sales was small considering the loss and the drastic decline in imports which may have negative effects on consumer welfare. In addition, the import tariff policy deteriorates the economic performance of most sectors such as mining, manufacturing and hospitality (in terms of their contribution to GDP). The target sector, agro-processing, is the only one with positive effect where its contribution to GDP increased by 4.82 percent. Despite this, the policy leads to some small benefits especially in primary agricultural sector where domestic sales of primary agricultural commodities increase. The government also gains as the net income tax revenue increases by 2.9 percent. Finally, transfer payment policy has positive though small effects on domestic sales and exports of agro-processed commodities. In addition, direct transfer payment policy leads to increases in incomes of all household groups. This policy has cost implications because it leads to an increase in total government expenditure by 16.45 percent. It can be concluded therefore that in as far as promoting domestic agro-processing is concerned (in terms of trade); the export tax and production subsidy policies work relatively well and may be considered. While the subsidy is also effective as it improves the economic contribution of both agro-processing and primary agriculture and also improves the welfare of all households, it may lead to government income losses if direct tax rates are fixed. The import tariff policy is not so effective due to the huge drop in imports and small increase in domestic sales and factor incomes. Despite the small changes, the transfer payment policy is effective at promoting agro-processing.

Two policies appear to be effective tools for promoting agro-processing in Zambia. The first one being the production subsidy which according to study findings appears to not only improve the economic performance of agro-processing sector but also shows greater improvements in the welfare of most households. However, subsidies tend to lead to inefficiencies in the allocation of resources and may not be sustainable given the huge government deficit. Also simulation results from sensitivity analysis suggest that serious losses may occur in total government incomes if direct taxes of domestic institutions such as enterprises and households are not adjusted upon implementation of such a policy. In such a case the alternative policy recommendation as indicated by simulation results, could be the use export taxes on primary agricultural commodities as a way of promoting the domestic agro-processing sector. The government could particularly target subsectors such as, cotton yarn and woven fabrics of cotton, high value tobacco products (such as cigars), refined sugar as well as some milling products. Descriptive statistics show that these subsectors have been underperforming in terms of export values and annual growth relative to their raw and unprocessed counterpart commodities.

In addition, households are affected by economic downturns such as depreciation of the Zambian Kwacha and given that most goods are imported; it implies that the cost of living eventually goes up. To mitigate the negative effects currently faced, the government may increase direct transfer payments to households. These can be offered in terms of cash transfer payments with which food and possibly inputs for production can be purchased.

Furthermore, the Government of Zambia must come up with tools that will enable monitoring and evaluation of such incentives to increase efficiency and effectiveness.

Finally, it is recommended that future studies be extended that would use CGE or similar models to evaluate the employment effects such policy changes may have. Agro-processing and primary agriculture form strong linkages, hence it would be necessary to analyze the economy-wide effects of fiscal and financial incentives on rural employment, wages and migration. Also having used a static CGE model, it is further recommended that a dynamic recursive model be used in future studies that will account for multiple period effects

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Appendices

Disaggregation of agro-processing account

Agro-processing

Data variable	**Description**
cmeat	Meat, fish and dairy
cmill	Grain milling
csugp	Sugar refining
cfood	Other food processing
cbeve	Beverages
ctobp	Tobacco curing and processing
ctext	Textiles and clothing
cwood	Wood and paper

Source: Zambian SAM (2007)

Disaggregation of primary agriculture account

Primary agriculture

Data variable	**Description**
cmaiz	Maize
crice	Rice
cocer	Other cereals
ccass	Cassava
croot	Other root crops
cpuls	Pulses and oilseeds
chort	Horticulture
ctoba	Tobacco
ccott	Cotton
csugr	Sugarcane
cocrp	Other export crops
clive	Livestock
cpoul	Poultry
cfore	Forestry
cfish	Fisheries

Source: Zambian SAM (2007)

AC global set for model accounts

Activities

AAGRA	primary agricultural activities
AAGRP	agro-processing activities
AMINE	mining activities
ANAMI	manufacturing activities (non-agricultural)
ACONST	construction
AUTILE	electricity and water
ATRADE	retail and wholesale trade
AHOPT	hospitality industries
ATRANS	transport and communication
AFINSS	financial services sector
ABUSS	business and real estate sector
AGADM	government administration
AEDU	education sector
AHEAL	health sector
AAOPS	other private services sector

Commodities

CAGRA	primary agricultural commodities
CAGRP	agro-processed commodities
CMINE	minerals
CNAMI	manufactured commodities (non-agricultural)
CCONST	infrastructure
CUTILE	utility services
CTRADE	trade services

CHOPT	hospitality services
CTRANS	transport and communication services
CFINSS	financial services
CBUSS	business services
CGADM	government administration services
CEDU	educational services
CHEAL	health services
CAOPS	other private services

TRNC-D	domestic transactions cost account
TRNC-E	export transactions cost account
TRNC-M	import transactions cost account

Factors

flab-n	Labour - not completed primary
flab-p	Labour - completed primary
flab-s	Labour - completed secondary
flab-t	Labour - completed tertiary
flnd	Crop land
fliv	Livestock
fcap	Capital

Households

hhd-r1	Rural - Quintile 1
hhd-r2	Rural - Quintile 2

hhd-r3	Rural - Quintile 3
hhd-r4	Rural - Quintile 4
hhd-r5	Rural - Quintile 5
hhd-u1	Urban - Quintile 1
hhd-u2	Urban - Quintile 2
hhd-u3	Urban - Quintile 3
hhd-u4	Urban - Quintile 4
hhd-u5	Urban - Quintile 5

Enterprises

ent	enterprises

Taxes

dtax	Taxes - Direct
etax	Taxes - Export
mtax	Taxes - Import
stax	Taxes - Sales
vtax	Taxes - Value Added

Required accounts

GOV	government
ROW	rest of the world
S-I	savings-investment
DSTK	stock changes

TRNCSTDOM	domestic transactions cost account
TRNCSTEXP	export transactions cost account

TRNCSTIMP	import transactions cost account
INSTAX	direct taxes on domestic institutions
FACTAX	direct factor taxes
IMPTAX	import taxes
EXPTAX	export taxes
VATAX	value-added taxes
ACTTAX	indirect taxes on activity revenue
COMTAX	indirect taxes on commodity sales in domestic market