Farm input subsidy program in Malawi: the rationale behind the policy

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ABSTRACT

There is a general agreement that agricultural growth in developing countries is needed in order to increase income and guarantee food security. Many authors agree that to achieve these goals, an increase in agricultural yield and production is necessary. However, the literature has shown a diverging discussion about which policy governments should apply for pro-poor agricultural growth. While some authors state that input subsidy policies (ISPs) are the principal tool to increase agricultural productivity for smallholders, many others say that these policies are highly costly and have not yet improved the development of rural areas. This article aims to show, from a theoretical perspective, that input subsidy policies can impact economic growth and food security. The method explores the welfare effects of a fertilizer subsidy policy on producers, consumers, government and society as a whole. The paper also examines, based on empirical data, the outcomes of the well-known Malawi farm input subsidy program (FISP). The results indicate that, as expected from theory, the FISP has raised productivity, households 'income and rural wages. However, it has not improved access to food at national level. The high cost and targeting inefficiency are also a constraint for maintaining the input subsidy program.

Table of Content

List of Figures

List of Tables

1 Introduction

Many studies have appointed that the agricultural growth in developing countries is a key factor to guarantee food security and poverty reduction (Dorward et al. 2004; World Bank, 2008). This statement can be best understood by acknowledging the importance of agriculture for the Sub-Saharan African economy, which is particularly expressive: agriculture holds a 34% share of Sub-Saharan Africa's GDP, and the rural population represents 63% of total population (World Bank, 2008). In Malawi, the share of rural population is even higher, 84% of the population lives in rural area (World Bank data, 2016). Another significant indicator is the percentage of employment in agricultural sector in relation to total employment: in Malawi, 72% of total employment is in agricultural sector; in Uganda this same indicator is 72%; and in Ethiopia it is 73% (World Bank data, 2016[1]).

Agriculture in Sub-Saharan Africa is primarily represented by smallholders, who, in many countries of the region, are poor farmers. According to Food and Agriculture Organization of the United Nations (FAO) (2014), 57% of the farms in Africa have less than 0.57 hectares, and the majority of this land is most responsible for subsistence food production.

Despite the economic dependence on agriculture, the agriculture in Sub-Saharan Africa has shown a very low productivity level. An indicator that measures agricultural productivity is the agriculture value added per worker, which is the total value of output less the value of intermediate inputs that one worker produces. Sub-Saharan Africa has the lowest level of value added per worker: the average for the region is US$ 706 (constant 2005 US$), while the world average is US$ 1,406 (World Bank data, 2016). In Malawi, the value added per worker is US$ 246 (World Bank data, 2016). All of this data shows that, although agriculture plays a key role in Sub-Saharan Africa's economy, its productivity is very low and an improvement in the sector is needed.

The low agricultural yield in Africa represents the main challenge to guaranteeing food security and economic growth in the region (World Bank, 2008). Food security is the state of having stable access to affordable and nutritious food. As the economy in Sub-Saharan African countries

[1] There is no data available for all Sub-Saharan Africa countries.

is dominated by subsistence agriculture, economic growth would positively impact the value of agricultural production. According to World Bank (2008), the low agriculture productivity in many African countries indicates why food insecurity exists in those countries. The same study also suggests that the high poverty index in Sub-Saharan Africa did not change in a 20 year period (from 1982 to 2002) due to the consistently low rates of productivity. In Malawi, for instance, the national poverty headcount ratio is 50.7% and for the rural population this indicator is 56.6%, demonstrating that 56.6% of total rural population lives below the national poverty line (World Bank data, 2016).

FAO (2014) states that Africa has a great opportunity to improve its agricultural sector, but there are significant challenges that need to be overcome in order to raise agricultural production, especially when poor small farmers are the main actors of the sector. The challenges most often mentioned in the literature are the access to input, finance, output markets and new technologies (FAO, 2014; Dorward et al., 2004). Morris et al. (2007) show that the average of fertilizer used in Sub-Saharan Africa is much lower than the other developing countries and indicate that the low use of fertilizers is one of the main reasons for low agricultural productivity. The intensity of fertilizer use in Sub-Saharan Africa is approximately 8 kg per hectare, compared to an average of 102 kg/ha in other developing countries (Morris et al., 2007).

In response to the challenges related to access, the tool most often used by the policy makers in Sub-Saharan Africa has been input subsidy policies (ISPs), especially for fertilizer subsidies. A fertilizer subsidy policy aims to increase fertilizer use, and consequently increase smallholder's productivity and income.

This study analyzes the theoretical part of an input subsidy policy, showing the direct effects expected by applying it. The article focuses on the Malawi's farm input subsidy program (FISP), one of the most studied programs in the literature. The paper discusses, based on empirical research, how the policy has realistically impacted the main actors involved in the Malawian program and evaluates if it has achieved the main objectives established by policy makers. This study will present an overview of the FISP outcomes and show how an input subsidy policy can impact a country.

The Farm Input Subsidy Program in Malawi: Historical overview

According to Dorward et al. (2008), the agriculture sector in Malawi is mostly represented by smallholders, who are very poor farmers that hold land with very low nitrogen levels. In Malawi, 97% of the agricultural households grow maize and 70% of the arable land is used for maize production (Chirwa and Dorward, 2013). In this context, the Malawian government began implementing projects to subsidize fertilizer and seeds to maize producers in the 1980s, which later became the Farm Input Subsidy Program (FISP).

Before implementing the FISP, the Malawian government executed three others projects: the "Inputs for work", the "Starter Pack" and the "Target Input Program (TIP)". The "Input for work" began in the 1980s as a donor funded project that was applied by NGOs only at a local scale. The project was a public work program, where participants were paid with agricultural inputs. In this period, the government also subsidized credit to small farmers and controlled the maize price. In 1993 the government started to distribute free input at a national level, which led to the creation of the Starter Pack program in 1998. For this project government distributed enough fertilizer and seed to plant 0.1 hectare of land to every smallholder, free of charge. However, the project had shown to be highly costly, not efficient in targeting poor farmers and also displaced private input sellers. This type of collapse in other African countries made the governments drop the program at the request of international donors, starting the period of liberalization of the market. During this period, agricultural productivity in Africa stagnated and the rural poverty rate was extremely high (Jayne and Shahidur, 2013). According to Morris (2007), this period was characterized with a significant fall in the level of fertilizer used and an increase of food insecurity among farmers. In Malawi, because of the fear of declining maize production and the possibility of a food crisis, the government decided to continue with the program, but with a better targeting approach, which led in the early 2000s to the Target Input Program (TIP). During this period, the government continued with the free provision of subsidies but now to a smaller number of target households.

