

Czech University of Life Sciences Prague

Faculty of Economics and Management

Department of Economics



BACHELOR THESIS

Impact of Imports and Food aid on Agriculture in the Democratic
Republic of Congo

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CZECH UNIVERSITY OF LIFE SCIENCES PRAGUE

Faculty of Economics and Management

BACHELOR THESIS ASSIGNMENT

Packs Kuyindama Mwika

Economics and Management

Thesis title

Impact of Imports and Food aids on Agriculture in the Democratic Republic Of Congo

Objectives of thesis

Examine the Impact of Imports and food aids on Agriculture and propose ways to food self-sufficiency in the Democratic Republic of Congo

- Identify causes (economic factor) that influence the increase of agricultural import
- Evaluate the effect of import and Food aid in the life of rural population and the Congolese economy(economic growth).
- Find out the optimal quantity level of import and food aid necessary to allow the maximization of the local agricultural production in the Congo

Methodology

Quantitative (Regression)and Qualitative data analysis

- Deduction method allows to analyse the evolution of import and food aid and its impact in the local production
- The analytical method helps for the analyse of different variables in order to find the impact of importation by regression process
- The collection of data include documentations and data collected from the National service of Agricultural statistics and food and Agriculture organisation statistical services and from several reseachers report about this matter.

The proposed extent of the thesis

35 pages

Keywords

Imports, Food aids, Agricultural production, Self-sufficiency, Rural population

Recommended information sources

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I declare that the thesis “Impact of Imports and Food aid on Agriculture in the Democratic Republic of Congo ” is the fruit of my own work and all literature sources used are listed in the references. As the author of the bachelor thesis, I declare that the thesis does not break copyrights of any third person.

In Prague _____

.....

Packs Kuyindama Mwika

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I would like to thank YHWH, my father for His everyday words that gave me strength to finish this thesis and for His ever lasting love for me.

I would also like to take this opportunity to thank the supervisor of this bachelor thesis Ing. Petr Procházka for his precious time and involvement in every part of this thesis.

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Impact of Imports and Food aid on Agriculture in the Democratic Republic of Congo

Dopad Dovozu a Potravinové pomoci na zemědělství v Demokratické Republice Kongo

Summary:

The main goal of this bachelor thesis is to find out the impact of imported food commodities and food aid in the agricultural production of the Democratic Republic of Congo. And in the case their implication on agriculture productivity is significant, this thesis examine factors causing their persistent presence in the Country. Since agriculture is a vast economic sector and since different group of commodities may have different behaviour, this bachelor thesis especially focuses on cereals which are staple foods for most of the congolese population and which have a great share in food aid provided to the country. The statistical method used is the regression analysis which helped us to process data.

After processing the data, the results of regression analysis showed that food aid does not have a significant relationship with the productivity of cereals in the Democratic Republic of Congo while the effect of imports of food commodities was found to be significant. However the study further revealed that the relationship between agricultural production and cereals imports was mainly driven by the high growth rate of the congolese population.

Key words: Imports, Food aid, Agricultural production, Self-sufficiency, Rural population

Sournh

Hlavním cílem této bakalářské práce je zjistit dopad dovážených potravinářských komodit a potravinovou pomoc v zemědělské výrobě Demokratické republiky Kongo. A v případě jejich důsledky na produktivitu zemědělství je významné, tato práce zkoumá faktory, které způsobují jejich perzistentní přítomnost v zemi. Protože zemědělství je obrovský ekonomický sektor, a protože jiná skupina komodit mohou mít odlišné chování, tato bakalářská práce je zaměřena především na obiloviny, které jsou základní potraviny konžských obyvatel a které mají velký podíl na potravinové pomoci poskytované do Kongu. Statistická metoda je regresní analýza, která pomáhají ke zpracování dat.

Po zpracování dat, výsledky regresní analýzy vyplynulo, že potravinová pomoc nemá významný vztah s produktivitou obilovin v Demokratické republice Kongo, zatímco vliv dovozu potravinářských komodit byl zde být významný. Nicméně Studie dále odhalila, že tento vztah mezi zemědělskou výrobou a dovozem bylo zle tažen vysokým tempem růstu konžské populace.

Klíčová slova: Dovoz, Potravinová pomoc, Zemědělská výroba, Soběstačnost, venkovské obyvatelstvo

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List of Abbreviations

DRC	Democratic Republic of Congo
FAO	Food and Agriculture Organization (of the United Nations)
GDP	Gross domestic product
GNI	Gross national income
GNP	Gross national product
INS-RD Congo	Institut National de la Statistique-République Démocratique du Congo/National Institute of Statistics Democratic Republic of Congo
NGO	Non-Governmental Organization
WFP	World Food Program

1. Introduction

Nutrients provided by different products of agriculture are among, if not the principal sources of energy and food for human and animals consumption. Therefore it is imperative for a government to consider the well-functioning of this sector since it provides commodities which allow the labor force to be energized, thus to increase their productivity which leads to economic growth and further to development when different conditions are fulfilled (in the case of developing countries). There have been different arguments about the impact of imports of food commodities and food aid in the agricultural productivity of countries receiving food through these means for a long period. The conventional claim in the case of food aid is that it creates dependency by damaging domestic agriculture which usually employs a great percentage of rural population in most of the low-income countries facing food insecurity despite their great agricultural potential and arable lands. However imports of food commodities and Food aid are still used as essential tools to ensure food security by covering the gap of the domestic need of food for the past decades in developing countries.

Despite its agricultural potential, the Democratic Republic of Congo still resorts to food aid and to imports of food commodities to cover the nutritional need of its population mostly living under poverty. That food imports and food aid account to cover the deficit of required food needs for this gigantic country with favorable climate for agriculture is puzzling. This thesis principal interest is to find the relationship between the quantity of commodities locally produced, food aid and imports of cereals, as well as factors affecting their demand in DRC.

2. Thesis Methodology and Objectives

2.1. Objectives

The principal aim of this thesis is to find out the impact of food aid and imports of food commodities on agriculture by providing empirical evidence of whether they significantly affect the agricultural productivity in the Democratic Republic of Congo and to find out the direction of their significance. In other words to know if they have a positive or downward pressure on agricultural supply as well as the effect they might have in the lives of population depending on agriculture activities as the primary source of income, thus in the congolese economy in case of their statistical significance. Another purpose of this thesis is to find out factors that create the persistent need of food imports in the country, if necessary propose maximum quantity of imports and ways to self-sufficiency.

2.2. Methodology

To fulfil this thesis objectives and provide plausible information on the impact of imports of food commodities and food aid in the agriculture production of the Democratic Republic of Congo, secondary data were gathered from INS-RD Congo, FAO and other international institutions listed in the references. Regression analysis was implemented as the statistical method enabling the processing of data and deductive reasoning to draw conclusions. It has been also necessary to look at essential numerical data in tables which helped with the application of basic knowledge encountered in the theoretical part.

The software used to help with the processing of data is SAS Enterprise Guide and Microsoft Excel 2013.

3. Theoretical Part

This thesis section deals with the theoretical concepts of agriculture, imports, food aid and related notions.

3.1. Agriculture

3.1.1. Definition of Agriculture

The broad scope of activities covered by agriculture and its varied application as a practice, an art, a science and a business, have led many authors to develop different definitions to clarify the meaning of the term “agriculture” according to their field of interest. While most definitions of agriculture are founded on the assumption that agriculture primarily involves growing of crop and livestock, forestry and fisheries can be included as agricultural practices (Bareja, 2014).

Agriculture can be defined in general terms as the art and science of working the soil to cultivate, grow crops and raise livestock necessary to sustain and improve human life. It takes into consideration the preparation of its products for people usage and their distribution to the market place (National Geographic Society, 2016).

3.1.2. Types of Agriculture

As there are many definitions of agriculture, there are also various ways to classify agriculture. Agriculture can be classified on the basis of characteristics such as water availability, the volume of production, the geographic location and on the basis of many other variables (Chand, 2014).

This thesis focuses on two major types encompassing all agricultural activities: Subsistence agriculture also called “Traditional agriculture” and Industrialised agriculture.

- ***Subsistence Agriculture***

Subsistence agriculture is a form of farming which activities consist of harvesting enough livestock and crops on a small-scale of land to provide food for farmers and their households . The surplus amount of product is put on the market to provide cash for farmers’ families. This type of agriculture provides self-sufficiency to those who practice it. It is more labor-intensive relying on animals and manpower, the use of archaic tools and low technology to work the land.

Natural techniques such as utilisation of manure are used instead of chemical fertilizers to enrich the soil. Different types of crops and livestock are raised in one area in order to get the most output (Cunningham, 2016).

