

Study on Food Import in D. R. Congo

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Abstract

Democratic Republic of Congo is a developing country located in Central Africa with a population of over 75 million. Generally, it relies on import in international market for food as it has constantly been experiencing domestic crisis which hinders production. Given the importance of shores price policy and income policy, the government pays meticulous attention to these factors to meet the present and future food security. In order to understand the import behavior related to GDP and international trade prices, the study employs Almost Idea Demand System (AIDS) model using FAO data. The result explains that price effect is more useful to the food security of the country than the income effect, thus this study suggest the government should give priority to policy on price.

Keywords

Agricultural Import, Almost Ideal Demand System (AIDS), D. R. Congo, Policy

1. Introduction

More of the poor population lives in the rural regions and are highly dependent on agriculture for their livelihood in D. R. Congo and in other developing country in the world [1]. The Agriculture in the world is the principal of economic development these nations [2]. In Africa, the major agricultural growth opportunities will be in regional and domestic markets for food staples. To seize these opportunities, there should be continued and sound macroeconomic policies to further improvements in the investment in infrastructure and institutions [3] [4]. At least four out of every ten children suffer from stunted growth due to poor nutrition. Since no enough is grown locally to meet demand, supplies have to be brought in from outside. With rising global prices, it is hard for families to afford imported food.

In this study, we focus on the food issue in The Democratic Republic of Congo, including agricultural production, trade and the relation to its prices. Using the Almost Ideal Demand Model (AIDS), the study analyzes how the price and GDP influence the food import in D. R. Congo. The study provides and updates food security situation of D. R. Congo relative to its importation prices.

2. Data and Its Description

2.1. Data Area

The Democratic Republic of Congo is very rich country with natural resources; the political instability makes the country experience slow development and the difficult infrastructure, the world of commercial product exploitation is from colonial extraction with a little development. Prior to 1997, D.R. Congo was called Zaire (see **Figure 1**). It is located in Central Africa. It borders with the Republic of the Congo, the Central African Republic, and to the north, South Sudan, to the east- Uganda, Rwanda, Burundi and Tanzania; to the south-Zambia and Angola; and to the west-the Atlantic Ocean. D.R. Congo is the second largest country in Africa by area, the largest in Sub-Saharan Africa, and the eleventh largest in the world with a population of over 75 million. Its location is in the equatorial and humid tropics experiencing an average temperature of 25°C around the bowl, from 26°C on the coast 18°C to 20°C at the altitude of 1500 meters, 16°C to 17°C in 2000, 11°C to 3000 meters and 6°C to 4000 meters. The Democratic Republic of Congo has generally two seasons, that is to say, dry and rain.

2.2. Data Source

All data in this study originates from United Nation Food and Agricultural Organization (FAO). Categorically the data concentrates on 5 groups of common food in the country including staple food (cassava, maize, rice, millet, beans), livestock, oil-fat, milk and sugar. Their cultivated area, the total output and yield were also collected.

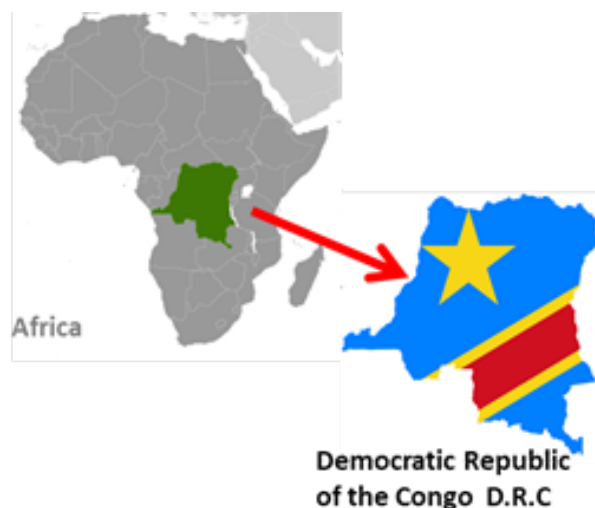


Figure 1. Map of democratic republic of Congo in Africa.

At first, the crop structure and their production are introduced beginning with cassava, maize, rice, millet, beans, cowpeas, pulses, banana, peanut, oil palm, sesame, soybeans, bananas, root tuber, vegetable, sweet potatoes, coffee, tea, cotton, sugarcane. Secondly, the trade of the above mentioned is presented.

