

Impact of Rising World Rice Prices on Poverty and Inequality in Burkina Faso

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Impact of Rising World Rice Prices on Poverty and Inequality in Burkina Faso

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Abstract

Between January 2006 and April 2008, the prices of most of the agricultural products considerably rose in international markets. Empirical studies show that this spike in world food prices has increased the number of poor households in developing countries, but the magnitude is not the same in all countries. This paper assesses the impact of rising rice price on poverty and income inequality in Burkina Faso. We use a methodology based on the concept of compensating variation combined with the net benefit ratio (NBR) developed by Deaton (1989) and living standard survey (QUIBB, 2003). The results show that higher rice prices have a negative impact on income and poverty in the regions with a large proportion of households who are net buyers of rice. The poverty rate increases by 2.2 to 2.9 percentage points depending on the assumptions. The increase in poverty increase is higher in urban areas than in rural areas. Rising rice prices also increase income inequality. Income inequality particularly increases in urban areas and in relatively rich regions, but it decreases in poor regions with an important proportion of rice producers.

JEL Classification: I32, Q12, Q11

Key Words: Measuring and analysis of poverty, farm household, Price

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1. Introduction

Between 2006 and 2008, the prices of most of the agricultural products considerably increased in international markets. Wheat price more than doubled between March 2007 and March 2008, rice price tripled from January to April 2008; and maize price doubled between July 2007 and June 2008 (World Bank, 2008a). This increase in food prices could affect households' income in low income countries as their food expenditures represent an important proportion of the total expenditures. In addition, their income depends heavily on agricultural production. Farmers are expected to benefit from higher prices because they will see an increase in their income that can offset rising food prices. In contrast, consumers are likely to be adversely affected by rising food prices.

The nature and the magnitude of the effects of higher world prices on producers and consumers in the low income countries depend on how those countries respond to spikes in prices. Indeed, these effects differ according to market structures and public intervention mechanisms. The spike in food prices on the period 2007-2008 led to a 26% and 16% increase in prices in Vietnam and Chile respectively. Even in countries where inflation was historically low (for example West Africa Economic and Monetary Union[3] countries), the prices significantly increased over the period 2007-2008 (see graph A1 in appendix). A recent study applied to Burkina Faso shows that more than 80% of the increase in world prices are transmitted to domestic markets (Badolo, 2010).

For many analysts, the price increase is rather an opportunity for producers from the Southern countries which have long suffered from the falling prices. Farmers are expected to benefit from higher prices because they will see an increase in their income that can offset rising food prices. In contrast, consumers are likely to be adversely affected by rising food prices. In addition to this effect on income and poverty, it is appropriate to consider the potential impacts on income inequality. Indeed, in most of the Sub-Saharan Africa countries, rice consumers are households who live in urban area and those with intermediate incomes. However, the majority of producers are rural poor households. Hence an increase in rice prices tends to reduce households' income and to increase poverty (Minot and Goletti, 2000; Nouve and Wodon, 2008; Simler, 2009). But rising rice prices tend to reduce income inequality as long as rice farmers represent an important proportion in the total population.

[3] West Africa Economic and Monetary Union is composed of Benin, Burkina Faso, Côte d'Ivoire, Guinea-Bissau, Mali, Niger, Senegal and Togo

Curiously, most of the empirical studies have examined the short run effects of higher prices and tend to neglect the long run effects and the potential effects on income inequality[4].

The objective of this paper is to estimate the impact of higher rice prices in international markets on poverty and income inequality in Burkina Faso which is a major rice consumer and imports more than 60% of its total consumption. This paper is an extension of the study conducted by Badolo (2010) which highlights an almost complete transmission of higher international prices to local markets in Burkina Faso. The impact of higher prices will be estimated in two ways. First, we analyze the effects of higher prices on households in terms of poverty and income inequality by taking into account their social and economic characteristics[5]. Given that Burkinabe households are rice consumers and they allocate a high proportion of their budget to it, we expect a negative impact of higher prices on their income. This impact should be positive on the net producers of rice. Depending on whether the net producers of rice have a high income or a low income, we expect an increase or decrease in income inequality in major rice producing areas.

We use a methodology based on the net benefit ratio (NBR) developed by Deaton (1989) combined with the concept of compensating variation of income (Deaton and Muellebauer, 1980; Minot and Goletti, 2000). We use the living standard survey conducted by National Statistics and Demography Institute (NSDI) over the period 2002-2003 (QUIBB, 2003). The survey includes 8,500 households and contains information on income from rice and total consumption expenditures. We estimate the impact of higher food prices on households' income, poverty rate and income inequality.

This method is favourable to estimate, in addition to short run effects, the long run effects of rising food prices and to distinguish between net producers and net consumers. We estimate the impact of higher prices on poverty using the formula developed by Minot and Daniels (2002). The authors consider the impact on producers. We extend their formula by adding consumers to calculate the net impact on poverty indicators developed by Foster, Greer and Thorbecke (1984). Furthermore, unlike previous studies that have analyzed the impact of higher food prices on poverty, in addition to this impact, our paper takes into account the effects on income inequality using Gini and Theil Indexes.

[4] To our knowledge, no study addresses this issue.
[5] Location, income group and region.

The results show that rising rice prices adversely affects households' income in the short and long run, and increases poverty in most of the regions except for rice producing areas. The effect is higher in urban areas than in rural areas. Rising food prices also increases income inequality except for a few regions.

The rest of the paper is structured as follows: section 2 provides the literature review on the impact of changes in food prices on households' income and poverty. Section 3 presents the methodology used to estimate the impact of higher food prices on households. In section 4 we present the descriptive statistics on consumption and production of rice in Burkina Faso. Section 5 concludes.

2. Empirical Literature Review

There is an extensive literature on the impact of changes in food prices on households in low income countries but the results are sometimes mixed. We discuss the results of recent studies in this part.

The findings of most of the studies depend on household profile, depending on whether the household is a net producer or a net consumer, and the proportion of net producers in the total population. Ulimwengi and Ramadan (2009) use a multimarket model and living standard survey (UNHS, 2005-2006) to analyze the impact of higher food price on consumption and profits in Uganda. The data show that on average 12% of households are net producers and 66% are net consumers. The authors conclude that households who depend on the agricultural sector and who live in rural areas are positively affected by rising food prices. This might be explained by the fact that rural households are more likely to be net producers.

Ivanic and Martin (2008) estimate the short run effects of higher food prices for seven commodities[6] on poverty using living standard survey in nine developing countries. The authors use the method developed by Singh, Squire and Strauss (1986) and Deaton (1989, 1997). They conclude that on average a 10% increase in food prices leads to an increase in poverty. However, an analysis by product and by country gives different results. For example, in the case of Vietnam, a 10% increase in rice price reduces rural poverty by 1 percentage point and increases urban poverty by 0.2 percentage point, but there is a decline of 0.5 percentage point of poverty at national level. This might be explained by the fact that net

[6] Rice, maize, wheat, dairy, poultry, beef and sugar.

producers who benefit from higher food prices are more important than net consumers. In Zambia and Malawi, a 10% increase in maize price increases rural poverty by 0.8 and 0.5 percentage point, and urban poverty by 0.2 and 0.3 percentage points respectively. In the two countries, urban and rural households are net consumers of maize.

The study conducted by Minot (2010) is one of the few studies that have examined the long run effects of rising food prices on poverty in low income countries. The author uses living standard survey (GLSS, 2005-2006) and the method developed by Deaton (1989) to analyze the impact of higher food prices on poverty in Ghana. He shows that on average 21% and 46% of households are producers and consumers of maize respectively and a 81% increase in producer and consumer prices leads to an increase in poverty by 0.6 percentage points in the short run. However, if the increase in producer price is higher than in consumer price, poverty falls by 1.2 percentage points in the short run. Urban households (7% of net producers and 56% of net consumers) lose both in the short and long run, but the losses are less important in the long run. In contrast, rural households (31% of net producers and 39% of net consumers) win in the long run and in the case where producer prices rise more than consumer prices. In regions where the proportion of net producers of rice is almost equal to that of net consumers, poverty falls in the long term if producer prices rise more than consumer prices.

Beyond the household profile, some empirical results are explained by the social and economic situation of each country and region. The study conducted by Wodon et al. (2008) highlights this aspect. The authors estimate the short run impact of food imported prices on poverty using the method developed by Deaton (1989) in twelve West and Central African countries. They conclude that an increase in food prices leads to an increase in poverty more important in rural areas than in urban areas in Ghana, Senegal and Liberia. The case of Ghana might be explained by the fact that poverty was initially lower than in the other two countries. The results obtained in Senegal and Liberia are due to the importance of imported food in household consumption so that the gains of net producers are low.

Finally, the findings of studies on the effects of rising food prices depend on the magnitude of the increase in food prices, the social and economic characteristics of households and the social and economic situation of the country. Many of these studies focus on the analysis of the short run effects and tend to neglect the long run effects. None of these studies has considered the impact on inequality. Our paper contributes to the literature by assessing the long run effects and the impact on inequality.

3. Methodology and Data

3.1. Methodology

We use the method developed by Deaton (1989) and extended by Minot and Goletti (2000). This method does not impose any particular structure on the data and does not require a significant amount of information. In addition, it has the advantage of allowing the identification of net producers and net consumers and of distinguishing between the short and the long run impacts using the supply and demand elasticities. We use the concept of compensating variation to calculate the income loss of consumers related to higher food prices. We analyze the short and long run effects on real income, poverty and income inequality.