In spite of this new approach, the TIP faced problems. It was very difficult to select the beneficiaries, which affected the targeting efficiency and other outcomes expected from the program. In the 2004/2005 season, Malawi experienced a very strong drought, which resulted in

another very poor harvest with subsequent effects on maize prices, food storage, expenses in maize imports and damage to the country's economy. Under this context, the Malawian government decided to implement the Agricultural Input Subsidy Program, which later became the Farm Input Subsidy Program (FISP). For this new approach of the program, which started in the 2005⁄2006 maize season, the government established more precise guidelines to identify the target beneficiaries and improved the distribution of the assistance. Priorities were set to target vulnerable groups, such as poor female farmers.

According to official literature, the objective of the Farm Input Subsidy Program is:

"*The programme's core objective has been to increase resource poor smallholder farmers' access to improved agricultural inputs in order to achieve food self-sufficiency and to increase resource poor smallholder farmers' incomes through increased food and cash crop production." (Chirwa and Dorward, 2013, p.89).*

The program involves the distribution of vouchers or coupons to farmers, who can purchase fertilizers and seeds with 90% subsides. Only Malawian farmers that own a land can receive the voucher and each household can purchase 100 kg of fertilizer and a specified amount of seeds at a subsidized price. This study will focus only on the fertilizer subsidy, which was the major expense of the program and also the primary product subsidized by the government.

2 Research Methods

The objective of the study is to analyze the input subsidy policy from a theoretical perspective showing the expected direct effects. Input subsidy policy is the use of the government budget to reduce price (or cover all costs) of inputs purchased by farmers. This kind of policy has a direct effect on producers' output production as it reduces the cost of production and intensifies the use of input. However, the implementation of such policy is not a consensus between policy makers, donors and researchers. Some studies suggest that governments apply such policies out of self-interest or patronage, ultimately allowing them to remain in power or as a political bargaining process (Jayne et al., 2002). On the other hand, other authors show that domestic policy makers actually believe that a public intervention is necessary in order to transform smallholder agriculture (Mockshell and Birner, 2015). However, the value of judgment of the input subsidy

policy for donors or policy makers is not the objective of this study. The article will focus on the economic rationale behind the policies in order to show the possible outcomes of implementing ISPs.

Framework

Government intervention can be explained by the rationality behind each policy it applies. In developing countries, the most common rationale is the promotion of non-efficiency objectives, such as income distribution and improvement of domestic food security - and not only to maximize the national income (an efficiency objective). These interventions might impact, among others, the prices of outputs and inputs, and for this reason winners and losers arise in the system. Figure 1 (below) shows the tradeoff between the non-efficiency objective (X axis) and efficiency objective (H axis) that a policy maker needs to choose when she or he is implementing a policy.

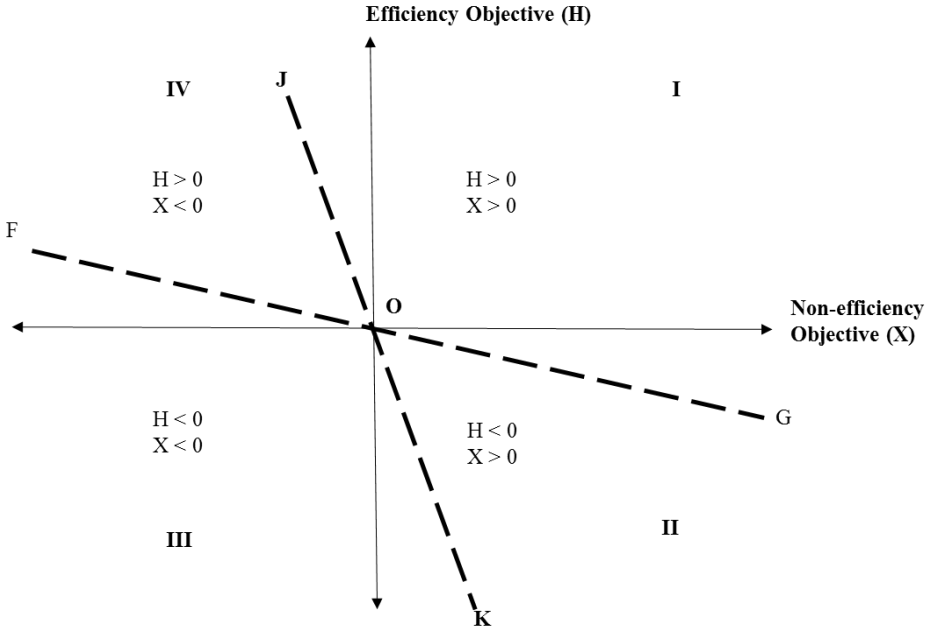

Figure 1: Tradeoff between efficiency and non-efficiency objectives. Source: recreation from Monke and Pearson (1989)

In order to explain the potential benefits in government action, we will look into each quadrant. Quadrant I shows the profitable system and also contributes to the non-efficiency objective, so there is no tradeoff between the objectives, which means that there are no losers in the system. In contrast, systems that are in quadrant III are not profitable (H<0) and do not encourage the non-efficiency objectives (X<0), therefore policy makers should not choose the policies that cause this effect because there will be no winners, only losers. Quadrants II and IV are the situations of tradeoff between objectives, and therefore are the areas of difficulty for policy choice. Quadrant II is the area that government chooses for a non-efficiency objective (X>0), but that can occur only at a cost that reduces the national income (H<0). In quadrant IV, a wish in increasing and maximizing the national income (H>0) leads to a decrease in the non-efficiency objective. Points on these two quadrants represent the amount of gain needed in one objective that will compensate the reduction or losses of the other objective.