According to Brüntrup and Heidhues (2002), attributes ascribed to subsistence agriculture in agricultural economics literature are mostly negative. Practiced today in both developing and early stage of industrialised countries, subsistence agriculture is mostly associated with concepts such as traditional, low-income, low-input, small-scale, resource poor, low technology farming. The reason for this criticism is said to be the lack of efficiency and constraints of resource use, coming from the lack of good management and entrepreneurship, the low responsiveness of farmers to policies and the priority given to satisfy family needs. These things are argued to prevent comparative advantage and to hold back the economic performance and growth of a given territory. In short, the difficulty of controlling subsistence agriculture, the low productivity associated with subsistence farming and the fact that market are supplied only when there is a surplus and during good harvesting do not allow governments to rely upon it to supply food for populations of urban areas continuously.

- ***Industrialised Agriculture***

It is the modern-day agriculture where large quantity of commodities are produced through industrialised techniques to sell and feed a growing population. Thus an increase in the production for each unit of land is the purpose of this form of agriculture. The high productivity of industrial agriculture results from the farming methods used. Animal and manpower are replaced by large machines and innovative technologies able to work faster and harder. Nevertheless the use of these machines has increased the need of fossil fuels inputs on industrial farm, therefore a change of oil price can cause the price of food produced to fluctuate. The extensive use of chemical fertilizers to enrich the soil with nutrients and seeds pesticides to kill pests harmful for the crops are also common methods used by industrial farmers to control and increase the yield or output (Cunningham, 2016).

According to Motes (2010) the linkage of industrial agriculture to a variety of factors have made this type of farming very successful--Specific nutrients provided to maintain and develop soil fertility when depleted, the easy access to resources and improved inputs, technologies that create favorable condition to enhance plant growth while minimizing disturbance and soil loss, and efficient irrigation systems to supplement rainfall in different climates. This success is also dependent on factors such as supportive policies implemented by governments, and investments

from the private and public sector providing farmers with effective technologies , facilities and information¹ from the production to the marketing process of products. Unlike subsistence farmers, industrialised agriculture farmers are reported to respond positively to effective commercial system and policies that generate economic returns throughout the production-marketing chain, hence contributes to economic development. This can be perceived in developed countries where farmers' output goes throughout a well structured agricultural value chain comprising different systems of transfer, storage and process until the final product reaches consumers. This sophisticated system allows price regulation and provides jobs and activities to many sector in a government.

Despite the benefits provided by industrialised agriculture, there are emerging concerns about its sustainability, its effect on the environment , the exposure of consumers to health hazards from food contaminants, animal welfare as well as the damage perceived on smaller family with agriculture oriented operations and rural areas (Motes, 2010).

3.2. Concepts Related to Agriculture

3.2.1. Demand for Commodities

Numerous factors affect the composition and weight of consumers' baskets (or food demand) and enable either an increase or fall in the demand of food commodities. Demographic factors such as the structure and the size of the population along with its growth rate, the consumption per person also called the per capita consumption linked with the level of income, the price of commodities, the price of a complement and substitute of these commodities are important determinants of quantities of food purchased in a given area or country (FAO, 1995; Rakotoarisoa, Lafrate and Paschali, 2011).

Malthus (1798) states that population growth is geometrical while food production follows an arithmetic function. This means that the food production growth could not cover the demand for food in some point because of resource availability constraints while the population is growing, leading food supply to decline in subsistence level.

¹ Farmers in industrialised agriculture are provided with modern techniques and scientific knowledge able to improve crops and livestock genetics for the purpose of increasing output quality and to prevent them (crops and livestock) from diseases and other threats (Motes, 2010).

A high rate of population growth causes food to be imported to a region or country when the local agricultural production is not sufficient to satisfy the need in food. The contribution of imports in ensuring food security is visible when a surge in demand for staple food is observed and when the composition of foods imported or consumed does not change. This illustrates that there has been no change in dietary pattern. The population growth rate is therefore the cause of persistent imports of commodities (Rakotoarisoa, Lafrate and Paschali, 2011).

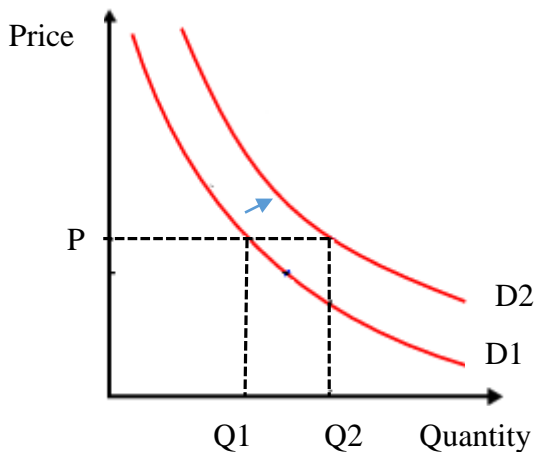
Another cause that affect significantly the change in food demand is urbanisation. The number of people involved in agricultural activities decreases when economies become urban. When rural areas empty from their populations, the proportion of women in the labour force grows in urban areas which reduces time for cooking and leads to a change in the dietary pattern and in the demand for food (Umberger, 2015 ; Regmi, 2001).

However the impact of urbanisation on food pattern and preferences depends on the extent to which it (urbanisation) has occurred. In a country which has largely finished urbanisation, and has reached a stable economic development, the dietary pattern change due to urbanisation is very small. When the share of rural inhabitants is still greater compared to urban areas the effect of urbanisation on food pattern varies according to the country economic condition (Regmi, 2001).

In addition to the population growth and urbanisation which is a major factor in determining food preferences, food demand is also stimulated by economic growth which increases the ability of consumers to purchase a product (Umberger, 2015)

Low income countries respond greatly to changes in the level of income and prices of commodities for all food subgroup in comparison to developed countries. For example a decrease in disposable income leads consumers of low income countries to reduce their consumption expenditure. However the reduction of expenditure varies for different food group. Expenditure on commodities such as cereals and other staple foods is reduced the least compared to high value commodities such as meat and fish. The income elasticity of demand for staple commodities such as cereals and fruits is lower for all countries with different level of income than for high value food items such as meat and dairy products. Again elasticity differences between commodities of different value are greater in low income countries than in high income countries. That is to say change in dietary pattern are more likely to occur in low income countries when income changes (Regmi, 2001).

Figure 1: Elasticity of demand



Source: Adapted from Hall and Lieberman (2008)

Figure 1 illustrates the shift of demand curve from **D1** to **D2** when other factors such as income influence demand while the price remain constant. Expected change of price of commodities also shifts the demand curve from **D1** to **D2** (Hall and Lieberman, 2008).

3.2.2. Economic growth and economic development

These two terms are very important for policy-makers to help improve the well-being and performance of a community or a country as a whole. Mistaken with one another these economic concepts are not necessarily similar though one may precedes the other one occurrence (Haller, 2012).

The 1970s marked the redefinition and separation of these two concepts when economists noticed the unchanged living condition of poor populations in developing economies while these countries economy were facing high growth rate of national income. Questions about whether development objectives was to increase GNP, or GDP² rather than the alleviation of poverty, inequality and unemployment triggered the setting up of new development goals (Todaro and smith, 2011).

² GDP: Gross domestic product is the total worth of services and goods produced within a country's boundary in a single year while GNP or GNI encompasses income received from national resident living abroad subtracting the income claimed by non resident (Maitah, 2015).

Further in the 1990s, economists recognized that the quality of life was the indicator of whether a country reached development or not. Health status, hunger and death rates of populations of developing countries dramatically changed the view of development goals (Dang and Sui Pheng, 2015).

Many Economists agree that economic growth concerns with an increase of a country's total output (total quantity or volume of goods and services produced). Moreover, it is associated with the increased efficiency, quality and improvement of factors of production such as education and technology. That is to say it is associated with an increase in the value of goods and services produced by the national economy (Haller, 2012; Economicsconcepts.com, 2016 a).

In contrast to growth, economic development is more of a normative concept that implies a change or increase in the living standards (Todaro and smith, 2011; Haller 2012).

It is considered as a process whereby a country's real GDP as well as GNI per capita increase cumulatively over a long period of time backed by non-economic and economic forces which operate over a long period of time to affect the entire society. These forces imply changes in the distribution of income, in capital formation, changes in the societal institution and demographic composition, skills , technology and infrastructure, equality, social justice (Haller , 2012; Economicsconcepts.com, 2016; Todaro and Smith,2011).

While growth excludes data from informal economic activities³, environmental damage , leisure, voluntary workers, income distribution, change in composition of population, development is broader in its measurement and includes every factors that affect the well-being of a population (Bucknall, 2013; diffen.com, 2016).