3.1.1. Measuring of the Impact of Rising Rice Prices on Real income

The impact of price changes on household welfare is often calculated using consumer surplus[7] (CS) or the equivalent variation[8] (EV) or the compensating variation (CV). In this paper, we use the concept of compensating variation as it was developed by Deaton and Muellebauer (1980) and Minot and Goletti (2000). The compensating variation is defined as the amount of money needed to compensate a consumer for the price change and restore the original utility level. So in the case of rising food prices, the compensating variation is the most relevant measure (Varian, 2008). In addition, unlike the two other measures, it requires fewer assumptions as one needs only the original level of the data before the price change. The compensating variation change can be written as the difference between two values of the expenditure function:

$$CV = e(p_1, u_o) - e(p_o, u_o) \quad (1)$$

Where CV is the compensating variation, $e(.)$ is the expenditure function, p is the vector of prices, p_0 and p_1 are before (0) and after (1) the price change, u is utility. Using second-

[7] If there is a price change, the surplus consumer is limited because it is based on the implicit hypothesis of constant marginal utility of money along the integration path (Deaton and Muellebauer, 1980).
[8] The equivalent variation is the willingness to pay. It measures the maximal amount to pay to prevent the increase in prices and it requires the price and quantity levels of the initial situation.

order Taylor series expression and Shephard's lemma on Equation (1), we obtain the effect of price changes on consumer[9]:

$$\frac{CV}{x_0} \cong \frac{p_{0i} q_i(p_0, x_0)}{x_0} \frac{\Delta p_i}{p_{0i}} + \frac{1}{2} \varepsilon_d \frac{p_{0i} q_i(p_0, x_0)}{x_0} \left(\frac{\Delta p_i}{p_{0i}} \right)^2 \tag{2}$$

Where q_i and p_i are the quantity demanded and the rice price respectively, x_0 the original income and ε_d is the own-price elasticity of demand of rice. Equation (3) can be rewritten in its reduced form:

$$\frac{CV}{x_0} \cong CR_r \frac{\Delta p_i}{p_{0i}} + \frac{1}{2} \varepsilon_d CR_r \left(\frac{\Delta p_i}{p_{Oi}} \right)^2 \tag{3}$$

CR_i is the consumption ratio for rice which is defined as the proportion of budget affected to rice consumption.

The impact of rising prices on the household as producer is determined using the profit variation which is defined as following:

$$\Delta\pi = \pi(p_1, w_0, z) - \pi(p_0, w_0, z) \tag{4}$$

Where $\Delta\pi$ is the profit variation, $\pi(.)$ is the profit function, p is the vector of output prices, p_0 and p_1 are the before (0) and after (1) the price change, w is the vector of input prices, z is the vector of fixed factor quantities. By applying the same procedure used in the case of consumers, we obtain the effect of rising prices on the household as producer[10] which is defined as following:

$$\frac{\Delta\pi}{x_0} \cong \frac{p_{0i} s_i(p_0, w_0, z_0)}{x_0} \frac{\Delta p_i}{p_{0i}} + \frac{1}{2} \varepsilon_s \frac{p_{0i} s_i(p_0, w_0, z_0)}{x_0} \left(\frac{\Delta p_i}{p_{0i}} \right)^2 \tag{5}$$

Where s_i and p_i are the supply quantity and the price of rice, and ε_s is the own-price elasticity of supply of rice. Equation (5) can be rewritten in its reduced form:

[9] The detailed derivation is available upon request.
[10] The detailed derivation is available upon request.

$$\frac{\Delta\pi}{x_0} \cong PR_r \frac{\Delta p_i}{p_{0i}} + \frac{1}{2}\varepsilon_s PR_i \left(\frac{\Delta p_i}{p_{0i}}\right)^2 \quad (6)$$

PR_i is the production ratio of rice which is defined as the value of rice production as a proportion of income (or total expenditure). Combining equation (3) and equation (6), the following expression is obtained:

$$\frac{\Delta w^2}{x_0} \cong \frac{\Delta p_i^p}{p_{0i}^p} PR_i + \frac{1}{2}\left(\frac{\Delta p_i^p}{p_{0i}^p}\right)^2 PR_i\varepsilon_s - \frac{\Delta p_i^c}{p_{0i}^c} CR_i - \frac{1}{2}\left(\frac{\Delta p_i^c}{p_{0i}^c}\right)^2 CR_i\varepsilon_d \quad (7)$$

Where Δw^2 is the second-order of the net welfare effect of a rice price change on household, p^c and p^p are the consumption and production prices respectively. Equation (7) takes into account the response of producers and consumers to the rice price change. The immediate welfare impact of the price change is obtained by setting the elasticities equal to zero:

$$\frac{\Delta w^1}{x_0} \cong \frac{\Delta p_i^p}{p_{0i}^p} PR_i - \frac{\Delta p_i^c}{p_{0i}^c} CR_i \quad (8)$$

Where Δw^1 is the first-order approximation of the net welfare effect of a rice price change.

There are two major issues in this analysis. The first one is the relationship between producer and consumer prices. The second issue is the use of appropriate supply and demand elasticities.

The first issue is related to the fact that it is rarely possible to obtain data on producer prices of commodities particularly in sub-Saharan African countries. To avoid this problem, most of the studies suppose that producer and consumer prices increase in the same proportion, which is equivalent to assuming a marketing margin that is a fixed proportion of the consumer price. However, the assumption of fixed marketing margin is more plausible, which implies that the percentage increase in producer price will be greater than the percentage increase in consumer price. Such assumptions make sensitive the estimation of the impact of higher prices on welfare (see Dawe and Matsoglou, 2009). For example, if the consumer price is twice the producer price and the marketing margin is fixed in the absolute terms, the percentage increase in the producer price will be twice the percentage increase in the consumer price.

Regarding the elasticities, most of the studies assume no household responses (e.g. Deaton, 1989; Ivanic and Martin, 2008), which means that the elasticities are equal to zero. However, in the long run, households may be able to respond both as consumers and as producers. In this paper, we consider two assumptions. First, we assume that the value of demand and supply elasticities is equal to zero, which corresponds to the short run impact. Second, the value of elasticities is different from zero. We assume own-price demand elasticities of -0.20 and -0.40 and supply elasticities of 0.20 and 0.40. We perform a sensitivity analysis using own-price demand elasticities in the range of -0.20 and -0.40 and supply elasticities in the range of 0.20 and 0.40 by random draws from a uniform distribution.

The estimation of the short run impacts of higher prices on poverty and inequality is based on two simulations. ***In simulation 1***, we assume that households do not respond to higher prices (zero elasticities) and that producer and consumer prices rise by the same percentage (15%). ***In simulation 2***, we assume that households do not respond to higher prices (zero elasticities) and that the percentage increase in producer prices is twice the percentage increase in consumer prices (30% and 15%). The simulations for the long run impacts are defined as following. ***In simulation 1***, we assume that households respond to price changes (demand elasticity is of -0.20 and supply elasticity is of 0.20) and that producer and consumer prices rise by the same percentage (15%). ***In simulation 2***, we assume that households respond to price changes (-0.20 and 0.20) and that the percentage increase in producer price is twice the percentage increase in consumer prices (15% and 30%). ***In simulation 3***, we assume that households respond to higher prices (-0.40 and 0.40) and that producer and consumer prices rise by the same percentage (15%). ***In simulation 4***, we assume that households respond to higher prices (-0.40 and 0.40) and that the percentage increase in producer prices is twice the percentage increase in consumer prices (15% and 30%).

3.1.2. Measuring the Impact of Rising Rice Prices on Poverty

The impact of rising rice price on poverty is estimated using the approach developed by Minot and Daniels (2002) to examine the impact of cotton price variations on producers in Benin. We extend their formula by taking into account the consumers to determine the overall impact. We compare the poverty measures before and after the price has changed.

We calculate the impact of higher prices on poverty using the income expression defined as follows:

$$x_{i1} = x_{i0} + \Delta\pi - CV \tag{9}$$

Where x_1 and x_0 are the consumption expenditures of household before and after the price change, respectively, $\Delta\pi$ and CV are the profit variation and compensating variation, respectively. By replacing $\Delta\pi$ and CV by their expressions, we obtain:

$$x_1 = x_0 + s_i(p_0, w_0, z)\Delta p_i + \frac{1}{2}\varepsilon_s \frac{s_i(p_0, w_0, z)}{p_{0i}}(\Delta p_i)^2$$
$$-[q_i(p_0, x_0)\Delta p_i + \frac{1}{2}\varepsilon_d \frac{q_i(p_0, x_0)}{p_{0i}}(\Delta p_i)^2] \tag{10}$$

The impact of higher prices on poverty is examined using the poverty measures developed by Foster, Greer and Thorbecke (1984) defined as following:

$$P_\alpha = \frac{1}{N}\sum_n^1 \left[\frac{\bar{x} - x_j}{\bar{x}}\right]^\alpha \tag{11}$$

Where P_α is the measure of poverty, N is the number of households, $\bar{x}$ is the poverty line, x_j is the consumption expenditure of household j. If α = 0, P_0 measures the poverty headcount, i.e. the proportion of households with an expenditure level below poverty line. If α = 1, P_1 measures the poverty gap. This measure takes into account the number of poor and severity of poverty. If α = 2, P_2 measures the poverty gap squared. This measure takes into account inequality between poor and gives more weight to the poorest.