Policy-makers who have relatively strong concerns for non-efficiency objective, which is the objective of this study, will prefer to have a large loss in the amount of national income in order to have a gain in the social issues, such as food security and income distribution. This effect can be represented by the line JOK, which has a steeper slope.

A quantitative analysis will be the method to study the impacts of an input subsidy policy. The approach of this evaluation will be the partial equilibrium diagram. The equilibrium diagram measures the efficiency effects, which are the difference between incremental social benefits (surplus) and incremental social costs. Some theoretical assumptions and empirical simplifications that are useful to better understand the analysis will be assumed (assumptions are in the section “Results from theoretical analysis).

Empirical Research: data analysis

As an empirical research, this study evaluates the Malawi’s farm input subsidy program and verifies if the outcomes of the program are the same as the expected results from the theoretical analysis. The evaluation will be based on data from existing literature from previous empirical studies of the Malawi’s FISP, which use quantitative and qualitative methods for data collection.

Dorward et al. (2008) use data from the national household survey from 2007, which contains information on 2,491 households from 12 different districts in Malawi (Dorward., 2008) and shows the outcomes of the program. This study is based on a statistical and econometric modelling. The study of Shively et al. (2013) also does an econometric analysis with data from 2003 and 2007 of 13 different districts in Malawi, and contains information on 1,375 households. This study also complements the evaluation with 380 detailed interviews with farmers from 35 villages located within two districts in Malawi (Shively et al., 2013) and presents the effects of the FISP. Ricker-Gilbert et al. (2009) use a panel data based on a survey with information from 1,416 households from the years 2002/2003, 2003/2004 and 2006/2007 to test if subsidy fertilizer really increased farmers yield.

Dorward and Chirwa conducted an extensive, long-term analysis of the FISP for the Malawian government (some of studies are: The Malawi Agricultural Input Subsidy Programme: 2005/06 to 2008/09; The Agricultural Input Subsidy Programme 2005 to 2008: Achievements and Challenges; Evaluation of the 2006/7 Agricultural Input Subsidy Programme, Malawi; Evaluation of the 2008/9 Agricultural Input Subsidy Programme, Malawi; Evaluation of the 2010/11 Farm Input Subsidy Programme, Malawi). In 2013, the authors published a book about the farm input subsidy program in Malawi, which contemplates the whole evaluation and impacts that they found throughout the studies. Their evaluations are based on econometric analysis using the national household surveys, which have information from 2004/2005 and 2006/2007. The authors also complemented the data analysis with interviews with 463 households during March and April of 2011, and with data from the Malawian government for social and economic indicators.

Houssou and Zeller (2010) preformed a regression analysis based on the 2004/2005 national integrated household survey, which covers 11,280 households, to evaluate how the program is reaching poor farmers, and also suggests a better approach to improve the targeting efficiency and cost-effectiveness of the program.

3 Results from the theoretical analysis

Many governments implement input subsidy policy in order to increase production, aiming to guarantee self-sufficiency. This section presents the analysis of an input subsidy policy from a

theoretical approach. The evaluation is based on the partial equilibrium diagram and will focus on the direct effects that such policy imposes on the rural sector and a country's economy.

As Malawi is the case study for this paper, we will use some assumptions that are similar to Malawi's reality in order to conduct the analysis and to better expose and understand the impacts of the FISP. The assumptions are:

- One country and one good: a small maize producing country, which cannot affect the world market price.
- Open market: the commodity analyzed is internationally tradable.
- Maize importer: before the policy, the country is a maize importer.
- The instrument used by government is the input subsidy program, which in this case is fertilizer subsidy.
- Country is a fertilizer importer.
- No trade costs.
- Market failures and changes in demand and supply of related products are ignored. Elastic price demand: estimates of elasticities are often difficult to obtain, but some studies have shown an elastic price demand for maize in Malawi, for example a price elasticity of demand of- 1.115 (Simler and Hall, 1997).

3.1 Level of fertilizer use and impact on fertilizer imports

The first analysis is the effect of the level of fertilizer used on maize production. The input subsidy program in Malawi was applied in order to reduce the price of fertilizer for making it more accessible to farmers. This change in input price increases the demand for fertilizer (from D1 to D2), as indicated in Figure 2 below.

The figure shows a country that imports input. The reduction in the input price also impacts the quantity of fertilizer imported. As more farmers are willing to use more fertilizer at this lower price, and as domestic fertilizer producers are less disposed to sell the input at a lower price, the quantity of fertilizer imported also rises.

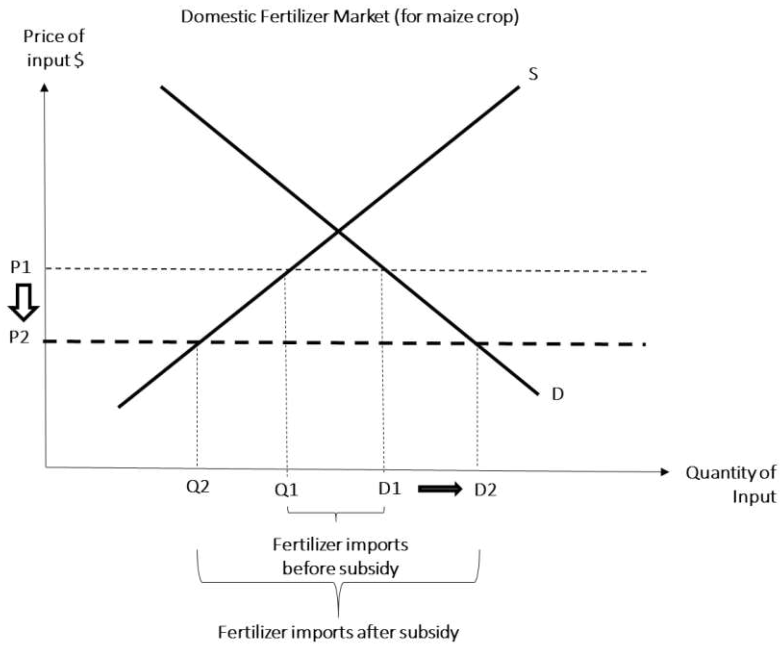

Figure 2: Impact of ISP on input use level and quantity imported. Q1 and Q2 represent the quantity of fertilizer supplied and D1 and D2 represent the quantity of it demanded. P1 is the fertilizer price before the ISP and P2 is the price after the policy.