To summarize economic development is qualitative and emphasizes on economic, political, social ,cultural and environmental requirements while economic growth is quantitative and concerns only with the increase in production. Moreover growth may create undesirable effects such as depletion of natural resources which might lead to pollution while development implies sustainability.

³ Informal economy also known as black economy are unrecorded economic activities which might be of high significance in developing countries (diffen.com, 2016)

3.2.3. Rural area

According to National Geographic Society (2011), rural areas are land with relatively low population density. Habitat and businesses are very close to each other and agriculture is the principal activity of the inhabitants (rural population).

Indicators used to define and classify rural areas and their evolution vary greatly and are not subject of consensus at the international level but constitute ways to distinguish urban and rural area. Rural areas are classified on the basis of the population size, functional relations with the urban area (Mora, et al., 2008).

In addition Deavers and Browns (1985) classifies rural area according to social , demographic and economic information.

OECD (2011) considers a basic community as rural if the population density is less than 150 per square kilometer. The second criterion used by OECD qualifies regions as “predominantly rural” if more than 50% of their inhabitants lives in rural communities, such as "predominantly urban" if less than 15% of the population lives in rural communities, and as "intermediary" for the remaining .

3.3. Food Security and Self-sufficiency

3.3.1. Food Security :Conceptual framework

Food security is one of the primary goals of governments considering the growing world population and political issues that cause Hunger. The lack of food sufficiency remains the cause of infantile mortality among under-five. In developing countries, some 795 million people are lacking access to sufficient food to live a healthy life between 2012 and 2014 in the world and three-quarter of them living in rural area of Africa and Asia (FAO, IFAD and WFP 2015).

The concept of food security is multi-dimensional. It is not enough to have sufficient food to cover the need of the population .The population should also have access to the food (Supply and demand side). Food security exists when there is physical, social and economic accessibility of all people, at all times to sufficient, safe and nutritious food meeting thereby dietary needs and food preferences for an active and healthy life (FAO, 2005).

- ***Availability***

It is concerned with the supply side of food security and implies that local production, food aid, the quantity of food produced abroad (imports) as well as net trade are of good quality and in sufficient quantity to feed a given population (Bajagai, 2016)

- ***Accessibility***

Availability of food at national level or in a given region is not a proof of food security. It is necessary for individuals and households to have enough income and capacity to procure food. It is the dimension of food security concerned with resource enabling individuals and household to procure sufficient quantity of food commodities with appropriate quality (Bajagai, 2016).

It is dependent upon the power of household to purchase food products, the level of poverty and the existing food distribution system along with transport and market infrastructure. Price of food, wage and many other can be indicator of food accessibility (FAO, 2005)

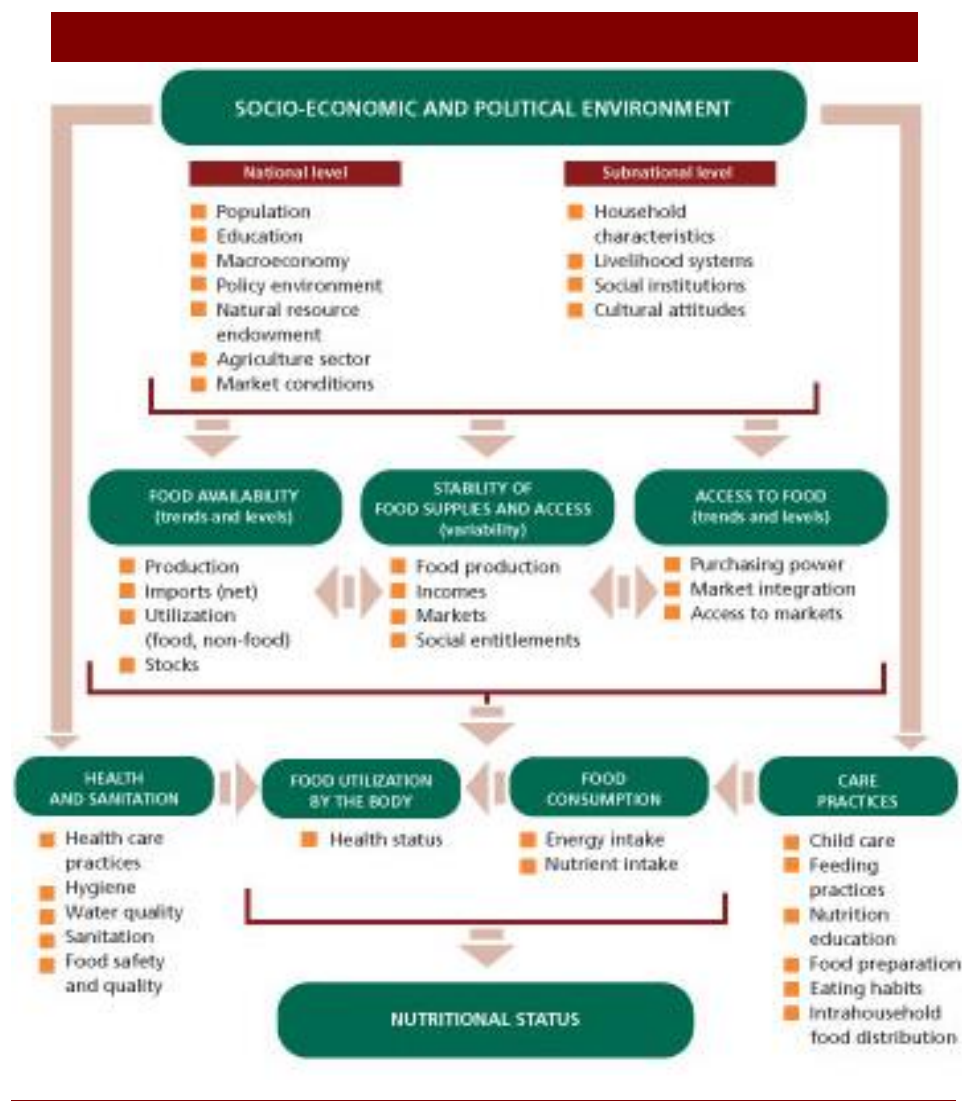
- ***Food Utilization***

This dimension is concerned with not only the quantity of individuals or households food consumption but also with the food they eat and how they consumed them. It also includes food preparation, water and sanitation, health care practices and distribution of food in a household. Safe and healthy use of food is dependent upon health and sanitation, food safety and quality and feeding, access to clean water, health and sanitation (Bajagai, 2016)

- ***Stability***

Stability dimension implies that availability, accessibility and food use are stable are efficient. There is no food security when concerned people consider themselves food insecure and food security is fulfilled only when there is stability of the first three dimension of food security. Factors such as weather, disasters caused by men and price fluctuations may affect food supply access and stability (Bajagai, 2016).

Figure 2: Conceptual framework for food insecurity



Source: FAO (2005)

According to FAO (2005) dimensions of food security are also influenced by trade. An illustration of this influence can be when access to food is enhanced because of growth in the economy, increased labour market opportunities and improved income of poor households deriving from an increase participation of a country in international trade. Moreover imports of commodities increase supplies and at the same time reduces variability of commodities supply in a country. When the degree of openness to trade is high in a country, the evidence shows there is less rate of undernourishment. However exceptions may occur with some households

not being able to benefit from the trade liberalisation but lose and then see their food security compromised.

The problem concerning relationship between food security and imports (trade) is addressed in different ways. The first approach defined as self-reliance is that a country does not need to produce its food commodities, the important thing is its ability to acquire the food needed for its population for example by exporting goods to foreign market to earn enough money to pay for the food import bill. Another approach to this problem is that domestic production should be the only supply source to cover the country need for food commodities. This self-sufficiency way to food security may require government supports to farmers if not protecting them. nevertheless , since reaching self-reliance and self-sufficiency in food can not be expected from all countries , they should not be the first choice of governments as strategies to reach food security . Rather, an undistorted and efficient agriculture sector should be established as the first step be considered and the extent to which it meet food need requirement of the country (FAO, 2003).

3.3.2. Self-Sufficiency

Food self-sufficiency generally means the extent to which a country could satisfy its food need directly from its domestic production. The difference between self-sufficiency and Food security are in the fact that Self-sufficiency focuses on self-reliance on the basis of production at national level only whilst Food security consider imports and Food aid as possible source of commodities. The idea of a positive link between food self-sufficiency and Food security has divided many authors. Some claims the control of food supply in a country by its government is a link to Food Security. However some other declare the non-probability of achieving food security through Self-sufficiency (Thomson and Metz, 1997).