The poverty analysis raises an important issue which is the choice of variable of interest used to calculate the poverty indicator. The variables frequently used in the empirical literature on poverty are the total consumption of households, per capita consumption and per adult equivalent consumption. The total consumption of households does not take into account the size of household and tends to overestimates the welfare of individuals who are in households with a large size. Per capita consumption takes into account the size of household but it doesn't consider differences in the size and composition by sex and age of households. To calculate per adult equivalent consumption, we convert households in adult equivalents using

the equivalence scales and we divide the total consumption of households by the number of adult equivalents. Per adult equivalent consumption takes into account both the size and composition by age of households but there is the issue of choice of equivalence scales. We use the two last variables in our estimations. The simulations defined above are used to analyze the impact of higher rice prices on poverty.

3.1.3. Measuring the Impact of Higher Prices on Income Inequality

The increase in rice prices should benefit to net producers and particularly to farmers whose rice sales are prominent. This would reduce income inequality between the rice producing areas and regions where rice consumption is important. Income inequality would also be reduced between rural areas and urban areas. To estimate the effect of higher rice price on inequality, we compare the inequality indicators before and after the price changes.

There are many indicators of income inequality. Two of these indicators are used in this paper: the Gini index and the Theil index. The Gini index is the most used in empirical studies on income inequality. It is defined in its reduced form as the covariance between the income (Y) of a person or household and his rank (F) in the distribution (the rank is equal to zero for the poorest and one for the richest). If $\bar{y}$ is the average level of income, the Gini index is defined as follows:

$$Gini = 2\,\mathrm{cov}(Y, F) / \bar{y} \tag{12}$$

The Gini index takes values between zero and one, with higher values indicating great inequality. In contrast, values close to zero reflect an egalitarian distribution of income. Although the Gini index is the most used in empirical work, it doesn't satisfy all the desirable properties[11] of a good indicator of income inequality.

Many inequality indices have recently been developed, and some of them satisfy all the desirable properties. One important example is the Theil index which is now widely used in empirical work. The Theil index is defined as follow:

$$T = \frac{1}{N}\sum_{i=1}^{N} \frac{y_i}{\bar{y}} \ln\left(\frac{y_i}{\bar{y}}\right) \tag{13}$$

[11] These criteria are: independence of average, independence of population size, symmetry, decomposition of the inequality indicator, statistical significance of the change in the inequality indicator over time. Gini index doesn't meet the last two criteria.

Where $\bar{y}$ is the average per capita income (or per capita consumption expenditure). A zero value of the index indicates perfect equality, with higher values of the index indicating greater inequality.

3.2. Data

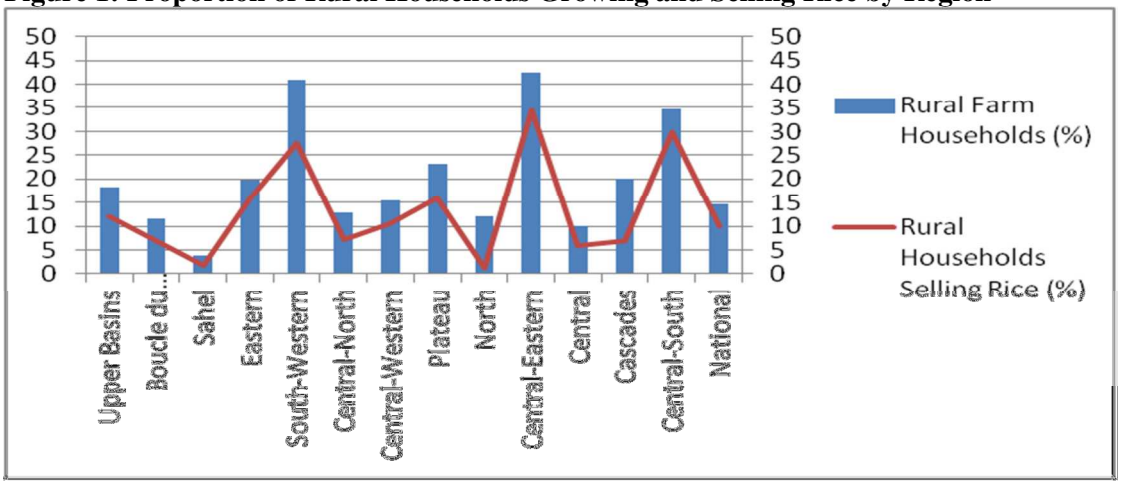
We estimate the impact of higher rice prices on poverty and income inequality in Burkina Faso using living standard survey (QUIBB, 2003). The survey is conducted by National Statistics and Demography Institute (NSDI) of Burkina Faso over the period 2002-2003. The survey covers 8,500 nationally representative households and contains information on income and consumption expenditures.

4. Consumption and Production of rice in Burkina Faso

Burkina Faso is a rural country with almost 80% of its population living in rural areas (World Factbook, CIA, UN, FAO, 2005). The agricultural sector plays a major role in the economy, it represents 45% of GDP and a significant proportion of population depends on agriculture (Food and Agriculture Statistics in Burkina Faso, 2006). Grains play a major role in terms of food security since they represent 90% of food needs in Burkina Faso. Among these grains, millet, maize, sorghum and rice are the most important in terms of food consumption.

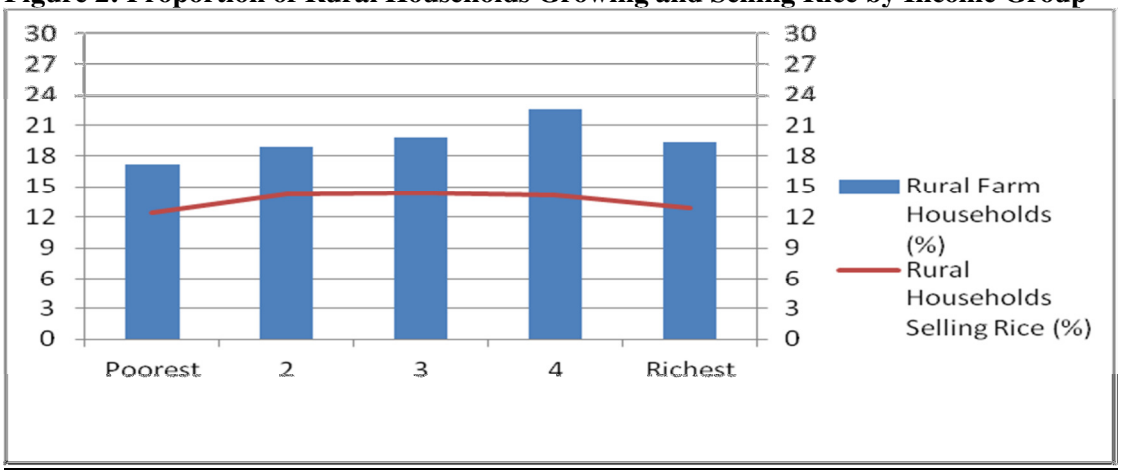
Survey data (QUIBB, 2003) indicate that almost 15% of rural households in Burkina Faso are rice producers and 13% of these households derive their income from rice production. Figure 1 shows that in the South-Western and Central-Eastern regions, rice production is more important than in other regions (more than 40% for each region). In other regions rice production stands for 10% - 30%, except for the Sahel where rice production is less than 10%. In nine regions of Burkina Faso, the income of about half of rice producers derives from rice production, except for the Boucle du Mouhoun, Sahel, North and Cascade regions. Figure 2 shows that in all income groups there are rice producers. In the intermediate income group, the number of rice producers is more important.

Figure 1: Proportion of Rural Households Growing and Selling Rice by Region



Source: calculated using survey data of household living standards (QUIBB, 2003)

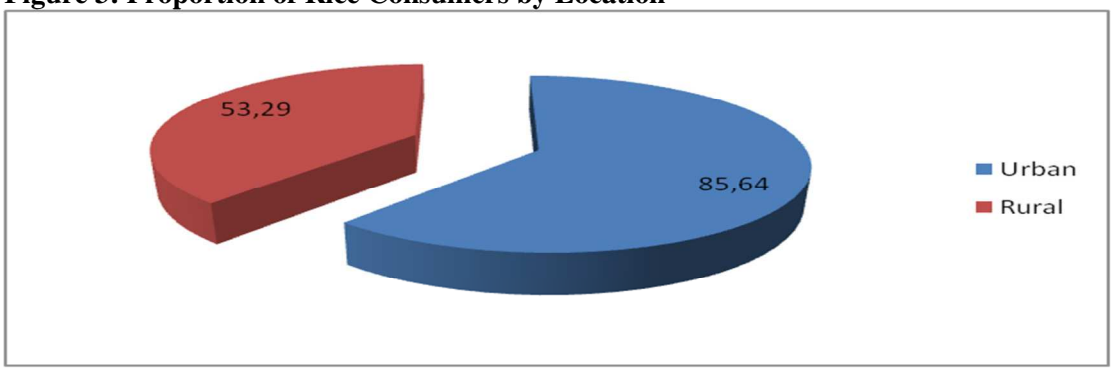
Figure 2: Proportion of Rural Households Growing and Selling Rice by Income Group



Source: calculated using survey data of household living standards (QUIBB, 2003)