3.2 Welfare Impact

An input subsidy policy causes transfers among producers, consumers, and government treasury. These effects can be different when we analyze an economy in a *closed market* or in an *open market.* As Malawi is in an open market, we will consider the policy in an open market, but an evaluation for a closed market will be also briefly shown as it is important to understand further discussion.

3.2.1 Open Market

In the figure 3, the lower input price encourages the intensification of its use and reduces the cost of production (the marginal cost). This impact increases the quantity supplied of maize (from Q1 to Q2), which is represented by shifting the supply curve S downwards to S'. We also can see that after the subsidy, the quantity supplied is equal to the quantity demanded, showing that the country achieved self-sufficiency (and does not need to import maize anymore).

Producer Surplus (PS)

Before the ISP, producer surplus was the area that is above the supply curve S and below the world price Pw (the triangle indicated by *a Pw b*). After the policy, the new producer surplus is

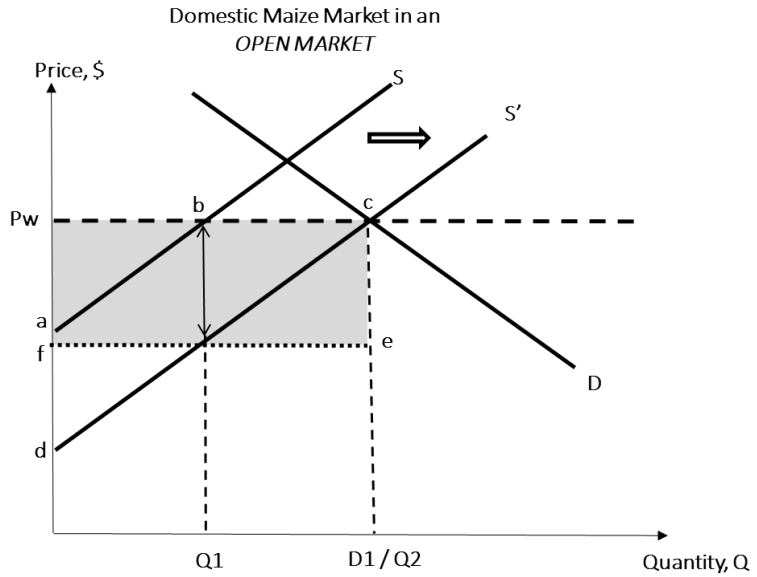

Figure 3: Impact of ISP on social welfare – open market. Q1 and Q2 represent the quantity of maize supplied and D1 represents the quantity demanded. Pw is the world price for maize.

the area that is above the curve S' and below the price Pw (the triangle indicated by *d Pw c).* So the variation in the producer surplus (PS) can be represented by the area:

$\Delta PS = + abcd$

As it is a positive effect, we can assume that producers are better off with the input subsidy policy.

Consumer Surplus (CS)

The same analysis can be made for consumers. As Malawi is a very small country, it cannot affect the world price, and thus consumers will not be affected by the policy. A positive impact on consumer surplus is very important to guarantee a complete effect on food security. Food security can be positively impacted by increasing food production, improving the consumers' purchasing power and decreasing food price. However, as illustrated before, the policy cannot reduce food prices in the country.

Government budget (B)

The government budget is also affected by the ISP. The subsidy applied by the government increases the maize production, shifting the supply curve S to S'. The distance between the two

curves S and S' (indicated with an arrow on the figure 3) is the cost paid by the government for each unit of subsidized maize. So the whole government cost is represented by the shaded area *Pw c e f*, which is the cost per unit (distance between S and S') times all units produced (Q2). The government cost can then be represented by the area:

$\Delta B = -$ *Pwcef*

Net social welfare (W)

As a result, there will be a negative effect on the whole society's welfare (W). This occurs because the amount of money spent by the government on the subsidy is higher than the producers' gain. The social welfare impact can be shown by:

$\Delta W = \Delta PS + \Delta CS + \Delta B = +$ *abcd* $+ 0 -$ *Pwcef*

As stated before, a subsidy policy has a non-efficiency objective, so it tends to cause a loss in the national income. Policy makers choose this type of policy expecting to have a trade-off between its income loss and the beneficiaries' gains.

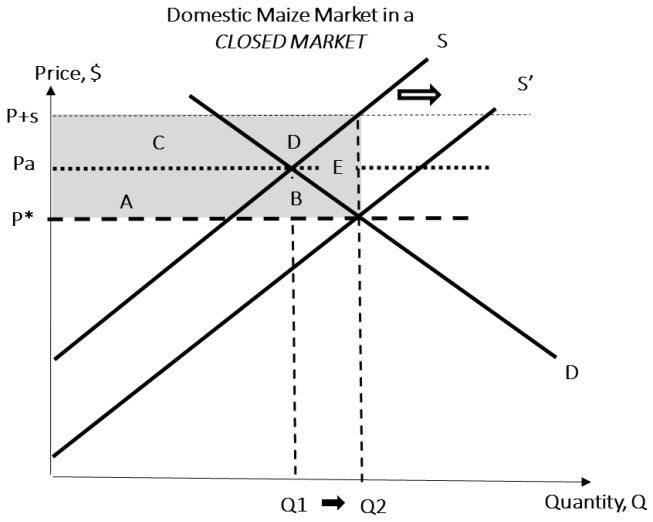

Figure 4: Impact of ISP on social welfare – closed market. Q1 and Q2 represent the quantity of maize supplied. Pa is the autarky price (equilibrium price) before the ISP, P* is the new consumer price after the policy, and P+s in the producer price after the policy.

3.2.2 Closed Market

Assuming a closed market and an elastic demand curve, when the quantity supplied increases the new consumer price equilibrium point is found at a lower price level (P*). The lower cost of production, which is a premium/subsidy for producers, can be represented by increasing the producer price from Pa to P+s. These changes together cause an impact for producers, consumers and government and are illustrated in Figure 4.