2.3. Crop Structure Changing

Figure 2 shows the crop structure of a 54 year data from 1969 to 2014. It lists 20 kinds of staple crops by five groups according to row listing, which includes staple foods, beans, oil materials, vegetable and fruits, and economic crops. These are described in detail in the following.

1) Staple food (first row in **Figure 2**), including tuber-cassava, and staple grains-maize, rice, millet. From 1994-1999, cassava had an increased in yield then starts declining after 2000. The reason for this sharp decline was as a result of the crisis during that period. Ever since, the yield has been declining. Maize on the other hand was experiencing increase until 1995 where yield remains relatively stagnant. Millet yield experiences a spike in 1997 and then dropped back to its normal trend in the following year.

2) Beans (second row of **Figure 2**), area bean-like crops, including cowpeas, pulses, Bambara beans. From 1995-1997, beans yield increased to 25.5 kg/ha and

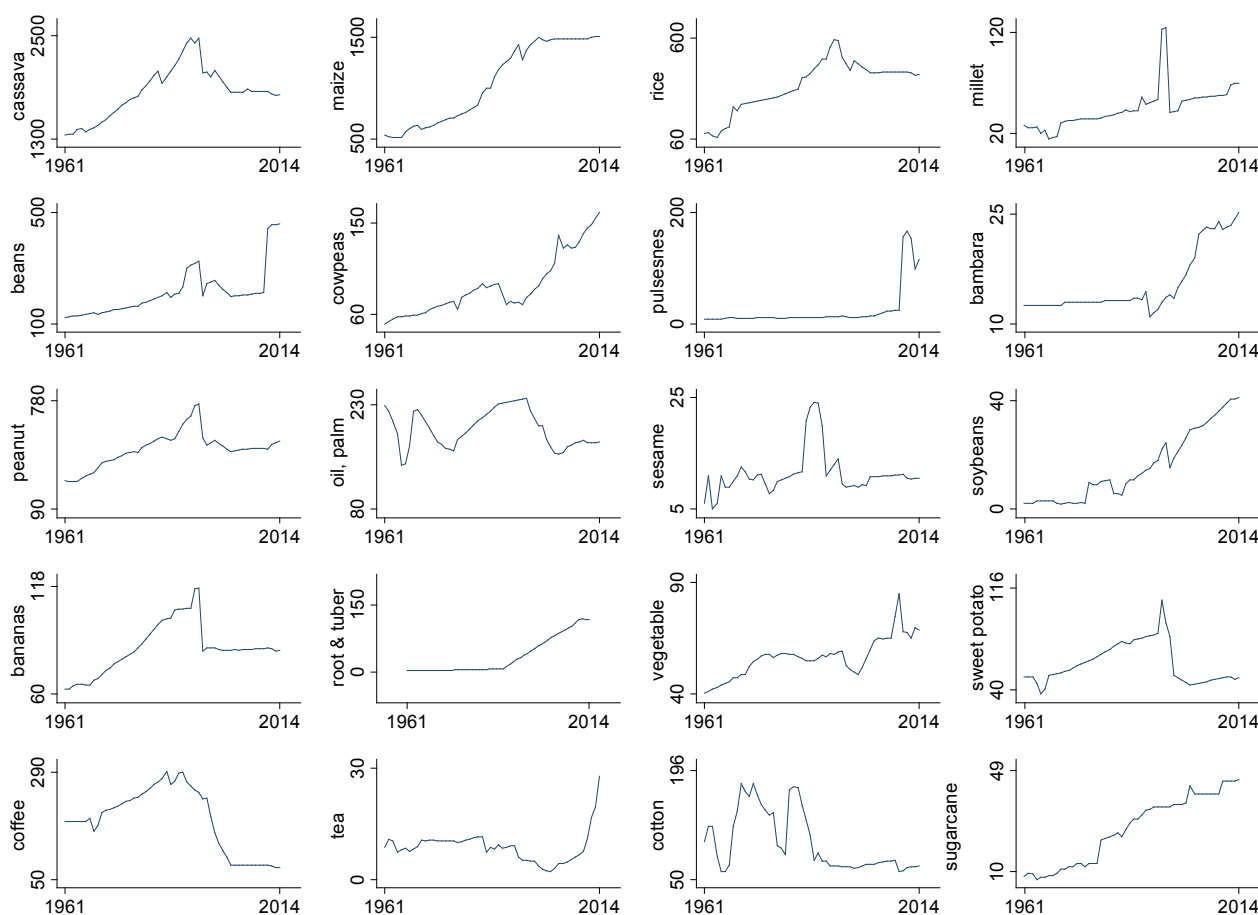


Figure 2. Crop structure area of D.R. Congo from 1961-2014 (Source: FAO, 2014).