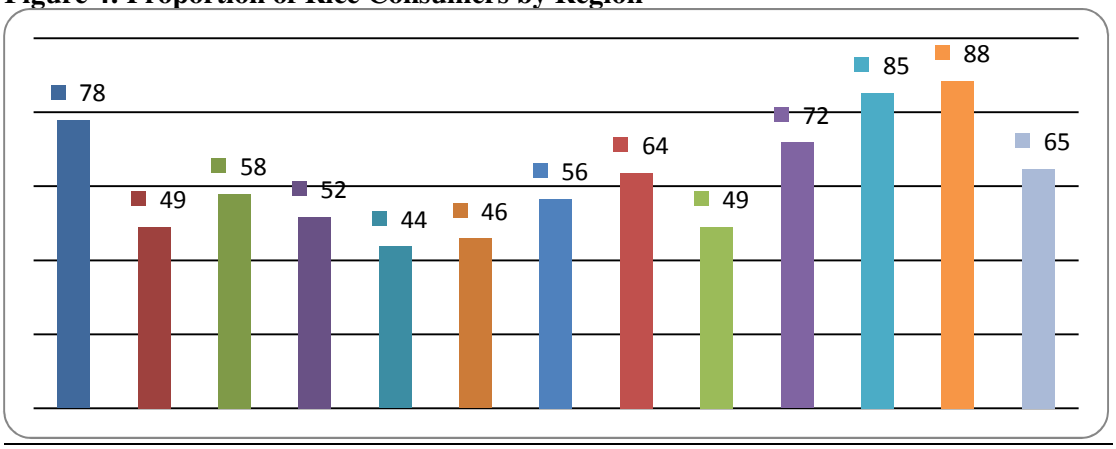
According to living standard survey (QUIBB, 2003), there is more than 63% of the population who consume rice in Burkina Faso. Figure 3 shows that rice is more consumed in urban area (85%) than in rural area. An analysis by region shows that rice consumption is more important in Cascade (88%), Central (85%), Upper Basins (78%) and Central-eastern (72%) regions. In other regions, the proportion of rice consumers is between 40% and 70% of the population.

Figure 3: Proportion of Rice Consumers by Location



Source: calculated using survey data of household living standards (QUIBB, 2003)

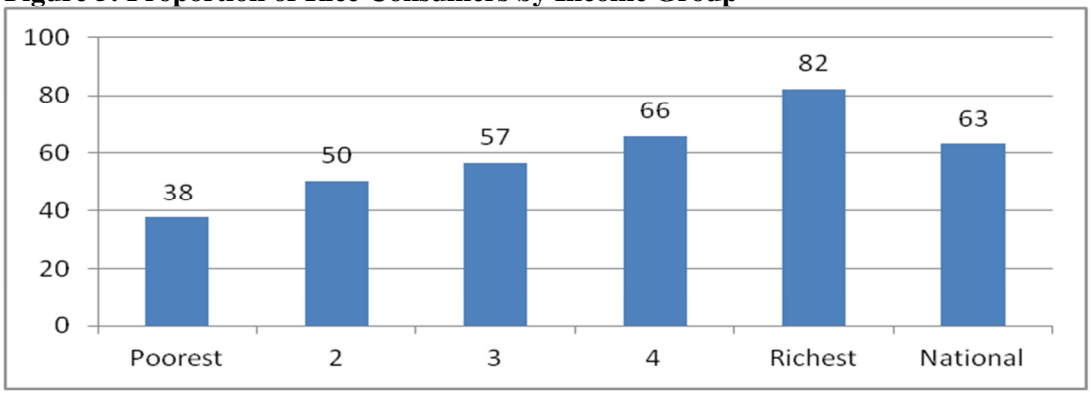
Figure 4: Proportion of Rice Consumers by Region



Source: calculated using survey data of household living standards (QUIBB, 2003)

Rice consumption considerably varies by income group (see figure 5). The proportion of rice consumers is more important in the high income group (82%) than in the low income group (38%).

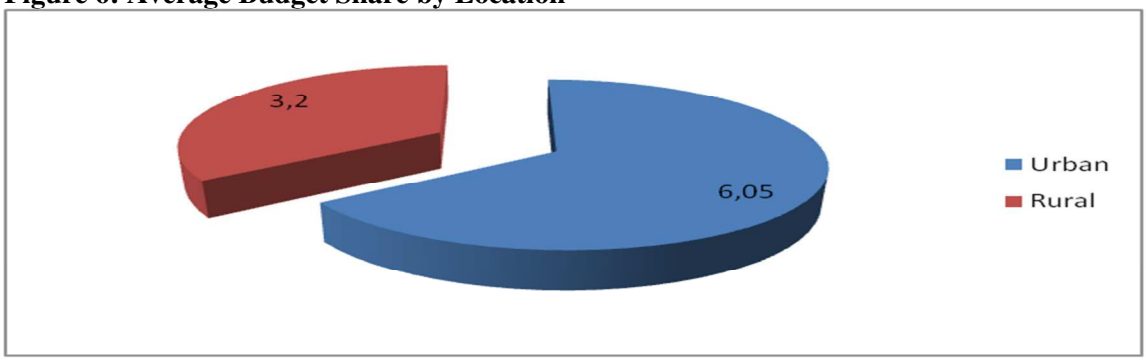
Figure 5: Proportion of Rice Consumers by Income Group



Source: calculated using survey data of household living standards (QUIBB, 2003)

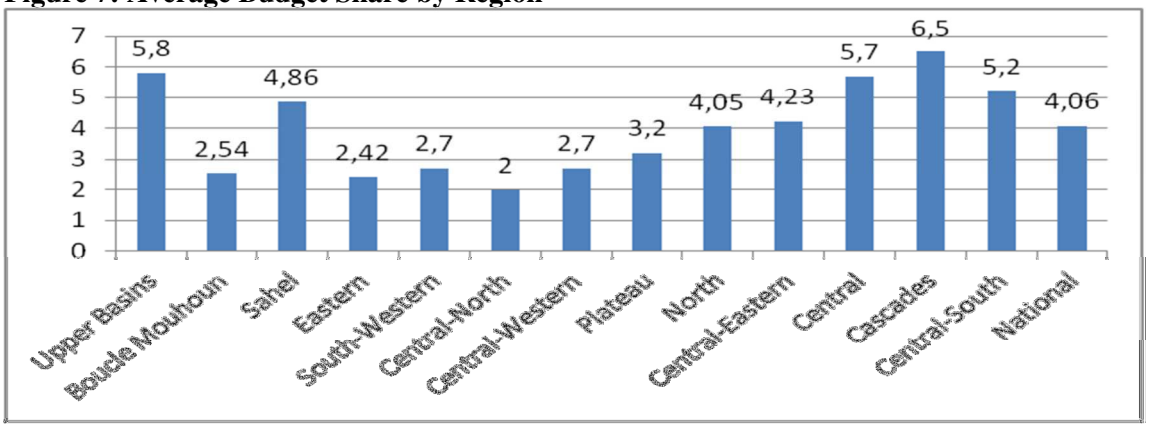
On average, each household affects 4.06% of its budget to rice consumption. The budget affected to rice consumption by urban households is more important (6.05%) than that of rural households (3.20%) (see figure 6). The budget shares affected to rice consumption vary across regions (figure 7). The regions with the more budget shares are Cascades (6.50%), Upper Basins (5.80%), Central (5.70%), Central-South (5.20%), Sahel (4.86%) and Central-Eastern (4.23%).

Figure 6: Average Budget Share by Location



Source: calculated using survey data of household living standards (QUIBB, 2003)

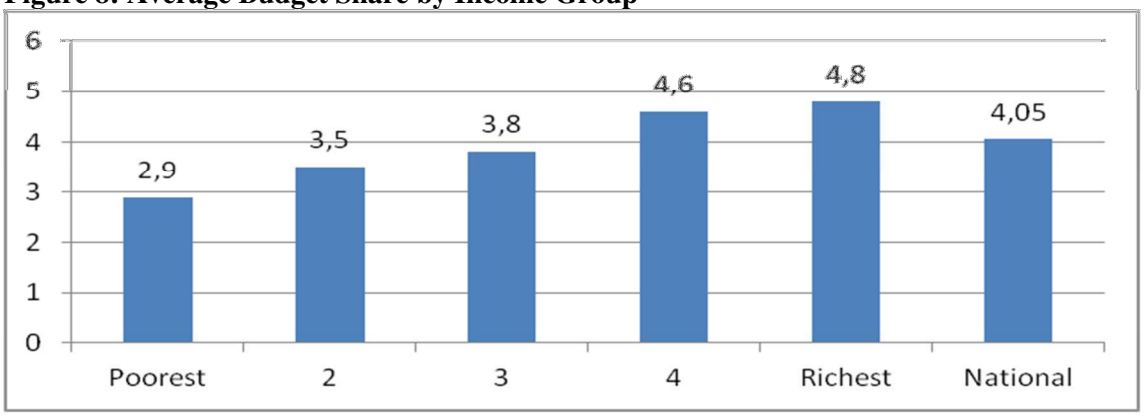
Figure 7: Average Budget Share by Region



Source: calculated using survey data of household living standards (QUIBB, 2003)

The budget shares affected to rice consumption vary by income groups. The richest households affect 4.80% of their budget to rice consumption against 2.90% for the poorest households.

Figure 8: Average Budget Share by Income Group



Source: calculated using survey data of household living standards (QUIBB, 2003)

5. Poverty Distribution in Burkina Faso

The absolute poverty line in Burkina Faso in 2003 was estimated to 82,672 CFAF ($US 0.40 per day) per person and per year (NSDI, 2003). This amount represents the level of food and non-food expenditures below which a person is considered as poor. This poverty line represents about 2/5 of $US 1[12] per day per capita, which is the international poverty line defined by the international community.