According to Gardner (2013), if The reliance on domestic production is greater, barriers being raised against imports of food items, food shortages will be greater. Consumers are likely to be harmed by such policies that leads to the raise of agricultural taxation .

3.4. Imports

3.4.1. International trade theories

International trade may be defined as the process of purchasing goods and services from the rest of world so called “import” or selling goods and services to the rest of the world also designated as export.

Various Economic theories explain main reasons and conditions under which international trade must take place and emphasize its mutual benefits between trade partners.

For trade to occur between two countries, one country must have the monopoly or advantage to achieve efficiently greater output in the production of a certain commodity compared to an other one while using the same amount of resources . The country with a larger output of a specific commodity is said to have an absolute advantage over the other one in the production of that commodity and should specialize in producing it . On the other hand, the other country will enjoy the low cost of purchasing that commodity from the advantaged country. In other terms if countries exports what they are best at, most of countries will be better off (Smith and Garnier, 1838).

An example of this situation is the absolute advantage of Brazil in its coffee production . The partial or non existence productivity of this commodity in other countries may be due to different resource endowment accross countries such as climate or soil or other factors that lead other countries to have access to them through exchange of goods (Economicsconcepts.com, 2016 b).

However absolute advantage is not the basic element to determine what a country should specialize in. Countries should focus on producing those goods and services with a lower opportunity cost. Even when a country makes use of absolute advantage, different other countries can still have comparative advantage over it (Boundless.com, 2015)

Table 1: Illustration of Absolute and comparative advantage

Country	Productivity (unit an hour)		Opportunity cost	
	Wheat	Maize	Wheat	Maize
A	2	4	4/2	2/4
B	10	5	5/10	10/5

Source: Own

Considering two countries **A** and **B** with the ability of producing efficiently the quantity of wheat and maize mentioned in the table above. Country **B** has absolute advantage over **A** for both wheat and maize because for the same amount of hours it produces more unit of wheat and maize than country **A**. However the opportunity cost of producing maize in country **A** ($2/4$ or 0.5) is lower than the one in country **B** ($10/5$ or 2) which makes country **A** to have a comparative advantage over **B** for maize. Following the same pattern country **B** has a comparative advantage over **A** for wheat production. Therefore country **A** should focus on producing maize production while country **B** should specialize in wheat production. Trade between these two countries will be beneficial for both. This example shows clearly that even though Absolute advantage is an important concept for a country, the question concerning what a country should specialize in is answered by comparative advantage (Boundless.com, 2015).

3.4.2. Trade Barriers

Transactions of goods and services are not completely free among countries. Even among partners with excellent relationship. Countries resort to set trade barriers by setting tariffs, quotas and other non-tariffs restrictions to imported products for multiples reasons (Love and Latimore, 2009).

Trade barriers are elaborated for national security purposes, to prevent local agriculture and infant industries from competition exposure in regard with imports which may affect the development of these sectors causing food insecurity in the case of agriculture and raise of unemployment rate, to protect consumers from undesired products, to sanction offending partners, to raise government revenue or just to discourage imports (Love and Lattimore, 2009; Maitah, 2016).

There are several types of trade restrictions categorized in tariffs and non-tariff restriction. Non-tariffs barriers include quantitative restrictions such as quota, voluntary restraints on imported goods, and orderly marketing arrangements while non quantitative restrictions consist of unfavorable foreign rules or regulations, subsidies, government purchasing policies etc. (Maitah, 2016).

The followings are some main trade barriers used by government:

Import and Export prohibition

This administrative measure aimed at prohibiting totally import and export of some goods to prevent health problems or to promote the growth of infant industries in the country (economicsconcepts,2016 c).

Tariffs

These are taxes or levy placed by importing countries to restrict trade or discourage imports. When set, this levy increases the price at which the domestic market may have imported commodities available. These tariffs could be specific or based on the value of imported goods also called “ad-valorem”. When custom duties are specific, taxes imposed by government correspond with the imported commodities quantity and other physical characteristics (economicsconcepts.com, 2016 c).

Tariffs are widely used restrictions because they generate revenue to support domestic services and governments (Coughlin, Chrystal and Wood, 1988).

Quotas

Import quotas are restrictions placed to limit the quantity of goods to enter the domestic market by setting a maximum amount of commodities to be imported from trade partners over periods of time. They are similar to tariffs in that the price of imported goods and domestic producers production increase after the restriction . However, unlike tariffs, the import licence owner gain revenue instead of the government(Coughlin, Chrystal and Wood, 1988).

Subsidies

Subsidies are government allowance provided to domestic firms to encourage an increase in productivity and export or used as a protection from imports. They can be given as cash payment or in any other forms (Maitah, 2016).

Trade preferences or preferential treatment

Governments discriminate imports by setting different tariff rate for different exporting countries (Economicsconcept.com, 2016).

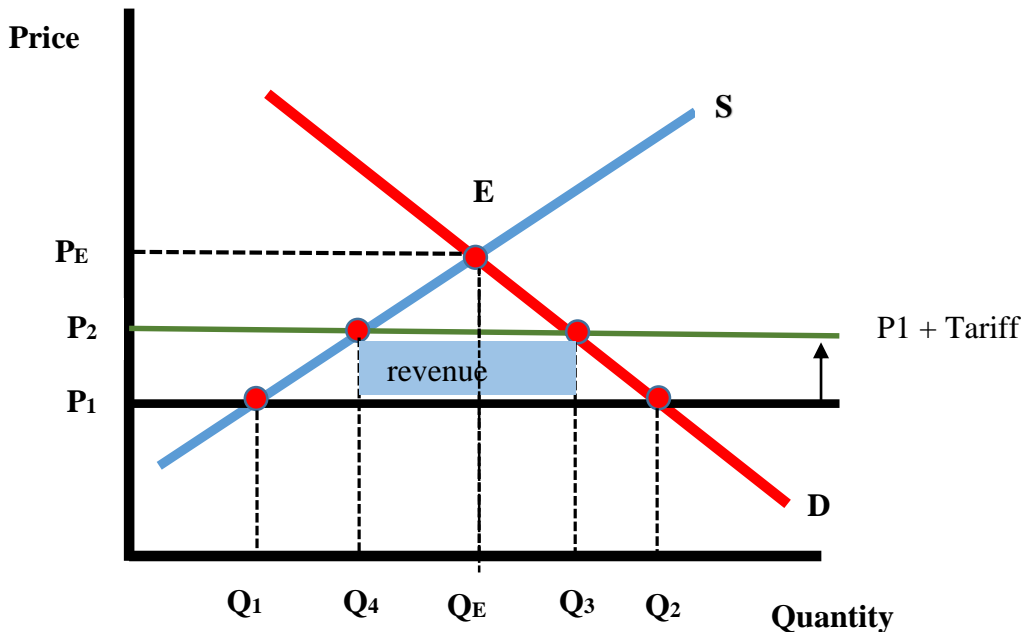
Variable import levies

These are payments which aims at equalizing prices of imported goods with the domestic market price. (Coughlin and Wood, 1989).

3.4.3. Impact of Import Tariffs

The assumption in this example is that the product of the local market and international market are considered to be identical in every ways. The model of import tariffs used in this thesis is for countries unable to affect the world price.

Figure 3: Example of maize



Source: Adapted from original: economicsonline.co.uk (2016)

D: curve representing the domestic demand of maize.

S: curve representing the domestic supply of maize.

E: The intersection of the demand and supply curve of the corn representing the equilibrium pricing quantity when imports is non-existent. At this point the total quantity of maize produced in the country is consumed. In other words the sources of supply and demand have determine the local market price.

P_E: is the price where the total quantity of maize produced is consumed. In other words it is the price where local market clears.

P₁: international market price with price set on the world market

The action of local buyers and sellers has no effect on it.

P₂: is the price of maize after the tariff being imposed.

In countries with no achievement of optimal efficiency most consumers have limited income to spend and the price of products is a crucial thing to consider.

When the outside world supply is added in such markets, the local market price is higher than the one of the rest of the world. The amount of product produced locally is much lower than before where the **P₁** curve cuts the domestic supply curve. The reason for this as it is stated in the law of supply, the lower the price, the lower the quantity supplied.

The low international price **P₁** will lead some local producers to reduce the quantity their supply to **Q₁** level or to close down completely because of their impossibility to cover their higher less efficient cost of production creating social and economic strain. But at the level of **Q₂** consumers wants more of the product than what the local producers can supply ; the quantity demanded **Q₂** is the intersection of the curve **P₁** and the demand curve.

This leads consumers and governments to resort to imports to cover the local market need. Under these circumstances government may introduce trade policies imposing tariffs on imported products in an effort to protect local producers and the employment they provide. The main idea is to make products of imports expensive to consumers in order to reduce the power of imported goods in the local market.