Doing the same analysis as before, the producer surplus can be represented by the area:

$\Delta PS = + C + D$

In a closed market, the increase in production leads to a fall in the good's price, causing a positive effect for consumers. With a decrease in maize price (from Pa to P*), consumers can purchase more maize. The change in the consumer surplus (CS) is represented by the area:

$\Delta CS = + A + B$

The subsidy applied by the government increases maize production and drives down the price of maize for consumers. The government expenses include the costs of the input (fertilizer) subsidy

and the dead weight loss (DWL) – the opportunity cost of not producing a certain amount of that good. These costs are represented by the shaded area:

$\Delta B = -A - B - C - D - E$, where E is the DWL.

As a result, the net social welfare (W) is also negative:

$\Delta W = \Delta PS + \Delta CS + \Delta B = -E$

3.3 Impact on rural wage

The rural wage is also impacted with the change in the quantity of output produced.

With an increase in the quantity produced, the demand for labor also increases (it shifts from D to D'). However, the supply for labor (S) remains the same, so farmers will need to pay higher wages (w2) to attract new employees. This effect is illustrated in Figure 5.

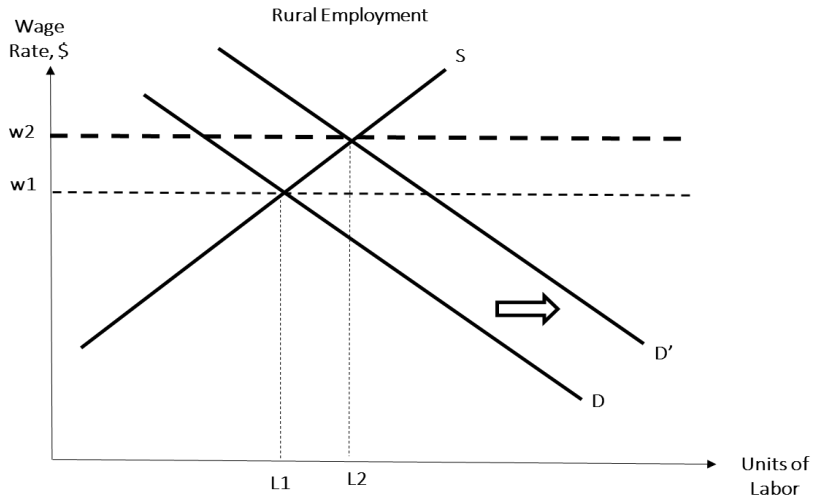

Figure 5: Impact of ISP on rural wages. L1 and L2 represent units of labor required. W1 is the wage rate before the policy and w2 is the wage rate after the ISP.

4 Results from the empirical studies

Many authors have done a massive and in-depth investigation into the input subsidy policies in Malawi. However, the divergence of the literature about the efficiency of such policies remains a debate. In this section, we compare the results from a theoretical perspective with what actually

happened in Malawi, investigating the gaps in the implementation of the farm input subsidy program (FISP).

4.1 Impacts of Malawi FISP

The FISP was designed to give coupons of 100 kg of two types of fertilizers, NPK and Urea (50 kg of each), and also a coupon of maize seed (also two varieties, one hybrid and another open pollinated variety) to poor smallholders. According to Malawian Ministry of Agriculture and Food Security (MoAFS), from 2006 to 2011, 3.5 million fertilizer' coupons were used every year on average, which represents approximately 80% of the fertilizer monetary value per year on average (Chirwa and Dorward, 2013). The objective to distribute these subsidized inputs was to improve maize productivity, leading to an increase in farmer's income and achieve food security at the household and national level. This goal aims to be reached mainly by giving access to fertilizers to poor farmers, allowing them to intensify the use of the input in their crops.

The results of increasing fertilizer used can be observed in a number of studies. For example, Shively et al. (2013) indicates that farmers who received the subsidy used on average 178 kg more fertilizer than the farmers who did not participate in the program. Jayne et al. (2013) estimates that each ton of subsidized fertilizer distributed elevated fertilizer use by 490 kg. We also can see that the quantity of fertilizer consumed in Malawi from 2000 to 2005 increased from 167 to 292 (in '000 metric tons) (Chirwa and Dorward, 2013). For SOAS (2009) the increase in fertilizer use was 60% to 80% higher.

As a result of the intensification of fertilizer use, maize productivity has also increased. Shively et al. (2013) show a strong and positive correlation between fertilizer use and yield growth, and the result of the study indicates that on average, maize yield increased 500 kg per hectare. The analysis of Ricker-Gilbert et al. (2009) indicates that one kilogram of subsidized fertilizer led to an increase in yield by 2.28 kg/ha. Another essential outcome found in this study is that farmers who did not use fertilizer in their crop - because they didn't have access to it - had a lower productivity in comparison with farmers that did use fertilizer. In contrast, in the year that those farmers – who didn't use fertilizer – got the subsidized fertilizer, their yield increased significantly: their yield was 22 kg per hectare higher than the other farmers on the sample

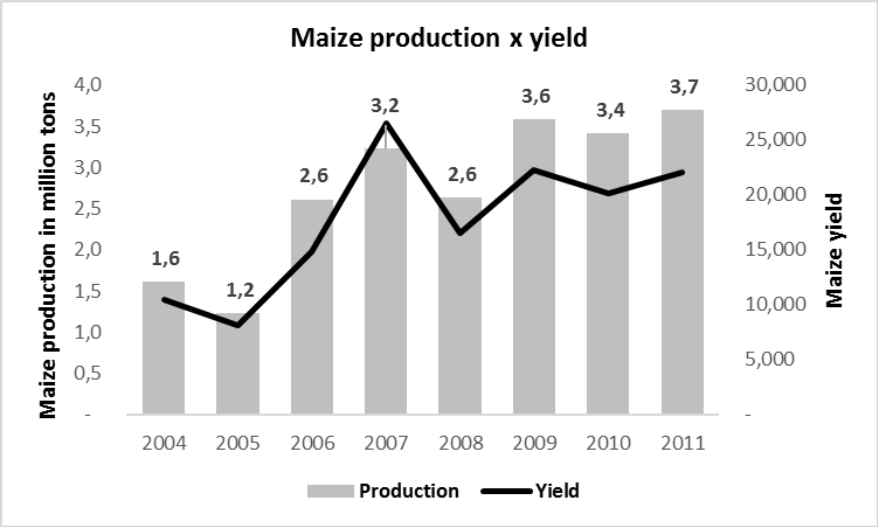

Figure 6: Maize production and yield in Malawi from 2004 to 2011. Source: FAOSTAT, 2016.