Tables 1 and 2 show the poverty indexes by location and by region for per capita expenditure and per adult equivalent expenditure respectively. These indexes are calculated using living standard survey (QUIBB, 2003). The results obtained with per capita consumption show that 51.60% of households in Burkina Faso are below poverty line. The result becomes lower if we use per adult equivalent expenditure (31.72%). The results are different across the regions. The poorest regions are Boucle Mouhoun, South-west, Plateau, North and Central-south, with the poverty lines above national average. The least poor regions are Upper Basins, Central-North and Central, with the poverty lines well below national average.

The poverty gap (P1) is of 23.26% and 12.10% with per capita expenditure and per adult equivalent expenditure, respectively. On average, the poverty gap is relatively less high in Burkina Faso. However, an analysis by region shows that the poverty gap is more important in the Boucle Mouhoun, North and Plateau regions. The results for the severity of poverty (P2) are relatively less high.

[12] $US 1 = 565 FCFA on August 2003

Furthermore, poverty is more pronounced in rural areas than in urban areas. The proportion of poor households is of 56.65% and 38.01% in rural and urban areas respectively. If we use per adult equivalent expenditure, we obtain the rates of 35.62% in rural area and of 21.19% in urban area.

Table 1: Poverty Profile by Location and by Region (per capita consumption)

		Poverty Indexes			Contribution to National Poverty		
Household Category	**Population (%)**	***P0***	***P1***	***P2***	***P0***	***P1***	***P2***
National	100,00	51,60	23,26	13,55	100,00	100,00	100,00
Location							
Urban	30,60	38,01	15,21	8,07	22,54	20,01	18,22
Rural	69,40	56,65	26,24	15,60	76,19	78,29	79,90
Regions							
Upper Basins	11,80	44,72	18,75	10,27	10,23	9,51	8,94
Boucle du Mouhoun	10,35	64,72	32,37	20,14	12,98	14,40	15,38
Sahel	7,02	47,42	17,44	8,57	6,45	5,26	4,44
Eastern	7,34	49,39	19,78	10,27	7,03	6,24	5,56
South-Western	6,10	60,47	28,45	16,72	7,15	7,46	7,53
Central-North	7,33	42,90	16,34	8,31	6,09	5,15	4,50
Central-Western	7,50	53,82	24,32	14,47	7,82	7,84	8,01
Plateau	4,50	60,46	29,40	18,10	5,27	5,69	6,01
North	7,74	68,31	32,85	20,38	10,25	10,93	11,64
Central-Eastern	7,20	52,40	25,06	15,48	7,31	7,76	8,23
Central	16,27	35,15	15,05	8,30	11,08	10,53	9,97
Cascades	3,05	43,00	20,21	12,46	2,54	2,65	2,80
Central-South	3,80	61,73	28,29	16,38	4,55	4,62	4,59

Source: calculated using Living Standard Survey of Burkina-Faso (QUIBB, 2003)

Table 2: Poverty Profile by Location and by Region (per adult equivalent consumption)

Household Category	Population (%)	Poverty Indexes			Contribution to National Poverty		
		P0	*P1*	*P2*	*P0*	*P1*	*P2*
National	100,00	31,72	12,10	6,35	100,00	100,00	100,00
Location							
Urban	30,60	21,19	7,05	3,41	20,44	17,83	16,43
Rural	69,40	35,62	13,97	7,44	77,93	80,13	81,31
Regions							
Upper Basins	11,80	26,83	9,00	4,36	9,98	8,78	8,10
Boucle du Mouhoun	10,35	44,28	18,62	10,36	14,45	15,93	16,89
Sahel	7,02	23,01	6,60	2,95	5,09	3,83	3,26
Eastern	7,34	27,04	8,15	3,61	6,26	4,94	4,17
South-Western	6,10	40,40	14,80	7,28	7,77	7,46	6,99
Central-North	7,33	21,61	6,63	2,77	4,99	4,02	3,20
Central-Western	7,50	31,18	12,86	7,20	7,37	7,97	8,50
Plateau	4,50	41,36	16,77	9,21	5,87	6,24	6,53
North	7,74	45,13	19,00	10,52	11,01	12,15	12,82
Central-Eastern	7,20	33,68	14,42	8,10	7,64	8,58	9,18
Central	16,27	20,13	7,32	3,73	10,33	9,84	9,56
Cascades	3,05	25,44	11,60	6,79	2,45	2,92	3,26
Central-South	3,80	40,10	14,93	7,45	4,80	4,69	4,46

Source: calculated using Living Standard Survey of Burkina-Faso (QUIBB, 2003)

6. Results

6.1. Net Benefit Ratio by Region and Location

The net position in a commodity refers to the net sales or purchases of the commodity for a household or a group of households. The net benefit ratio (NBR) is the value of net sales of a commodity as a percentage of household income. As discussed above, a positive NBR means that a household or group of households will gain from higher prices of the commodity in the short run, while a negative NBR means that it will lose.

Table 3 shows the net position in rice of different types of households in Burkina Faso. On average, rice production accounts for 7% of households' income and rice consumption represents 4% of the total. This implies an average NBR of -0.033 or -3.3%. The negative NBR is related to fact that Burkina Faso is a net rice importer. The net benefit ratio is negative in rural areas (-2.2%), indicating that rural households are adversely affected by

higher rice prices on average. It is not surprising that most urban households are net buyers, with a net benefit ratio strongly negative (-5.7%). Rice is more important to urban households, as a component in their expenditure.

Across the 13 administrative regions of Burkina Faso, the Cascades, Central and Upper Basins regions have the most negative NBRs (-6.5%, -5.6% and -5.1% respectively). In all three regions, households who are net buyers of rice account for over 75% of the total. Only one region (Plateau) has a positive NBR, which indicates that a large proportion of households are net rice sellers and would be less affected by an increase in rice price. The results presented by quintile of income shows that the NBR is more negative for the richest quintile of households (-4.4%) than for the poorest (-1.9%). This implies that the adverse effect of higher rice prices would be greatest on the rich.

Table 3: Rice Production, Rice Consumption and Net Position in Rice

Household Category	Population proportion	Production Ratio (PR)	Consumption Ratio (CR)	Net Benefit Ratio (PR – CR)	Net Seller	Neutral	Net Buyer
		(as a proportion of total expenditures)			(as a proportion of households)		
National	100,000	0,007	0,040	-0,033	2,320	37,920	59,760
Location							
Urban	30,600	0,003	0,060	-0,057	0,380	16,100	83,410
Rural	69,400	0,009	0,031	-0,022	3,170	47,390	49,340
Region							
Upper Basins	11,800	0,007	0,058	-0,051	1,300	23,420	75,280
Boucle du Mouhoun	10,350	0,001	0,025	-0,024	0,570	51,650	47,780
Sahel	7,020	0,001	0,048	-0,047	0,830	42,500	56,670
Eastern	7,340	0,008	0,024	-0,016	1,130	50,480	48,390
South-Western	6,100	0,020	0,027	-0,007	10,380	54,040	35,580
Central-North	7,330	0,008	0,019	-0,011	3,550	53,550	42,900
Central-Western	7,500	0,001	0,026	-0,025	1,100	44,290	54,620
Plateau	4,500	0,047	0,031	0,016	9,500	36,940	53,560
North	7,740	0,000	0,040	-0,040	0,150	52,580	47,270
Central-Eastern	7,200	0,018	0,042	-0,024	6,450	29,840	63,710
Central	16,270	0,000	0,056	-0,056	0,150	17,040	82,810
Cascades	3,050	0,000	0,065	-0,065	0,000	14,230	85,770
Central-South	3,800	0,012	0,052	-0,040	1,570	39,120	59,250
Quintile							
Poorest	13,450	0,009	0,028	-0,019	2,450	62,380	35,170
2	16,020	0,010	0,034	-0,024	3,240	51,100	45,660
3	17,730	0,010	0,037	-0,027	2,920	44,020	53,050
4	20,600	0,008	0,045	-0,037	2,570	35,730	61,690
Richest	32,200	0,003	0,047	-0,044	1,320	19,170	79,520

6.2. Impact of Higher Rice Prices on the Welfare of Households

6.2.1. Impact of Higher Rice Prices on Real Income

Equations 8 and 9 are used to estimate the impact of higher rice prices on real income. Table 4 shows the results of the impact in the short and long run. On average, the increase in rice prices adversely affects the real income of households in Burkina Faso. The income losses are estimated to 0.49% and 0.3% in the short and long run, respectively. Urban households are more negatively affected than rural households. This might be explained by the fact that the most urban households are net buyers of rice (84%) and they affect a more important budget share on rice consumption than rural households. If we assume a 15% increase in consumer price and a 30% increase in producer price, three regions benefit from these increases in the short and long run (South-Western, Plateau and Central-South). This is related to the fact that in these regions there is a more important proportion of rice producers (more than 60%) and a proportion of these producers derive their income from production. Looking at the impact by quintile of income, both poor and rich households are adversely affected by rising rice prices, but the losses are higher for rich households than for poor ones. Overall, higher rice prices are detrimental to a large majority of households since they are net buyers of rice.