Once the tariff is set ,price increases to **P₂** , The local market production increases to **Q₄** while the purchasing power of consumers decreases to **Q₃**.

Government benefits from a revenue amount of **P₂** times **Q₃** (Economicsonline.co.uk, 2016) .

3.5. Food Aid

Food aid is considered to be a mean of providing food and related assistance in form of cash or Food to fight hunger either in situations of emergency or in helping for long term allievation of hunger in order to achieve food security .

3.5.1. Types of Food Aid

Mousseau and Mittal (2005) classifies Food Aid in 3 main categories according to their type of distribution :

Program Food Aid

This Food aid is described as an „in-kind“ form of assistance to the recipient economy by which the donors provide aid to be sold in the recipient Markets to generate cash , mostly in developing countries when there is not enough food item to meet the need of beneficiaries' local market. Rather than being consider as being a Free given Assistance ,Program Food Aid mostly issued as a government-to-government transfer of resources are meant to lower food import bills and thereby constitutes a balance of payments and budgetary support for the recipient countries. Food aid is therefore purchased with money borrowed at lower than market interest rates.(Mousseau and Mittal, 2005)

This assistance is not intended to specific beneficiary group but is sold in local market and is granted to loan terms. Product sales in local currency can be used to create a counterpart fund, as part of an agreement between the donor and the beneficiary country that determines its management and use from time to time but most often on a multiannual basis (FAO, 2016a).

Relief, or Emergency Food Aid

This aid consists of free deliverance of food, generally provided as donations during emergency situations of food shortage to victims of natural disasters, human-induced catastrophies such as war and during population displacement. Permanent recipients of this form of aid are also number of countries facing some forms of chronicity of food insecurity. It is generally provided by NGOs , WFP and infrequently by government institutions (Mousseau and Mittal, 2005).

WFP (2016) expands this aid to include activities of rehabilitation and reconstruction, called protracted relief and recovery operations (PRRO) when it is clearly seen that the 24-month emergency operation will not be sufficient.

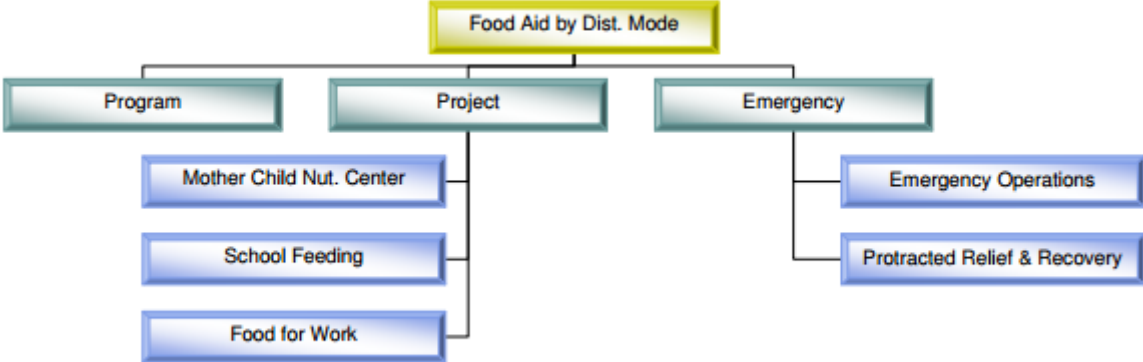
Project Food Aid

Project Food aid is designed to support and promote specific activities and projects such as agricultural, nutritional , economic development and food security in the fight against poverty and disaster prevention through the distribution of food for the related projects. It supports project such as food for work, mother-child nutrition, and school feeding programs (Mousseau and Mittal, 2005)

Similar to Emergency Aid, It is provided on a grant basis and is generally channelled through WFP, NGOs and occasionally by government institutions. This aid is generally distributed freely to targeted beneficiaries or sold in the local market becoming Food Aid

monetised. The funds are then used to promote targeted activities in the fight against poverty and food insecurity (Mousseau and Mittal, 2005; OECD, 2005).

Figure 4: Summary of food aid by distribution mode



Source: Lowder (2004)

3.5.2. Criticis on Food Aid systems

The ultimate purpose of food aid policy should be to make food aid avoidable . This does not mean that food aid should not be given for emergency purposes but that local infrastructure and support structure are to be set to enhance self-sufficiency and alleviate the need for food assistance in long run (Oaklandinstitute, 2008).

Some problems identified is the exploitation of recipients countries by donor’s assistance who mostly consider the aid as commercial opportunities and the fact that Food Aid is a tool of Foreign policies interests benefiting the donors rather than the recipients. This can expand donors power in recipients regions (Hoffmann, 2013).

Following the same idea , Mousseau and Mittal (2005) declares food aid to be a donor-driven system where the development of recipient is not really the objective. Moreover this helps promote the domestic interest of farmers in donor countries.For instance the cheap Food surplus dumping on poor countries are reported to open new market opportunities for donors whose ultimate desires are to enhance their export and trade of GMOs which are under severe regulation for entrance in many western countries.

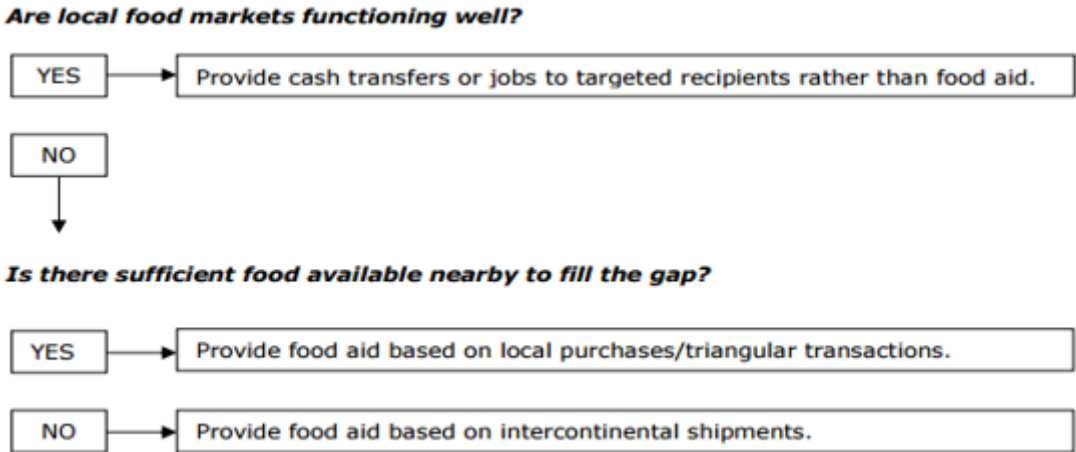
On the other hand ,this practice weakens the recipients local economy because of money flowing out of the country , thereby promoting the consumption of cheap food imports which undermines local agriculture and drives non-competitive farmers out of business by discouraging them to produce. Therefore increasing food insecurity and poverty which was to be eradicated at the first place (Oxfam, 2005)

3.5.3. Ways to have more effective food Aid

In order for food aid to have success in its core mission which is to devote to human development by providing temporary relief of food gaps, aid should be given to those who really need it in the world. The issue of targeting concerns questions surrounding the transfers of aid. such as who are those who need the aid , what is the aid,when is the aid going to reach them and how (Barrett and Maxwell, 2004).

Focusing on Food aid for emergency purpose, Barrett and Maxwell (2004) suggest a scheme to meet Food aid goals of reaching population in needs for food security by providing cash transfers or jobs to targeted recipients rather than food aid according to the performance of the local and nearby food markets .

Figure 5: Barrett and Maxwell decision tree



Source: Barrett and Maxwell (2004)

4. Literature review

4.1. Overview of the Democratic Republic of Congo

The Democratic Republic of the Congo (DRC) is located in Central Africa and has a total of 2,345,409 square kilometers designating it as the second largest african country on the continent. The country population of which 65 percent is classified as rural increased to 71 million in 2011(FAO, 2013).

It is estimated that only 10 percent of its 80 million hectares of agricultural potential are being used (Ragasa, Nkoya and Al, 2016).

About 60 percent of the labour force is employed by agriculture. People living below the poverty line account for 71 percent of the country total population, food security is of great concern at the national level with 42 % classified as undernourished. (FAO 2013).

Agriculture is a well-positioned tool to enhance the country economy. Yet Political instability and poor transport infrastructure in the country constitute great barriers to this sector causing the agriculture potential not to be utilize for the economic development (SAGCC, 2015).