(Ricker-Gilbert et al., 2009). This result shows the importance of the program for increasing productivity of poor smallholders in Malawi.

In their book, Chirwa and Dorward (2013) show that after the FISP, the total maize productivity and production significantly increased. Before the implementation of the last phase of the subsidy program (in the year of 2004/2005), maize production was estimated at 1.2 million tons. After the introduction of the FISP maize production more than doubled in 2005/2006, reaching 2.6 million tons and continue to grow until 2011/2012, when maize production was estimated at 3.7 million tons. Another study also indicates that the subsidy boosted maize production by 10% to 20% across all households, and for the target households – the poor farmers - the increase ranged from 30% to 40% (Dorward and Chirwa, 2013).

It is important to mention that the FISP also distributed hybrid maize seeds to farmers and that these seeds were a very important factor that influenced the increase in maize production. Additionally, there are also other variables that need to be considered in relation to maize yield in Malawi, namely the weather and rainfall.

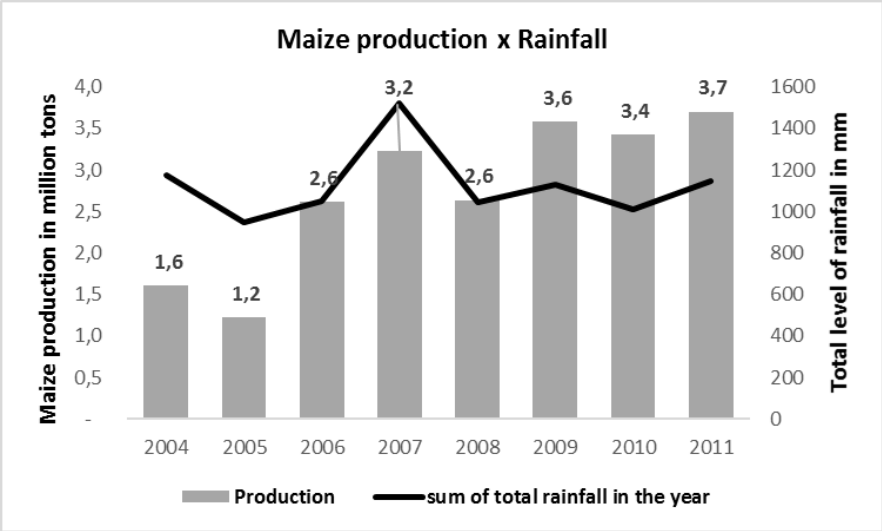

Figure 7: Maize production and level of rainfall in Malawi from 2004 to 2011. Source: production data was taken from FAOSTAT, 2016; rainfall data was taken from the World Bank Group – Climate Change Knowledge Portal, 2016.

Every period that the rainfall is low, the production also decreases, as we can see on the Figure 7. In 2004/2005 an important reason of the low maize production in Malawi was the major drought that the country faced that year. In 2008. the fall in maize production can be partially explained by the poor rainfall in some areas in Malawi, especially in the western region, which is a very important area for maize production (Moylan, 2012).

The quantity of maize produced also plays a role in the amount of trade. Malawi is more commonly a maize importer. The country imports a relatively small amount of maize annually. However, it is difficult to obtain an accurate number of trade flow in Malawi, due to the informal and unreported trade across borders. However, the estimates of trade from the FAO indicate that after the implementation of the FISP, Malawi's imports reduced drastically, reaching a level of zero in 2011. Moreover, Malawi could even export some amount of maize, exceeding the imports in the years of good harvest, as illustrated in the Figure 8. The low level of production in 2004 and the reduction in maize production in 2008 also suggests that Malawi imported a greater amount of maize on the next years, 2005 and 2009.

As shown before, due to the fertilizer subsidy, the level of fertilizer used has grown, which has led to an increase in household productivity and maize production - reaching a self-sufficiency. With this increase in production, policy makers and researchers were expecting a reduction in the maize price in Malawi. However, this effect could not be proven by empirical research. Chirwa

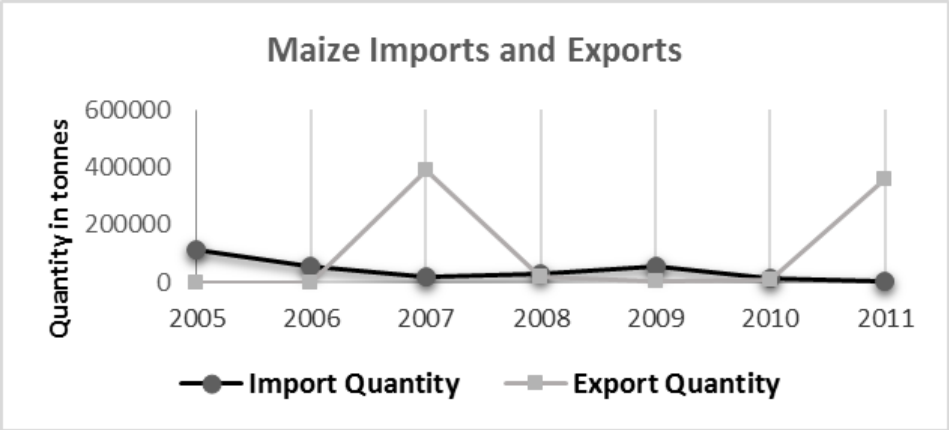

Figure 8: Maize imports and exports in Malawi from 2005 to 2011. Source: FAOSTAT, 2016.

and Dorward (2013) state that either the nominal and real price of maize should have fallen substantially, however, these prices (both in US dollars and in Malawi Kwacha) did not decrease. According to the authors, the real and nominal prices did not reduce because of several issues, such as increase of maize price in international market, reduction of trade between the neighboring countries due to political reasons, government interventions in purchasing maize, among others.