Table 4: Impact of Higher Rice Prices on Real Income

Household Category	Initial NBR	Short run Impact		Long run Impact			
		Simulation 1 $P_c\uparrow 15\%$ $P_p\uparrow 15\%$	Simulation 2 $P_c\uparrow 15\%$ $P_p\uparrow 30\%$	Simulation 1 $P_c\uparrow 15\%$ $P_p\uparrow 15\%$ $\varepsilon^d=-0.20$ $\varepsilon^s=0.20$	Simulation 2 $P_c\uparrow 15\%$ $P_p\uparrow 30\%$ $\varepsilon^d=-0.20$ $\varepsilon^s=0.20$	Simulation 3 $P_c\uparrow 15\%$ $P_p\uparrow 15\%$ $\varepsilon^d=-0.40$ $\varepsilon^s=0.40$	Simulation 4 $P_c\uparrow 15\%$ $P_p\uparrow 30\%$ $\varepsilon^d=-0.40$ $\varepsilon^s=0.40$
National	-3,3	-0,49	-0,37	-0,49	-0,37	-0,47	-0,35
Location							
Urban	-5,7	-0,76	-0,72	-0,76	-0,72	-0,74	-0,7
Rural	-2,2	-0,37	-0,22	-0,37	-0,2	-0,35	-0,19
Regions							
Upper Basins	-5,1	-0,69	-0,57	-0,69	-0,57	-0,67	-0,54
Boucle du Mouhoun	-2,4	-0,44	-0,42	-0,44	-0,42	-0,43	-0,41
Sahel	-4,7	-0,59	-0,57	-0,59	-0,57	-0,58	-0,55
Eastern	-1,6	-0,2	-0,01	-0,2	-0,01	-0,19	0,01
South-Western	-0,7	-0,1	0,14	-0,1	0,14	-0,08	0,17
Central-North	-1,1	-0,22	-0,11	-0,22	-0,11	-0,21	-0,09
Central-Western	-2,5	-0,39	-0,35	-0,39	-0,35	-0,38	-0,34
Plateau	1,6	-0,15	0,25	-0,1	0,25	-0,13	0,3
North	-4	-0,58	-0,52	-0,58	-0,52	-0,56	-0,5
Central-Eastern	-2,4	-0,5	-0,3	-0,5	-0,3	-0,48	-0,27
Central	-5,6	-0,82	-0,79	-0,82	-0,79	-0,8	-0,77
Cascades	-6,5	-0,83	-0,82	-0,83	-0,82	-0,81	-0,8
Central-South	-4	-0,16	0,31	-0,16	0,31	-0,14	0,37
Quintile							
Poorest	-1,9	-0,37	-0,19	-0,37	-0,19	-0,35	-0,16
2	-2,4	-0,48	-0,4	-0,48	-0,4	-0,47	-0,38
3	-2,7	-0,42	-0,29	-0,42	-0,29	-0,41	-0,27
4	-3,7	-0,44	-0,29	-0,44	-0,29	-0,42	-0,26
Richest	-4,4	-0,6	-0,52	-0,6	-0,52	-0,59	-0,5

6.2.2. Impact of Higher Rice Prices on Poverty

Equations 10 and 11 are used to estimate the impact of higher rice prices on the three poverty indicators: headcount poverty (P0), poverty gap (P1) and severity of poverty (P2). We discuss the impact of higher rice prices on headcount poverty in this section[13]. The poverty line used is equal to 82,672 CFAF per capita and per year (NSDI, Burkina Faso, 2003). This poverty line corresponds to $US 146 per capita per year.

Table 5 shows the effect of higher rice prices on poverty in Burkina Faso under different assumptions about household responses and about the margin between producer and consumer prices. At the national level, an increase in both consumer and producer prices in the short and long run increases poverty rate that varies between 2.2 and 2.6 percentage points depending on simulations. These percentages correspond to increases in number of poor by 268,334 and 317,122. In the long run, the effects are less negative as households adapt to the price increases. For example, if the producer price rises more than the consumer price, the poverty rate increases by 2.25 percentage points in the long run, this is less important than in the other simulations.

Both urban and rural households lose from higher rice prices both in the short and long run, but the average losses are more important for urban households (almost equal to 4 percentage points) than for rural ones (about 2 percentage points). Indeed, urban households affect a large budget to rice consumption. The increase in rice prices will lead to a decline in their purchasing power and this will result in an increase in the number of poor more important in urban areas than in rural areas.

The poverty impact is quite varied across regions. The increase in rice prices leads to an increase in poverty that varies between 0.16 and 4 percentage points in most of the regions. The poverty rate only decreases in the South-Western (1.07 percentage points in the short run and 1.34 percentage points in the long run). The decline in poverty is greater in this region when producer price increases faster than consumer price and when the elasticities are high. Indeed, the South-Western has an initial poverty rate of 60.47% and a large proportion of rice producers who benefit from higher rice prices. This contributes to reduce the poverty rate in this region.

[13] The results for P1 and P2 indicators are available upon request.

Table 6 shows the results on poverty using per adult equivalent expenditure. The results are different from those obtained in the previous case. The impact is high in the short and long run. At the national level, the poverty rate increases and varies between 2.6 and 2.9 percentage points depending on simulations.

The increase in rice prices raises the poverty rate by 5 and 2 percentage points in urban and rural areas, respectively. The Eastern, Plateau and Central-South regions are less adversely affected by higher rice prices because of the fact that the number of rice producers is relatively more important in these three regions than in the other regions. The South-Western is the only region where the poverty rate declines in the short and long run depending on simulations. This result is almost similar to that found with the variable of per capita consumption and the explanation given above is equally applicable here.

We perform a sensitive analysis by taking the supply elasticities in the range of 0.20 and 0.40 and demand elasticities in the range of -0.40 and -0.20 from a uniform probability distribution. The results (minimum and maximum values) do not differ significantly from those found previously[14].

[14] The results for sensitivity analysis are available upon request.

Table 5: Impact of Higher Rice Prices on Headcount Poverty Index (per capita consumption)

Household Category	Initial Poverty Rate	Short run Impact		Long run Impact			
		Simulation 1 $P_c\uparrow 15\%$ $P_p\uparrow 15\%$	Simulation 2 $P_c\uparrow 15\%$ $P_p\uparrow 30\%$	Simulation 1 $P_c\uparrow 15\% P_p\uparrow 15\%$ $\varepsilon^d=-0.20$ $\varepsilon^s=0.20$	Simulation 2 $P_c\uparrow 15\%$ $P_p\uparrow 30\%$ $\varepsilon^d=-0.20$ $\varepsilon^s=0.20$	Simulation 3 $P_c\uparrow 15\%$ $P_p\uparrow 15\%$ $\varepsilon^d=-0.40$ $\varepsilon^s=0.40$	Simulation 4 $P_c\uparrow 15\%$ $P_p\uparrow 30\%$ $\varepsilon^d=-0.40$ $\varepsilon^s=0.40$
National	51,6	2,61	2,27	2,54	2,27	2,55	2,25
Location							
Urban	38,01	3,98	3,94	3,99	3,92	3,95	3,91
Rural	56,65	2,09	1,76	2	1,64	2	1,62
Region							
Upper Basins	47,72	0,49	0,16	0,42	0,08	0,43	0,08
Boucle du Mouhoun	64,72	2,43	2,43	1,77	2,18	2,18	2,17
Sahel	47,42	2,52	2,38	2,58	2,38	2,53	2,38
Eastern	49,39	1,16	0,28	1,16	0,06	1,16	0,06
South-Western	60,47	-0,1	-1,08	-0,07	-1,07	-0,09	-1,34
Central-North	42,89	1,55	1,55	1,55	1,56	1,56	1,56
Central-Western	53,82	2,58	2,43	2,23	2,08	2,23	2,08
Plateau	60,46	2,99	2,76	2,99	2,62	2,99	2,61
North	68,31	2,67	2,67	2,69	2,69	2,67	2,67
Central-Eastern	52,4	3,09	2,75	3,1	2,75	3,09	2,75
Central	35,15	3,62	3,62	3,65	3,63	3,62	3,62
Cascades	43	4,18	4,18	4,2	4,19	4,18	4,18
Central-South	61,73	3,27	2,44	3,27	2,45	3,27	2,44

Source: simulations based on survey data of household living standards (QUIBB, 2003)

Table 6: Impact of Higher Rice Prices on Headcount Poverty Index (per adult equivalent consumption)

Household Category	Initial Poverty Rate	Short run Impact		Long run Impact			
		Simulation 1 P_c↑15% P_p↑15%	Simulation 2 P_c↑15% P_p↑30%	Simulation 1 P_c↑15% P_p↑1% ε^d=-0.20 ε^s=0.20	Simulation 2 P_c↑15% P_p↑30% ε^d=-0.20 ε^s=0.20	Simulation 3 P_c↑15% P_p↑15% ε^d=-0.40 ε^s=0.40	Simulation 4 P_c↑15% P_p↑30% ε^d=-0.40 ε^s=0.40
National	31,72	2,97	2,82	2,88	2,73	2,81	2,66
Location							
Urban	21,19	5,79	5,73	5,56	5,5	5,4	5,34
Rural	35,62	1,93	1,74	1,89	1,7	1,86	1,66
Region							
Upper Basins	26,83	2,92	2,78	2,64	2,5	2,64	2,5
Boucle du Mouhoun	44,28	2,84	2,84	2,84	2,84	2,84	2,84
Sahel	23,01	3,88	3,88	3,7	3,7	3,7	3,7
Eastern	27,04	1,01	0,86	1,01	0,86	1,01	0,68
South-Western	40,4	0,03	-1,05	0,03	-1,05	-0,39	-1,28
Central-North	21,61	1,11	1,11	1,11	1,11	1,11	1,11
Central-Western	31,18	2,38	2,22	2,38	2,22	2,38	2,22
Plateau	41,36	1,12	0,6	1,12	0,6	1,12	0,6
North	45,13	5,37	5,05	5,37	5,05	5,37	5,05
Central-Eastern	33,68	2	2	2	2	2	2
Central	20,13	6,14	6,14	5,82	5,82	5,53	5,53
Cascades	25,44	5,63	5,63	5,63	5,63	5,63	5,63
Central-South	40,09	0,84	0,84	0,84	0,84	0,84	0,84