from 2002-2014 increased further to 45.7 kg/ha. Cowpeas, from 1985-2000 had an increase of about 95 kg/ha and from 2010-2014 further increased with about 15.5 kg/ha. Pulses, from 1980-2005, yield was stable and then experienced a sharp increase in 2010 and then dropped with about 20 kg/ha and from 2010-2012. Bambara from 1996-1997 decrease with about 13.9 kg/ha and then from 2010-2014 sky-rocketed to about 25.2 kg/ha.

3) Oil crops (third row of **Figure 2**), including-peanut, oil palm, sesame and soybeans. From 1990-1994, peanut yield increased to 75.8 kg/ha and from 1999-2014 decreased to 50.1 kg/ha. Oil palm, from 1994-2003 decrease to 160 kg/ha and then from 2010-2014 increase 175 kg/ha. Sesame, from 1961-1994, its yield has been fluctuating but sky-rocketed in 1995-1997 after which it dropped back to its normal trend prior to 1995.

4) Roots & tubers, vegetables and fruits (fourth row of **Figure 2**), including bananas, sweet root & tubers-potato, vegetable. Bananas, from 1961-1998 has been experiencing increasing yield until 2002 when the yield dropped sharply then maintained the low yield to 2014. Vegetables yield has been increasing since 1961 but highly fluctuating. On the other hand, the yield of sweet potato continued to increase from 1961-1999 after which it dropped as low as that of the 1960s then continued to maintain same low yield till ever since.

5) Economics crops (fifth row of **Figure 2**), including coffee, tea, cotton, and sugarcane. The coffee, from 1988-1990, D.R Congo experienced the highest yield but after this period, yield began to decline even lower than that of the 1960s. Cotton, from 1961-1988, cotton production has been highly fluctuating. After 1988 its production became relatively stable but lower than the peak production experienced in 1983. Sugar is the only cash crop that maintained constant increase since 1961. As at 2012, about 45.5 thousand tons was produced (see **Figure 3**).

2.4. Agricultural Production

Cassava (**Figure 3**) during 1961-1994, the cassava production increased but continued to decline afterwards. Congo experienced the highest cassava production in 1992 which saw a production of about 19.8 million tons. Maize production, during the period 1961-1994, the maize production was increasing and then declined for a short period (in 1995) and then rose back 1998. After this period, its production has been relatively stable. Groundnut production, just as maize production, it was increasing from 1961-1994 and then dropped from 0.6 million tons to 0.4 million tons in 1995. Afterwards its production maintained the same low level. Sesame production kept fluctuating from 1961-1982. In 1985, production spiked up from 5.3 thousand tons to 13.2 thousand tons in 1988 and 1989. Afterwards, its production dropped as low as 5.5 thousand tons in 1991 then remained stable at that level. Animal protein food, including meat, egg, and milk production; these foods have been relatively increasing with little fluctuations except in milk production. During the 1990s, milk production dropped drastically as a result of the crisis thus forcing the nation to import from other