As analyzed in the *theoretical section*, Malawi is a very small country compared to large maize producers, so it does not have the power to change maize price, particularly when it is a maize importer. Hence, the reduction in maize price in Malawi could not be assumed in an open market. This assumption could be considered in a closed market, where there is no influence of international trade.

Another indicator that there is no evidence of improvement is food security at a national level. One explanation for that can be the no reduction of maize price. In order to guarantee food security, the whole nation must have access to affordable food.

However, when analyzing food security at a household level, it is possible to observe some improvements. Maize is the main staple crop in Malawi and majority of maize producers are also maize buyers and consumers. According to Chirwa and Dorward (2013), the national food production and per capita availability indices of households has improved with the farm input subsidy program. Chirwa et al (2011) conducted a study using the national panel data survey and the results show a positive and significant effect of FISP on food consumption adequacy.

According to the study, 69% of the surveyed households stated that after the program their food security has improved. Analyzing Malawi's indicator for food security, such as depth of food deficit, which indicates how many calories would be needed to leave the undernourishment status), we can see a small improvement during the years of the program. In 2005, the depth of food deficit was 191 calories and in 2011 this indicator was 145 calories (World Bank data, 2016). However, we cannot assume an improvement in food security for the whole country. Households could have better nutrition due to the increase in their income, regardless of being a recipient of the subsidy – or affected by it - could not increase the purchasing power, and thus the access to food remained unchanged.

The agricultural labor market in Malawi is known as *ganyu*. Many poor smallholders also work as *ganyu* to complement their income. Some studies show that the *ganyu* work represents 13% of households' total income (Ricker-Gilbert, 2013 quoting Jayne et al., 2010a, p. 34).

Ricker-Gilbert (2013) did a study, based on national panel data from household survey for the years 2003/4 to 2008/9, to analyze how FISP had influenced the wage rate in rural areas after its implementation. As a result, it was found that after the input subsidy program was implemented the demand for rural labor increased and the supply for *ganyu* work decreased, and this effect has risen the wage rate for rural workers (Ricker-Gilbert, 2013). An interesting result of the study is that when a producer receives 100 kg of subsidized fertilizer (the amount of input expected to be distributed to farmers), this household will work 11 days fewer on average as a *ganyu* (Ricker-Gilbert, 2013). This result indicates that when a household receives the subsidized fertilizer, she or he tends to leave the *ganyu* work and focus her/his activities on their own farm. Regarding wage rates, the study shows that an increase by 10 kg of subsidized fertilizer per household, raises the median *ganyu* wage rate by 1.4% in that community. Dorward et al. (2008) also presents that the median wage rate increased by 33% after implementing the FISP. The wage rates have increased especially during the good seasons of maize production, whereas in the poor seasons it did not change much.

Additionally, a study to evaluate how FISP has affected total output crop value was conducted. Ricker-Gilbert and Jayne (2012) used a panel data from nation household survey, which contains data from three waves of data collection – first wave was in 2003/04, second wave was in 2007

and last wave was in 2009 – to identify the effect of subsidized fertilizer on the value added in maize production. The researchers found that an additional kilogram (1 kg) of subsidized fertilizer had increased the mean value of total crop output by 104 Malawi Kwacha (US$ 0.69) per household on average.

Dorward and Chirwa (2013) conducted a study, which simulates both situations "with" and without" subsidy, in order to identify the direct effects of the FISP in Malawi. For these simulations two of the largest livelihood zones (in terms of population coverage), which, when combined, cover 40% of rural population, were chosen. The results show a real change in household's income. In the poorest livelihood zone of the study (Shire Highlands), the gain in producer's income reached 10% across all households, and 25% for the targeting beneficiaries (poorest households) (Dorward and Chirwa, 2013).

These studies have shown that the wage rate for a *ganyu* work has increased and also the total output value has risen. These effects indicate that FISP improved household's income.

4.2 Controversial aspects of FISP in Malawi

The most criticisms of the program appointed by the literature are the high costs of FISP and low efficiency of the program in targeting the poor farmers.

The FISP is extremely costly for the Malawian government. There are no accurate cost estimates of the program for the first year of implementation (2005/2006), but on the Table 1, there are the approximate costs of the FISP from 2006 to 2011.

Table 1: Cost of the Farm Input Subsidy Program from 2006 to 2011. Source: adapted from Chirwa and Dorward, 2013.

	Program Costs (million US$)	% of MoAFS budget	% of national budget	% of GDP
2006/2007	$ 74	45%	7%	2%
2007/2008	$ 100	56%	8%	3%
2008/2009	$ 250	68%	16%	7%
2009/2010	$ 120	54%	6%	2%
2010/2011	$ 150	60%	8%	3%

From the table, we can see that the cost in 2006/2007 was US$ 74 million, and this value jumped to US$ 250 million in 2008/2009. This large rise is due to the increase in fertilizer price in international market during 2008/2009. The price of NPK (fertilizer distributed to farmers) increased approximately from US$500MT in 2006 to US$1,500 in 2008 (Chirwa and Dorward, 2013). As the fertilizer is the main subsidy and the most costly product that the government distributes, the increase in the input price that year has significantly affected the program cost. In any case, we can see that the FISP is a very expensive project. On average it represents 57% of total Ministry of Agriculture and Food Security (MoAFS) budget, 9% of total national budget and 3% of country's GDP.

In order to support the program, governments spend a significant percentage of the public budget on the FISP, and some studies indicate that the costs are higher than the gains (Dorward and Ephraim, 2011; Jayne and Rashid, 2013). Many authors state that the high cost of the program against its insignificant gain shows the ineffectiveness of the FISP. For Jayne and Rashid (2013), the subsidy program cannot be justified because the gain with the increased production does not overcome the costs of the program. For SOAS (2009) the program cost was higher than the benefit analysis (yield gain and output price).