Source: simulations based on survey data of household living standards (QUIBB, 2003)

6.2.3. Impact of Higher Rice Prices on Income Inequality

We estimate the impact of higher rice prices on inequality using the Gini and Theil Indexes. Tables 7 and 8 show the results for Gini index with per capita consumption and per adult equivalent consumption, respectively. On average, rising rice prices lead to an increase in inequality that varies between 0.4 and 0.5 percentage points depending on the simulations (with per capita consumption). This might be explained by the fact that a large proportion of rice producers are in the intermediate income group. These producers benefit from higher rice prices and this contributes to increase income inequality. We can observe a confirmation of this result by the fact that rising inequality is as important as when producer price increases faster than consumer price (simulation2 versus simulation1 in the short run and simulation2 versus simulation1 and simulation4 versus simulation3 in the long run).

The impact of higher rice prices on inequality is greater in urban areas (1.3 percentage points on average) than in rural areas (varying from 0.3 to 0.6 percentage point). Indeed, urban areas have an initial index of income inequality higher than that of rural areas. In addition, the gap between the proportion of net consumers of rice in low income groups (9.6%) and the proportion of net consumers in high income groups (12.45%) is not very high in urban areas. Regarding rice producers who live in urban areas, the income from rice production of rich households represents four times that of poor households. In addition, the proportion of net producers of rice is lower in urban areas than in rural areas.

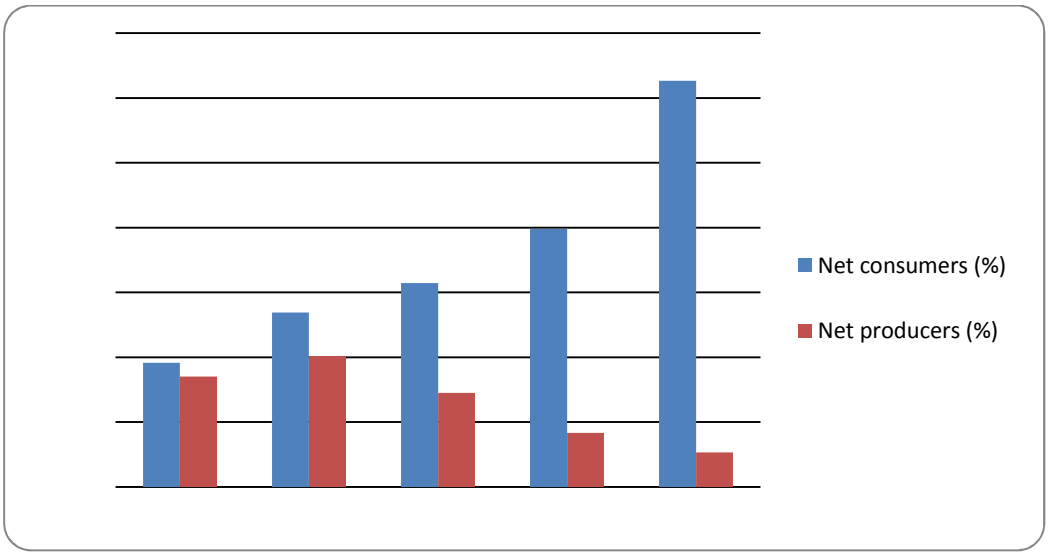
Rising rice prices increases inequality in most of the regions except for a few of them. We observe that income inequality declines in the South-Western where the proportion of net producers of rice is the most important. In this region, all income groups derive income from rice production. But, income from production is higher for poor households than for rich households (about 25%). However, on average, households from South-Western region are net consumers of rice. An analysis by income group shows that poor households in this region are net producers while rich households are net consumers. In addition, rich households allocate a greater budget to rice consumption than poor households. Figure 9 shows clearly the decreasing relation between the proportion of net producers and the income level. Rice producers from South-Western region and particularly poor farmers benefit from higher prices. This contributes to reduce the income inequality gap.

Rising rice prices also lead to a decrease in inequality in the North and Boucle du Mouhoun regions in the short and long run. These two regions have the same characteristics in terms of number of rice farmers (about 10%) and of rice consumers (less than of 50% of population). In addition, in these two regions, the budget affected by rich households to rice consumption is greater than that of poor households. Indeed, the negative effect of higher rice prices on purchasing power will be more important for rich households than for poor. Furthermore there is a proportion of rice producers higher than the national average, which decreases with the income level, particularly in the North (figure 10).

The use of per adult equivalent consumption to calculate income inequality indexes gives results almost similar to those obtained with per capita consumption. We observe a decrease in inequality in the South-Western and North regions. In contrast, inequality increases in the Boucle Mouhoun.

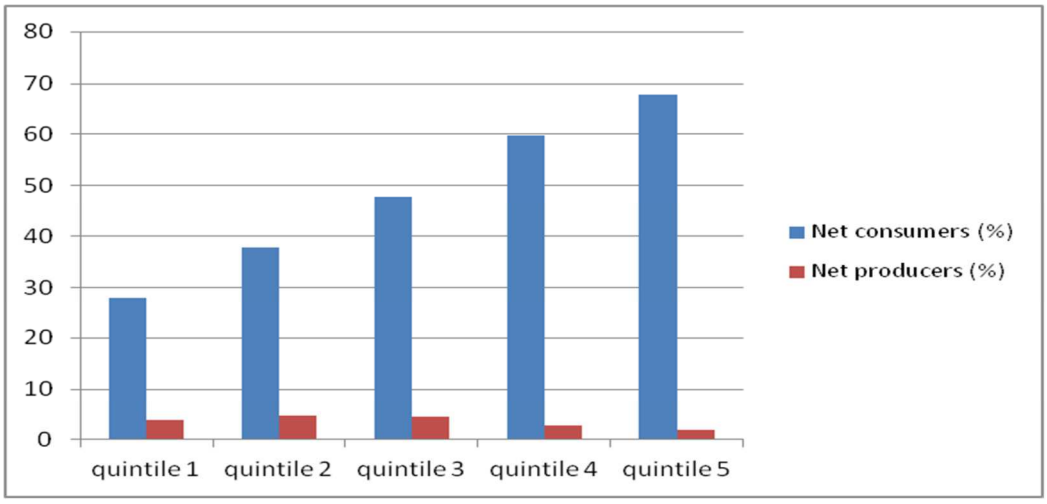
Tables 9 and 10 show the results for the Theil index with per capita consumption and per adult equivalent consumption, respectively. The results are higher than those obtained for the Gini index in the two cases. Rising rice prices leads to an increase in income inequality at the national level that varies between 1.4 and 1.6 percentage points (with per capita consumption). The increase in income inequality is higher in urban areas (between 3.5 and 3.7 percentage points) than in rural areas (between 1 and 1.7 percentage points). We also observe an increase in income inequality in most of the regions except for the South-Western and North regions where income inequality decreases. The use of per adult equivalent consumption gives results almost similar.

Figure 9: Proportion of Net Consumers and Producers (South-Western region)



Source : Constructed by author using survey data QUIBB, 2003

Figure 10: Proportion of Net Consumers and Producers (North region)



Source : Constructed by author survey data QUIBB, 2003

Table 7: Impact of Higher Rice Prices on Income Inequality (per capita consumption)

Household Category	Initial Gini Index	Short run Impact		Long run Impact			
		Simulation 1 P_c↑15% P_p↑15%	Simulation 2 P_c↑15% P_p↑30%	Simulation 1 P_c↑15% P_p↑15% ε^d=-0.20 ε^s=0.20	Simulation 2 P_c↑15% P_p↑30% ε^d=-0.20 ε^s=0.20	Simulation 3 P_c↑15% P_p↑15% ε^d=-0.40 ε^s=0.40	Simulation 4 P_c↑15% P_p↑30% ε^d=-0.40 ε^s=0.40
National	55,76	56,19	56,32	56,18	56,31	56,16	56,31
Location							
Urban	58,19	59,51	59,55	59,48	59,52	59,45	59,5
Rural	51,76	52,1	52,39	52,1	52,4	52,09	52,42
Regions							
Upper Basins	51,04	51,38	51,44	51,36	51,43	51,32	51,42
Boucle du Mouhoun	51,55	51,53	51,64	51,53	51,64	51,52	51,64
Sahel	46,72	47,03	47,04	47,02	47,03	47,01	47,02
Eastern	48	48,11	48,37	48,11	48,39	48,11	48,41
South-Western	50,23	49,79	49,83	49,79	49,84	49,79	49,85
Central-North	46,34	46,5	47	46,5	47	46,51	47,03
Central-Western	53,72	54,02	54,12	54,02	54,12	54,01	54,12
Plateau	52,91	53,88	54,84	53,88	54,89	53,88	54,94
North	49,06	48,85	48,83	48,84	48,82	48,82	48,81
Central-Eastern	54,87	55,56	55,82	55,55	55,83	55,53	55,83
Central	60,8	62,44	62,4	62,4	62,36	62,36	62,32
Cascades	55,3	56,74	56,72	56,71	56,69	56,68	56,66
Central-South	52,19	54,74	56,67	54,75	56,76	54,76	56,85