Population in different regions of the country practise both subsistence and perennial crop production of various commodities.Until the late 90s , The DRC benefited of large processing units which gradually ceased activities or disappeared from the beginning of the 1970s as a consequence of the socio-political instability and wars that followed the years of independence. These units consist particularly of oil mills, coffee hulling units, rubber processing mills, tea, rice mills, soap, flour mills and breweries (Minagri, 2012).

In its commitment to improve the economic environment and convinced that agricultural industry is the lever to restart the whole economy, the government launched an agricultural reform which first step consisted of creating agro-industrial park across the country. The first agro-industrial park covering 80,000 hectares and located in the region of Bukanga Lonzo, 240 Km from the capital city Kinshasa was launched in 2014 (CPCAI, 2015).

Although this project is meant to reduce food insecurity and create employment, some critics anticipate adverse consequences of these parks on subsistence farmers and rural areas which can lead to an unemployment circle (creating jobs for other technicians while putting subsistence farmers out of the market).

Transport is a major economic component confronted with DRC's surface area. The transport system of the country is based on using the Congo River, its tributaries and lakes which represent almost 15000 km long. The 5160 km of rail network are used to bypass unnavigable reaches of the Congo River, and the road network long of 160 000 km supplies river and rail networks. The air transport plays an important role to connect the different cities and production centers. The entire transport infrastructure is in very advanced state of disrepair (Auzias and Labourdette, 2015).

5. Practical part

This chapter aims to make a quantitative presentation of the congolese agriculture sector to highlight the impact of food imports and food aid on the congolese agricultural production .

The approach used consists of two sections. The first step is to measure the impact of food aid and imported agricultural products to DRC by the means of regression analysis. The following section consists of evaluating other factors influencing the presence of food aid and imported agricultural products to DRC in case they significantly impact the congolese agricultural production. The finding from these analysis and evaluation will determine whether it is necessary to find the level beyond which food imports and food aid become harmful to the local production (in case food imports and food aid affect the local production significantly). The last part of the practical section consist of finding out the contribution of imports in the economy.

5.1. Regression analysis

Regression is a technique used in statistics to attempt to describe the relationship between a dependent variable and another variable called independent variable (simple regression) or between a dependent variable and a set of multiple variables (multiple regression) through a quantified equation. The purpose of the regression analysis is to help with the prediction of the character of one variable called dependent variable in the best possible way on the basis of the behaviour of multiple random variables called independent variables (or explanatory variables or predictors). In other words, it expresses how much a dependent variable is influenced or impacted by other random factors. (Studenmund, 2011; Creech, 2016).

The general equation used to express the relationship between the dependent and independent variables is represented by $Y_i = \beta_0 + \beta_1 X_{1i} + \beta_2 X_{2i} + \dots + \beta_k X_{ki} + \epsilon_i$ (with $i = 1, 2, \dots, N$, “i” is used in case of cross section data and “t” for time series data). Where Y_i is the dependent variable and X_{1i}, \dots, X_{ki} are independent variables. β Symbols are coefficients. Apart from β_0 which is the intercept, each of the β coefficients expresses the impact of a one unit change in the corresponding X variable (independent variable) on Y (dependent variable), while the other independent variables remain constants. OLS or ordinary least squares is the most used method to find the estimated equation in a regression analysis. This method consists of minimizing sum of squared deviations (OLS minimizes $\sum_{i=1}^N (Y_i - \hat{Y}_i)^2$, where \hat{Y}_i is the estimated Y_i in the

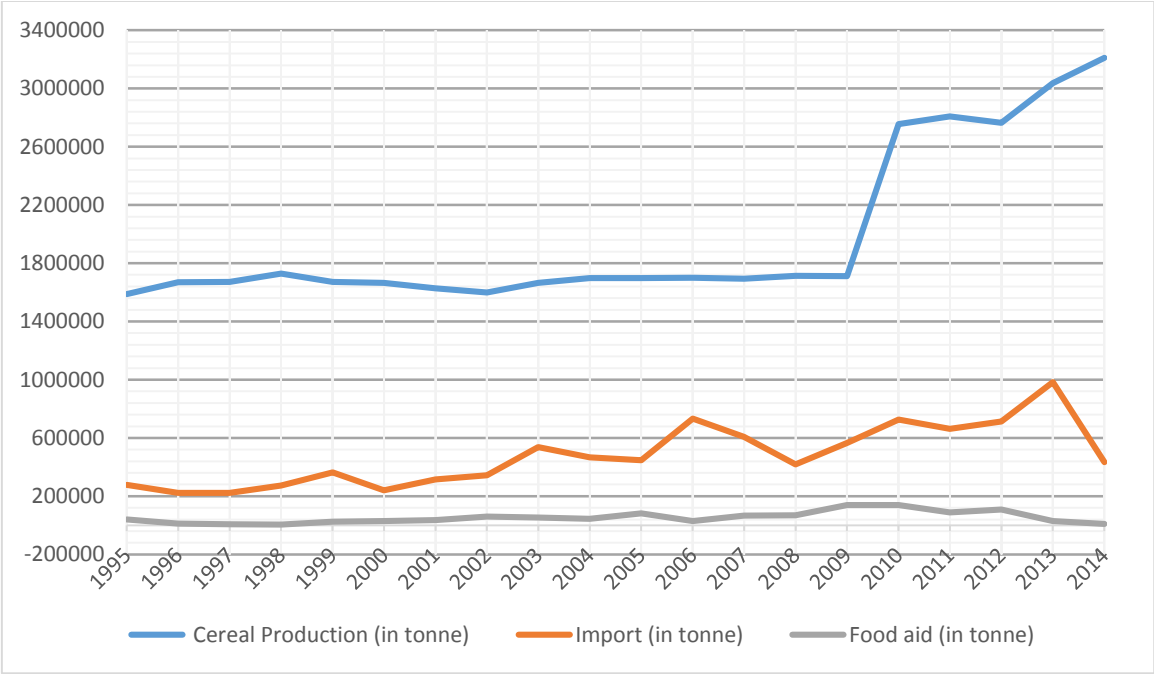
regression analysis). That is to say, the goal of OLS is to estimate the regression equation in a way that it will be as closed as possible to the observed data (Studenmund, 2011).

Studenmund (2011) stresses that even when a regression model shows statistically significant results, Causality should not be implied. Common sense and theoretical knowledge on the subject being studied are important to draw final conclusions.

Choice of data

This thesis focuses on agricultural products excluding products from fishery and forestry. Since according to FAO (2015) cereals are the major products of food aid sent to the Democratic Republic of Congo, this practical part examines data of cereals produced in and imported to DRC knowing that studying other different agricultural commodities requires deep investigations for each types. Data selected for cereals locally produced, food aid and imports are those of cereals from the year 1995 to 2014. These cereals consist of maize, sorghum, wheat, rice and other staple cereals consumed in the Democratic Republic of Congo. It should also be taken into account that unregistered amounts of cereals produced locally (black economy) can be very significant since DRC is a developing country.

Figure 6: Trend of cereals production, cereals imports and food aid in DRC



Source: Own , Data from INS-RD Congo (2015), FAO (2015) and Trademap.org (2016)

Figure 6 shows that cereals produced locally in DRC account greatly in the local market and in the process of ensuring food security. Amounts of Cereals produced in DRC had varied very

little between the year 1995 and 2009 while the trend of cereals imports shows more or less significant variation during that same period. It can also be noticed an almost vertical increase in the 2009 cereals production and a relatively low increase of imports while food aid does not vary much. This implies that, apart from cereals imports and food aid, other factors have an influence on the Congolese cereals production performance.

Economic model

The assumptions of our study are tested by means of an economic model including two independent variables (Cereals imports and food aid of cereals) .

Definitions of variables

Y_t total amounts of Cereals produced in the DR Congo in tonnes

X_{1t}total amounts of cereals imports in tonnes in DRC

X_{2t}total amounts of cereals provided as Food aid in tonnes

Regression model

Cereals production = f (cereal imports, Food aid)

$$\hat{Y}_t = \beta_0 + \beta_1 X_{1t} + \beta_2 X_{2t}$$

Where $\beta_0, \beta_1, \beta_2$, are unknown coefficients.

Hypothesis and Assumptions

- Cereals imports

H0: There is no relationship between local cereals production and Cereals imports

H1: There is a relationship between cereals production and cereals imports

Cereals production is assumed to be negatively affected by cereals imports

- Food aid

H0 : There is no relationship between cereals production and Food aid

H1: There is a relationship between cereals production and Food aid

Food aid is assumed to affect cereals production negatively

The significance level chosen for this thesis is 0.1 or 10%.