Applying a very high cost program, researchers were expecting to see an improvement in other social indicators, such poverty reduction. However, there is no evidence that the poverty index decreased in Malawi. One explanation for this may be the targeting efficiency. Many studies indicate that the medium-size and wealthier farmers received more fertilizers than the poor

smallholders (Dorward and Chirwa, 2009; World Bank 2007). Dorward et *al.* (2008), in the evaluation of 2006/2007 FISP, also indicates that 46% of the poor farmers did not receive fertilizer subsidies. Another study found that, according to the national survey, 35% of rural poor did not benefit from the FISP, while 62% of non-poor received the subsidy (Houssou and Zeller, 2010).

Studies also indicate that, in some cases, poor households were not able to receive the coupons, and the main reasons for that were (Shively et al., 2013):

- Social connections: some farmers have a better influence in the villages.
- Distance of urban areas: some smallholders are located in isolated areas without connection with roads, which hampers the reach of fertilizer distributers.
- Level of education: householders with more education had a better chance to receive fertilizer

In the same research, Shively et al. (2013) evaluate the correlation between householder's wealth and amount of fertilizer used, and the result found indicates that poor farmers used less fertilizer, especially when woman producers were analyzed – poor female households are the group that use the lowest amount of fertilizer.

Houssou and Zeller (2010) state that the targeting mechanisms of the farm input subsidy program in Malawi are not efficient because they are based on community perception and interest. In this approach, the local authorities and community representatives are responsible for identifying the beneficiaries, but they do that based on their perception of living standards, favoritism, political interest and lack of understanding the targeting criteria. As a result, Malawi's farm input subsidy program has also defined non-poor households as poor farmers – the level of under-coverage is 73% on average – which is impacting the cost of the program (Houssou and Zeller, 2010).

All these studies confirm a targeting failure of the FISP. The program is not reaching the poor famers, so they are not being able to increase their income and to have access to a more affordable food. This problem may be the reason why literature could not yet accurately show the impact of FISP on poverty ratio in Malawi.

Another negative effect of targeting inefficiency is the crowding-out of fertilizer on the private market. For Dorward et al. (2008) the input subsidy has generated gain just for the private sellers who were allowed to distribute the fertilizers on behalf of the government, while other private fertilizer companies that were excluded from program were displaced of the market, resulting in a crowding—out of around 30% of private market. Shively et al. (2013) estimate that the subsidized fertilizer crowded-out 22% of fertilizer commercialized in the private market. These numbers indicate that a failure in the FISP has happened. Jayne et al. (2013) suggest that 30% to 40% of the fertilizer that should have been distributed by the government to farmers were diverted and resold to private market, instead of being used by the intended beneficiaries.

The FISP was designed to reach poor farmers who didn't have access to inputs, so as they did not have access or money to buy fertilizers, the program could not displace the private market. However, as shown before, displacement in the market occurred, indicating again a targeting error of the program.

5 Conclusion

An understanding of the economic importance of agriculture and poverty among rural areas in Malawi is essential to comprehend the implementation of the farm input subsidy program. The significance of maize crop and the low maize productivity trap are particularly relevant in this context. Therefore, input subsidies have played an important role in agricultural development policies in the country.

To analyze the success of the farm input subsidy program, a judgement against its objectives needs to be made.

As stated before the objective of the FISP is to increase maize productivity, improve households' income and guarantee national food security. According to theoretical analysis, the main potential outcomes of an input subsidy policy in an open market are:

- Increase in input use
- Increase in productivity and generate an incremental production
- Impact on producer surplus and society welfare
- Increase in labor demand and wages

- High cost for government

The Malawi's FISP demonstrates a positive effect for maize producers. The program intensified the fertilizer use, improving the maize yield and increasing national production. This increase led to a better income for rural sector. Producers who received the subsidy had a higher income and rural workers also earned higher wage, so we can say that the program achieved one part of its objective.

Subsidy programs have a tendency to focus more on production objectives and producer welfare, rather than consider consumer's interests. As discussed previously, a large subsidy program raises land and labor productivity and these effects raise the real incomes of poor producers and workers. However, for pro-poor economic growth, consumers also need to be a beneficiary. When analyzing the FISP from the consumer perspective, we can observe that they are not being impacted by the program. The effects show that, although some households who received the subsidy have improved their food consumption, the food security as a whole did not improve. Malawi is a very poor country, where people do not have access to adequate nutrition. The impact on the prices of goods is also necessary for poor consumers to have access to food (staple crops) – and not only increase the production.

The change in food prices in an open market does not depend just on the level of production, the price will be impacted by international market and trade. Therefore, policy makers cannot expect that the price of a good will change just by increasing production, there are many others variables that need to be considered, particularly in a country as small as Malawi.

As expected from the theoretical analysis, the FISP has also shown a high deficit for the government. For many authors, this high expense does not justify the program, mainly because it is not improving the country's overall well-being. The program carried a substantial cost and an inappropriate implementation method, which brought little gain compared with the large amounts of scarce national resources used. The social incremental benefits are not showing a significant result, mainly because of the poor targeting efficiency. FISP has covered a limited number of poor farmers and has benefited a significant number of non-poor households. Malawi is a low-income country and an improvement on its social and economic indicators is urgently needed. In order to improve the program and increase poor farmers' economic growth, the government

should guarantee the focus of the program in the poorest farmers. If the government wants to increase the income of vulnerable households in Malawi, it needs to reach the poorest people.

As stated before, a policy that has a non-efficiency objective does not aim to maximize the national income. A subsidy policy will always cause a loss in net welfare, but the trade-off for the incremental social benefits needs to occur in order to explain the high investment.

The farm input subsidy program has reached all the outcomes expected by the theoretical analysis, but it did not achieve all the objectives established by the government. FISP is an important tool for increasing maize productivity and improving poor household's income – when efficiently targeted. However, the consumers are not better off as a result. Hence the objective of improving national food security is not being guaranteed.

Policy makers should combine FISP with other strategies for improving food security, because the farm input subsidy program alone will not affect this indicator. For this reason, they need to decide the trade-off between the non-efficiency and efficiency objective they want to have with the program. It seems that the amount of money expended by government is extremely high for the results achieved – the loss on the efficiency objective is not being compensated by the gain on the non-efficiency objective. Government could continue with the program - under the assumption of targeting efficiency - but at a lower cost in order to guarantee the growth in income of poor households and in maize production. Thereby, government could save part of the money to improve food security completely and other social problems, such as poverty reduction.

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