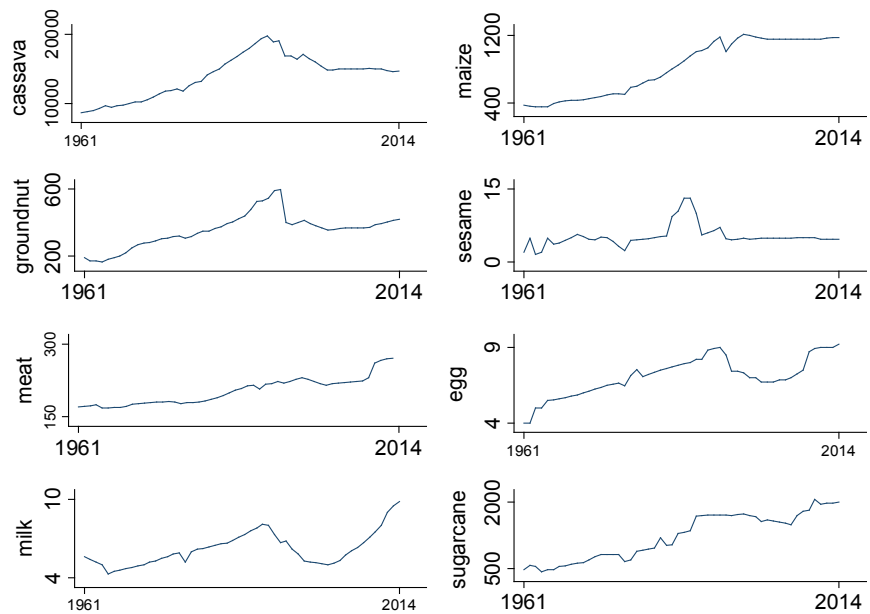


Figure 3. Agricultural production of D.R. Congo from 1961-2014 (Source: FAO, 2014).

countries.

2.5. Trade

Figure 4 shows the import quantities and values for grain, meat, oil fat, milk, and sugar from 1961 to 2013. The figure shows that in most of the agricultural trade, D.R. Congo experiences trade export deficit. That is to say, import has been greater than export throughout the year 1961 to 2013. Although the country exports more oil-fat prior to 1989 but afterwards import exceeds export followed by zero export.

3. AIDS Model

This section showed how to fit a quadratic almost ideal demand system (AIDS). Here we show how to fit the basic AIDS model by using nlsur. shows how to fit the quadratic AIDS model using nlsur. the dataset food. dta contains import expenditures, expenditure share, and log prices for four broad food groups. For a four-good demand system, we need to fit the following system of five equations:

$$w_k = a_k + \sum_{i=1}^5 g_{ij} * \ln p_i + b_i \ln \left\{ \frac{m}{p(p)} \right\} + u_i$$

where w_k denotes a fraction of expenditures share on good k , $\ln p_k$ denotes the logarithm of the price paid for good k , m denotes a import total expenditure on all four goods, the u_i are regression error terms, and

$$\ln P\{p\} = \alpha_0 + \sum_{i=1}^5 \alpha_i \ln p_i + \frac{1}{2} \sum_{i=1}^5 \gamma_i \ln p_i \ln p_j$$

The parameters for the fourth good's share equation can be recovered from the following constraints that are imposed by economic theory:

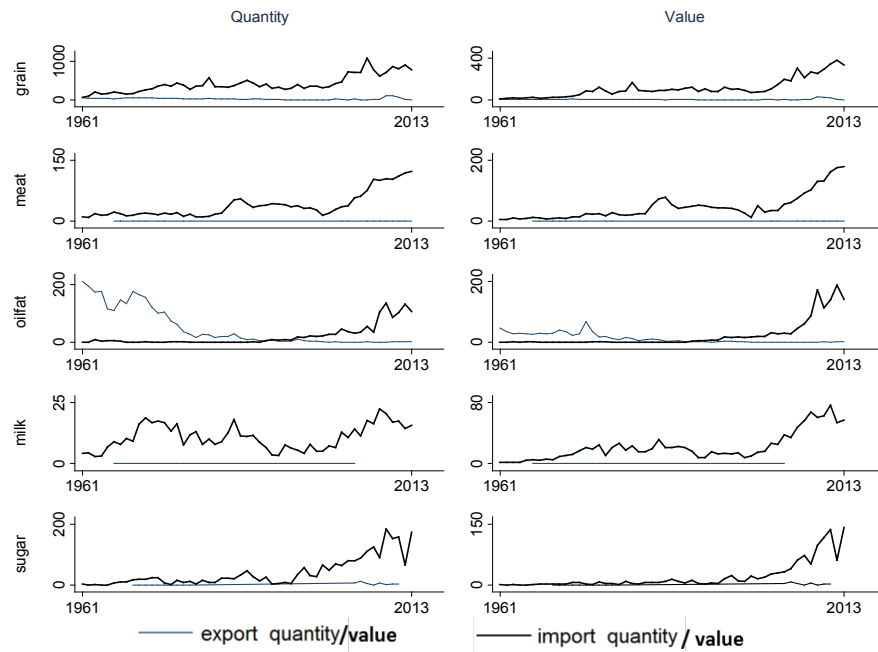


Figure 4. Agricultural trade of D.R. Congo from 1961 to 2013.

$$\sum_{i=1}^5 \alpha_i = 1 \quad \sum_{i=1}^5 \beta_i = 0 \quad \gamma_{ij} = \gamma_{ji} \quad \text{and} \quad \sum_{i=1}^5 \gamma_{ij} = 0 \quad \text{for all } j$$

Our model has a total of 12 unrestricted parameters. We will not estimate directly. Instead, we will set it equal to 5 as was done in Poi (2002); see Deaton and Muellbauer (1980) for a discussion of why treating as fixed is acceptable.