Table 2: Correlation analysis

Pearson Correlation		
Statistic	Cereals imports (tonnes)	Food aid (tonnes)
Mean	477607.9	53577.25
Correlation	0.483170996304512	

Source: Own from processes data

The result of the correlation analysis which is $r = 0.48$ shows that the linear relationship between cereals imports and food aid is weak although it is positive. In other words there is no collinearity between our independent variables. It is therefore not necessary to eliminate one of them to run the regression analysis.

Table 3: Linear regression analysis

The REG Procedure
Model: Linear_Regression_Model
Dependent Variable: Cereal Production (in tonne)

Number of Observations Read	20
Number of Observations Used	20

Analysis of Variance					
Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	2	2.387389E12	1.193695E12	5.67	0.0130
Error	17	3.579772E12	2.105748E11		
Corrected Total	19	5.967162E12			

Root MSE	458884	R-Square	0.4001
Dependent Mean	1983859	Adj R-Sq	0.3295
Coeff Var	23.13090		

Parameter Estimates						
Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > t	90% Confidence Limits
Intercept	1	1198119	262177	4.57	0.0003	742035 1654203
Import (in tonne)	1	1.81259	0.57375	3.16	0.0057	0.81450 2.81068
Food aid (in tonne)	1	-1.49255	2.94625	-0.51	0.6189	-6.61788 3.63277

Source: Own from data processed

Goodness of fit

R-Square is the coefficient of determination explaining the variability of cereals production on the basis of cereal imports and food aid .

$R^2 = 0.4001$ meaning that the model explains only 40.01 % percent of the variability of the cereals production in the Democratic Republic of Congo. The other 59.99 % are random factors or omitted variables.

P-value

The p-value help us find out whether our data is appropriate.

Cereal imports (in tonne) has a **P-value** equal to 0.0057 which is lower than the level of significance chosen for this thesis. The first hypothesis stating that there is no relationship between imports of cereals and cereal production must be rejected. In other word the quantity of cereals imported has an impact on the cereal production in DRC.

Food aid reveals a **p-value** of 0.6189 which is greater than the level of significance $\alpha=0.1$ which means that it is not statistically significant. In this case the first hypothesis stating that there is no relationship between cereal production and food aid should be accepted. This allows to draw the conclusion stating that Food aid does not have a significant impact on cereal production in the DRC.

Estimated equation

$$\hat{Y}_t = 1198119 + 1.81299 X_{1t} - 1.49255 X_{2t}$$

The estimated value of cereal production when there is no food aid and cereal imports in DRC is 1198119 tonnes a year.

The theoretical assumption states that imports have a bad effect on cereal production. However the model shows that there is a positive relationship between the two variables. That is to say cereal imports do not have bad impacts on cereal production in the Democratic Republic of Congo. The estimated equation states that when there is an increase of one tonne of imported cereals, the local cereal production increases by 1.81299 tonnes a year.

Food aid was found to be statistically insignificant in the case of the congolese agricultural production of cereals.

5.2. Evaluation of factors influencing cereals imports

The second step consists of examining factors which may influence imports of cereals.

Table 4: Demographic evaluation

year	Population/ Total	Rural population	Urban population in %	Population growth (annual in %)	Population density (people per square km of land area)	GDP per Capita growth (annual %)
1995	42183620	28331363	32.84	3.33	18.61	-2.59
1996	43424997	28969250	33.29	2.90	19.15	-3.85
1999	46788238	30571903	34.66	2.47	20.64	-6.60
2002	50971407	32593666	36.06	3.03	22.48	-0.13
2005	56089536	35068300	37.48	3.22	24.74	2.78
2008	61809278	37740127	38.94	3.25	27.26	2.83
2010	65938712	39604769	39.94	3.23	29.09	3.68
2012	70291160	41506930	40.95	3.19	31.01	3.80
2014	74877030	43446648	41.98	3.15	33.03	5.66

Source: Own, data from world Bank (2016)

The table above shows that there is a massive movement of population in DRC to urban areas. Urban lands accounted only for 32.84 % of the population in 1995 to reach 41.98% of the population. It can be implied by this data that agriculture which is the main activity of rural population is losing its work force.

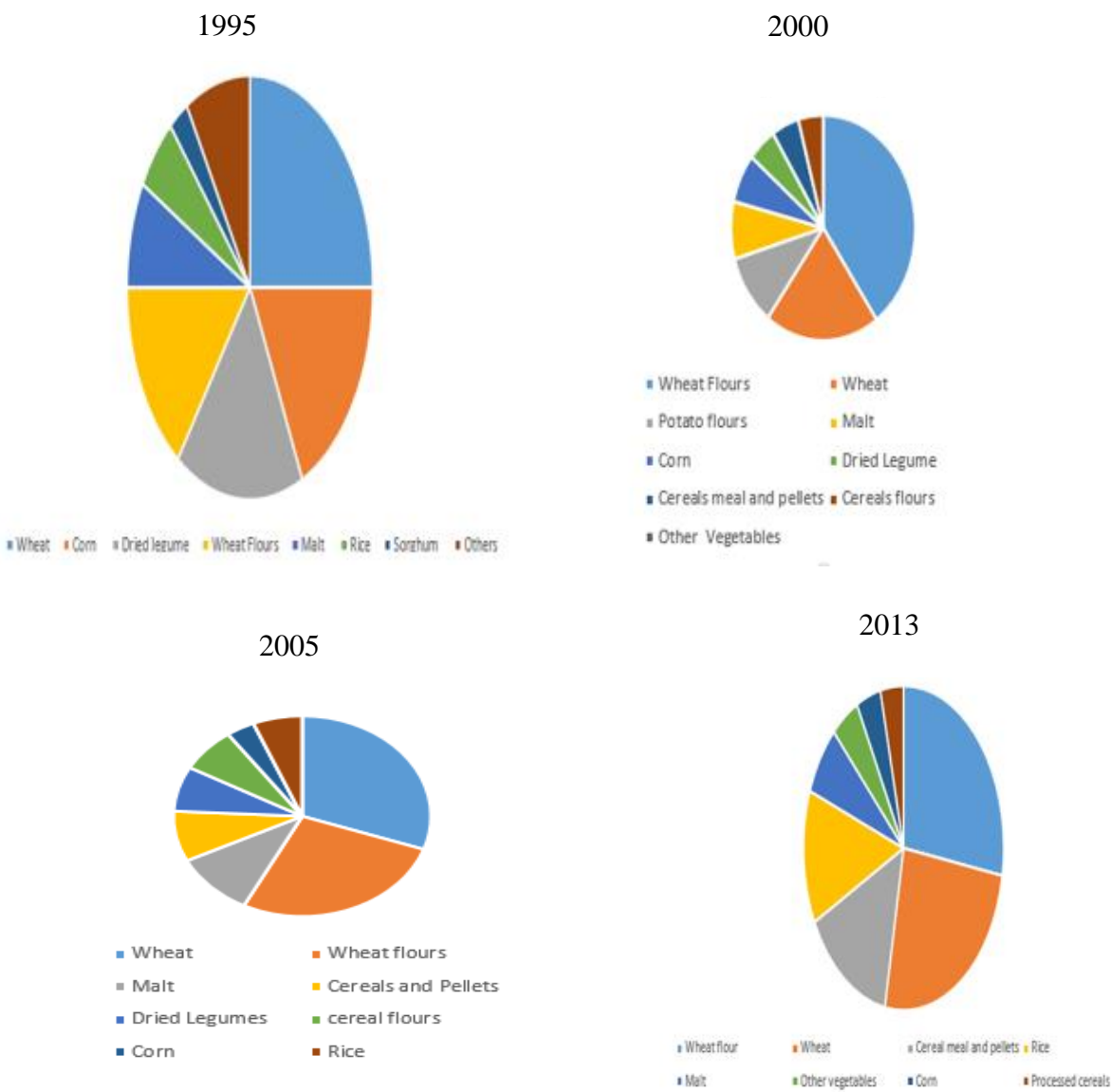
Since the population is said to grow geometrically and food production arithmetically in the case of subsistence farming which employs the two third of the congolese population; with an annual average population growth of 3.08 the domestic production is not sufficient to satisfy the need in food. This explains the persistent cereal (food) imports as a response to the gap in the domestic production .

Another important indicator to consider is the GDP per capita which has passed from -2.59 to 5.66. The GDP per capita can explain a change in the capacity of consumers to buy commodities which can lead consumers to shift from domestic cereals to imported cereals when the quality

of domestic production does not satisfy consumers. However these numbers (GDP per capita) do not state that the nation wealth is evenly distributed to individuals across DRC. Knoema (2016) indicates that the poverty head count ratio was estimated to be equal to 73.30 % in 2005 which means that about the two third of the the population lived below the poverty line against 63.60 % in 2012 at the national level. The World Bank (2016) also indicates that 77.2% of the population lived on less than 1.90 dollar at the international price of 2011.