Price Elasticity and Import Expenditure Elasticity

Import expenditure elasticity: The expenditure elasticity of demand in certain period, The expenditure elasticity of demand in consumption expenditure changes in demand for certain degree of change caused by the extent of the value if positive, that consumption and consumption expenditure changes in the same direction, number represents the degree of influence on it, the larger the value, when the total expenditure of living consumption after the increase, the consumption of good larger. The expenditure elasticity is in the following:

$$\varepsilon_i = 1 + \frac{b_i}{w_i}$$

The price elasticity of demand can be calculated by using the AIDS model, which can be used to calculate this self-price elasticity and cross price elasticity of production. Own-price and cross-price elasticity: when $i = j$, since the price elasticity, this time $\delta_{ij} = 1$. Since the price elasticity is negative, that consumption and prices reverse, with rising commodity prices, the number of rural resident consumption of the goods decreased value represents the size of the impact of price change son consumption. When $i \neq j$, $\delta_{ij} = 0$. The price elasticity is in the following:

$$\eta_{ij} = -\delta_{ij} + \frac{g_{ij} * b_i * w_j}{w_i}$$

4. Result and Discussion

The R square (R^2) explains how well the function (W) supports the coefficients of the variables. All the functions had more than 90% acceptance. The import share is decided mainly by the logarithm of Own price excluding milks and sugar. The price and expenditure elasticity of staple food is presented in **Table 1**.

From Table, according to the function of expenditure elasticity and price elasticity, the needed elasticities are listed in **Table 2**. The oil fat own-price elasticity was slightly lower than other food. As shown the import expenditure is relatively similar to the ratio of the own price change. Most of the cross-price elasticity within the staple food was positive, implying that the major food items can be substituted. The oil fat was complementary to the grains and sugar, while the milk is a complement food to the meat, as shown by the negative cross-price elasticity.

5. Conclusion

Import expenditure elasticity is less than price elasticity for two of staple food

Table 1. AIDS model coefficient.

function	denotion	Coef. Of determ.	Staple food	Price elasticity Coef. (g_{ij})				Expenditure elasticity.
		(R^2)		Livestock	Oil-fat	milks	sugar	b_i
W_1	Staplefood	0.9932	-0.1130 (-1.41)	-0.0044 (-0.12)	0.0451 (1.29)	-0.0054 (-0.17)	-0.0101 (-0.57)	-0.0383 (-3.22)
W_2	Livestock	0.9793		-0.1782 (-4.45)	0.0504 (1.81)	0.0572 (2.35)	0.0138 (1.05)	-0.0162 (-1.82)
W_3	Oil-fat	0.9293			-0.0531 (-1.93)	-0.0033 (-0.19)	0.0109 (1.12)	0.0148 (2.01)
W_4	Milks	0.9493				0.0206 (0.89)	0.0012 (0.11)	0.0179 (2.58)
W_5	Sugar	0.9101					-0.0108 (-1.41)	0.0021 (0.53)

Table 2. Import of price elasticity and expenditure elasticity.

n_{ij}	Price elasticity					Import Expenditure Elasticity
	grains	meat	oil fat	milk	sugar	
grains	-0.9957	0.0001	-0.0002	0.0000	0.0000	0.9202
meat	0.0002	-0.9971	-0.0002	-0.0005	-0.0001	0.9165
oilfat	0.0067	0.0030	-1.0008	-0.0001	0.0002	1.3083
milk	-0.0005	0.0020	0.0000	-0.9996	0.0000	1.1808
sugar	-0.0002	0.0001	0.0000	0.0000	-1.0000	1.0382

groups including grains and meat, which means that price effect is much more useful than income effect for important staple food. So the government should give priority to price policy. For oil fat, milk, and sugar, expenditure elasticity is greater than price elasticity, which means income policy has more affect their price policies (see **Table 2**); according to the expenditure elasticity and price elasticity, the country should have priority to encourage developing oil fat industry.

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