This shows again that the movement of imports does not change because each individual increases their consumption (per capita consumption) by purchasing great amount of food as an effect of increase in income but because mouths to be fed have been multiplied rapidly.

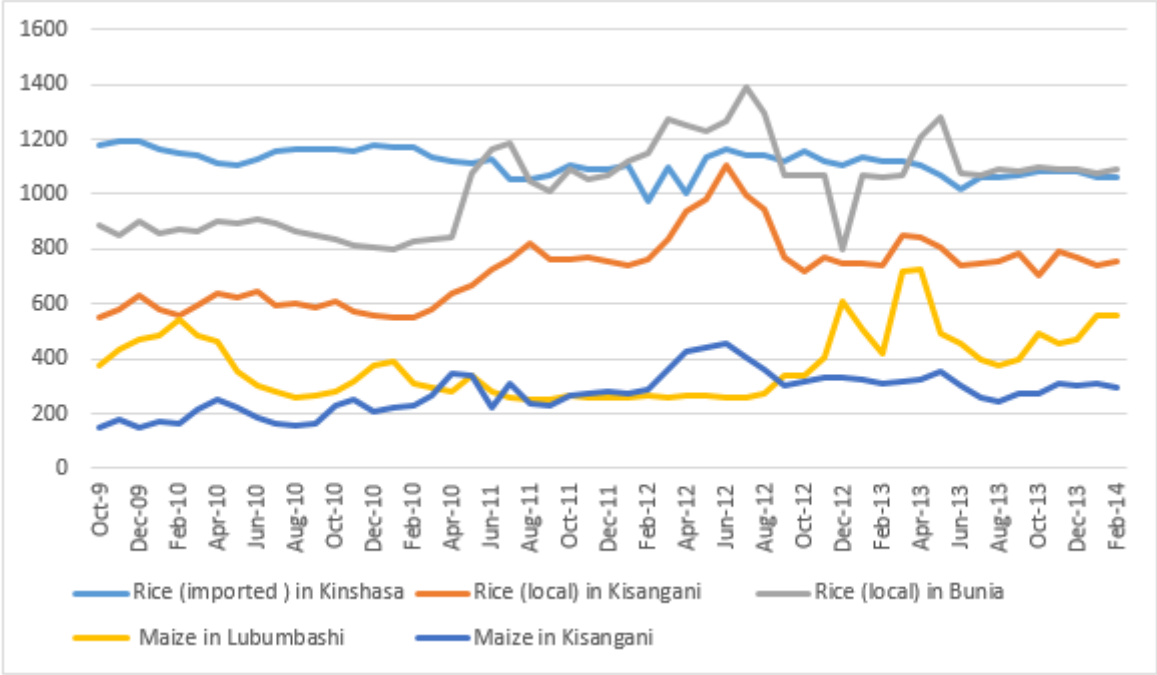
Figure 7: Composition of Vegetables imports



Source: Own, data from OEC (2016)

Figure 7 shows that the composition of imports has not changed which means that the taste or food preferences has not been changed by urbanisation.

Figure 8: Prices of cereals (rice and maize) in different town of DRC



Source: Own, Data from FAO, 2016b

Figure 8 illustrates that the local rice is most of the time cheaper than the imported rice, which lead us to state that consumers do not shift to imported cereals because they are cheaper than the one of local producers in DRC. However it is very important to notice that prices of food commodities vary greatly across the country which leads to the statement that transport infrastructure among the cities of DRC are not functioning well. This could also be the cause for farmers not to be willing to increase their production or to stop producing those commodities which could be damage along the way. The variability of prices also indicates that price of cereals is not a good variable to consider when evaluating the cause of aggregate imports of cereals food commodities in the DRC. The study should be done in each region for deep information.

5.3. Imports contribution to the economy

Table 5: Sectors contribution to GDP and Food aid share of cereals consumed in DRC

Year	Agriculture contribution in GDP (%)	Subsistence Agriculture contribution to GDP (%)	Share of Vegetables in import DRC (%)	Food aid share of cereals consumed in DRC (%)	Taxes and duties contribution in GDP
2001	31.62	31.17	10	1.83	2.57
2003	25.07	24.71	7.4	2.33	3.10
2005	20.66	20.31	6.3	3.69	3.59
2007	21.26	20.95	6.6	2.79	3.29
2009	23.26	22.92	7.5	5.75	3.93
2011	20.50	20.20	5.4	2.50	3.69
2013	19.27	19.00	5.9	0.716	4.11

Source: Own, INR-RD Congo (2015), OEC(2016) and Computed data from FAO (2015)/ TRADE MAP (2016)

Considering taxes, imports of vegetable products, cereals included which constituted only 10 % of all imported products in 2001 and 5.9% in 2013 do not provide enough revenue to the government for the growth of the economies since tariffs and duties set for every sectors as a whole only contributed for 2.57 % in 2001 to the GDP to attain 4.11% in 2013. However the contribution of subsistence in the GDP also shows its great importance in the congolese economy providing about 98.5 % of total revenue of different type of agriculture practiced in the country. As regards cereals food aid as a mean of food security, it constitutes only 1.83 % of cereals consumed in the country which is not much compared to cereals imports and the local production of cereals.

6. Conclusion

Results of processed data in this bachelor thesis lead to the conclusion that food aid, as a contribution to ensuring food security in the Democratic Republic of Congo, does not have a significant effect in the variability of the Congolese total production of cereals while an increase of one tonne in the quantity of imported cereals leads cereals locally produced to increase by 1.81 tonnes. However the relationship between cereal imports and agricultural production in DRC is due to the fact that the population is growing in an average of 3 % annually. This annual growth rate does not allow the local subsistence agriculture and agriculture as a whole to supply sufficient food in the Democratic republic of Congo. It has also been found that even though the Congolese gross domestic product is facing significant growth, it is not one of the factors causing the persistent imports of cereals since income across the country is not evenly distributed among individuals. We then assume that the per capita consumption has not changed much since the population living under the poverty line accounted for 73.30 % in 2005 to be reduced to only 63.60% in 2012 and there has been found no change in the composition of imported food products. In addition, local cereals across DRC are cheaper than the imported cereals most of the time throughout the year. Prices being greatly different across DRC also proves that transport infrastructures play a significant role in the context of enhancing the production of rural population and that it is one of the 59.91% unexplained random factors influencing agricultural production of cereals.

It is then no use setting a limit to the quantity of imported cereals and food aid since the population growth and the state of infrastructures account greatly to justify the presence of cereals imports in DRC to feed the population. This study also reveals that the contribution of imports to the congolese economy is minimal because all taxes and duties of different activities in DRC constitute in average about 3.5% of GDP while the local agriculture contribute greatly, hence the importance to support it (local agriculture).

The recommendation to the government would be not to only create an efficient agricultural sector but to also improve the value chain of agriculture. That is to to say to rehabilitate the processing unit that are not functioning any more and to improve the transport to allow rural population not only to maximize their production but to also have the possibility of reaching markets across the country.

Since DRC is classified as a low income country building agro-industrial park to reach self-sufficiency and food security should be gradually introduced even though it could provide

food for a great majority of the population. Allowing rural populations which still constitute the majority in the DRC to continue with agricultural production will not only reduce unemployment and increase the Congolese cereals production and at the same time provide revenue to the government but it will also provide them (rural population) with enough to pay for their children school fees to prepare future managers of these agro-industrial parks. While building agro-industrial parks with an high rate of people living under the poverty line will not solve food security since money is one requirement to purchase a product.

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8. Appendices

Data used for regression analysis

	⁽²⁾ Year	⁽²⁾ Cereal Production (in tonne)	⁽²⁾ Import (in tonne)	⁽²⁾ Food aid (in tonne)
1	1995	1587375	277156	40062
2	1996	1670485	222020	10938
3	1997	1672495	222043	6945
4	1998	1727765	272289	4967
5	1999	1670982	362662	24425
6	2000	1666123.67	239500	28860
7	2001	1626753.6	315055	36362
8	2002	1599195	342701	59353
9	2003	1665920.22	538000	52657
10	2004	1697963.61	467915	44617
11	2005	1697759.79	447426	82277
12	2006	1700127.89	732048	30065
13	2007	1694702.25	607507	66120
14	2008	1712780.09	419390	69334
15	2009	1711278.17	566269	139105
16	2010	2755292.98	726890	139226
17	2011	2807651.2	662192	89335
18	2012	2764410.14	712838	108256
19	2013	3036876.54	983657	29029
20	2014	3211240.74	434600	9612