Source: simulations based on survey data of household living standards (QUIBB, 2003)

Table 8: Impact of Higher Rice Prices on Income Inequality (per Adult Equivalent consumption)

Household Category	Initial Gini Index	Short run Impact		Long run Impact			
		Simulation 1 P_c↑15% P_p↑15%	Simulation 2 P_c↑15% P_p↑30%	Simulation 1 P_c↑15% P_p↑15% ε^d=-0.20 ε^s=0.20	Simulation 2 P_c↑15% P_p↑30% ε^d=-0.20 ε^s=0.20	Simulation 3 P_c↑15% P_p↑15% ε^d=-0.40 ε^s=0.40	Simulation 4 P_c↑15% P_p↑30% ε^d=-0.40 ε^s=0.40
National	53,22	53,7	53,84	53,68	53,83	53,67	53,83
Location							
Urban	55,44	56,83	56,87	56,79	56,84	56,76	56,81
Rural	49,8	50,16	50,45	50,15	50,47	50,15	50,48
Regions							
Upper Basins	48,64	49,05	49,15	49,04	49,15	49,02	49,14
Boucle du Mouhoun	49,49	49,6	49,72	49,6	49,72	49,6	49,73
Sahel	44,05	44,36	44,37	44,35	44,36	44,33	44,35
Eastern	45,98	46,14	46,43	46,14	46,45	46,14	46,47
South-Western	47,49	46,95	46,98	46,95	47	46,95	47,01
Central-North	43,97	44,11	44,58	44,12	44,61	44,12	44,64
Central-Western	51,66	51,99	52,08	51,98	52,08	51,98	52,08
Plateau	51,54	52,5	53,43	52,5	53,48	52,5	53,53
North	46,31	46,21	46,21	46,19	46,2	46,18	46,18
Central-Eastern	53,13	53,86	54,12	53,85	54,12	53,83	54,12
Central	58,02	59,78	59,75	59,73	59,7	59,69	59,65
Cascades	53,28	54,78	54,76	54,75	54,73	54,72	54,7
Central-South	50,3	52,86	54,73	52,86	54,82	52,87	54,91

Source: simulations based on survey data of household living standards (QUIBB, 2003)

Table 9: Impact of Higher Rice Prices on Income Inequality (per capita consumption)

Household Category	Initial Theil Index	Short run Impact		Long run Impact			
		Simulation 1 $P_c\uparrow 15\%$ $P_p\uparrow 15\%$	Simulation 2 $P_c\uparrow 15\%$ $P_p\uparrow 30\%$	Simulation 1 $P_c\uparrow 15\%$ $P_p\uparrow 15\%$ $\varepsilon^d=-0.20$ $\varepsilon^s=0.20$	Simulation 2 $P_c\uparrow 15\%$ $P_p\uparrow 30\%$ $\varepsilon^d=-0.20$ $\varepsilon^s=0.20$	Simulation 3 $P_c\uparrow 15\%$ $P_p\uparrow 15\%$ $\varepsilon^d=-0.40$ $\varepsilon^s=0.40$	Simulation 4 $P_c\uparrow 15\%$ $P_p\uparrow 30\%$ $\varepsilon^d=-0.40$ $\varepsilon^s=0.40$
National	66,03	67,45	67,66	67,42	67,64	67,38	67,63
Location							
Urban	72,73	76,43	76,5	76,36	76,44	76,29	76,38
Rural	53,06	54,08	54,74	54,06	54,77	54,04	54,8
Regions							
Upper Basins	51,42	52,82	52,77	52,78	52,74	52,73	52,71
Boucle du Mouhoun	53,01	53,44	53,69	53,43	53,69	53,42	53,7
Sahel	46,24	47,83	47,77	47,78	47,73	47,74	47,69
Eastern	43,35	43,48	44,22	43,48	44,28	43,48	44,33
South-Western	56,43	55,94	55,53	55,92	55,51	55,9	55,49
Central-North	41,42	41,98	43,22	42	43,31	42,01	43,4
Central-Western	56,51	57,47	57,73	57,45	57,73	57,44	57,73
Plateau	56,4	58,28	60,03	58,26	60,13	58,24	60,24
North	47,34	47,07	46,97	47,04	46,94	47,02	46,92
Central-Eastern	57,92	59,59	60,22	59,56	60,23	59,53	60,25
Central	77,81	82,07	81,96	82	81,87	81,92	81,79
Cascades	63,97	68,34	68,31	68,26	68,23	68,18	68,15
Central-South	59,1	64,92	72,74	64,95	72,15	64,99	72,56

Source: simulations based on survey data of household living standards (QUIBB, 2003)

Table 10: Impact of Higher Rice Prices on Income Inequality (per adult equivalent consumption)

Household Category	Initial Theil Index	Short run Impact		Long run Impact			
		Simulation 1 P_c↑15% P_p↑15%	Simulation 2 P_c↑15% P_p↑30%	Simulation 1 P_c↑15% P_p↑15% ε^d=-0.20 ε^s=0.20	Simulation 2 P_c↑15%P_p↑30% ε^d=-0.20 ε^s=0.20	Simulation 3 P_c↑15%P_p↑15% ε^d=-0.40 ε^s=0.40	Simulation 4 P_c↑15% P_p↑30% ε^d=-0.40 ε^s=0.40
National	57,78	59,14	59,37	59,11	59,36	59,07	59,35
Location							
Urban	62,49	65,85	65,92	65,79	65,86	65,72	65,81
Rural	48,45	49,5	50,14	49,48	50,17	49,47	50,2
Regions							
Upper Basins	45,18	46,61	46,65	46,57	46,62	46,52	46,6
Boucle du Mouhoun	48,42	48,95	49,22	48,94	49,22	48,93	49,22
Sahel	41,04	42,64	42,59	42,6	42,55	42,56	42,51
Eastern	39,16	39,45	40,26	39,45	40,32	39,45	40,37
South-Western	50,17	49,52	49,11	49,5	49,1	49,48	49,08
Central-North	36,11	36,5	37,53	36,51	37,61	36,53	37,68
Central-Western	51,05	52,02	52,25	52,01	52,25	51,99	52,25
Plateau	52,87	54,69	56,23	54,67	56,32	54,64	56,42
North	41,5	41,59	41,52	41,56	41,49	41,53	41,47
Central-Eastern	52,78	54,5	55,06	54,46	55,07	54,43	55,08
Central	66,91	70,84	70,74	70,77	70,66	70,7	70,58
Cascades	56,4	60,47	60,44	60,4	60,36	60,32	60,29
Central-South	55,43	61,05	67,29	61,07	67,66	61,1	68,03

Source: simulations based on survey data of household living standards (QUIBB, 2003)

7. Conclusion

This paper estimates the impact of higher international rice price on poverty and inequality in Burkina Faso. The determination of production and consumption ratios using living standard survey (QUIBB, 2003) shows that most households are net consumers of rice. A great majority of these consumers live in urban areas. In addition, there are rice producers in all income groups, but the proportion of rice producers in the intermediate and high income groups is the most important.

The simulations based on the concept of compensating variation of income and the indicator of net benefit ratio developed by Deaton (1989) show that higher rice prices have a negative effect on the real income in the short and long run. This effect is higher in urban areas than in rural areas. It is also high for higher income groups and in the regions where rice production is very low. If we assume an increase in producer price (30%) more important than that of consumer (15%), the effect is positive for the South-Western, Plateau and Central-South regions because these regions have a larger proportion of rice producers than other regions and they benefit from higher rice prices. The effect is more interesting in the long run for these regions.

The effect of higher rice prices on poverty is negative in the short and long run. If we use the per capita consumption, an increase in rice prices leads to an increase in poverty that varies between 2.2 and 2.6 percentage points depending on simulations. The variation of poverty rate is from 2.6 to 2.9 percentage points with per adult equivalent consumption. The negative effect on poverty is higher in urban areas than in rural areas. Rising rice prices increase poverty in most of the regions except for the South-Western where there is a large proportion of rice producers who benefit from higher prices. Furthermore, the rise in rice prices increases inequality except for some regions, which are the rice producing areas. The increase in inequality is higher in urban areas than in rural areas. Indeed, the proportion of net producers of rice is not significant in the population and there is not a clear relationship between this proportion and income level at the aggregated level.

Overall, the results of this paper show that the changes in world rice prices have a significant impact on households' income, poverty and inequality in Burkina Faso. This highlights the country's vulnerability to food price shocks on international markets. One approach to mitigate this vulnerability would be to implement the economic policies in order to limit the

strong dependence of a country vis-à-vis imports. For example, governments could invest to develop the rice local industry in order to meet the domestic demand and encourage exports. In the short run, government could implement sound subsidy policies of grain prices by region. Another issue related to this topic is the high degree of concentration on the import side. The oligopoly structure of the import market may stress the impact of price shocks and reduce the impact of policy options (such as tariff cuts) taken by the government.

Finally, note that the methodology used in this paper corresponds to the maximum effect that would be observed following the increase in rice prices. Indeed, one can imagine that if there are major changes in rice price, households will substitute other grains to rice. However, we generally observe that the price of locally produced cereals tends to follow the same trends as those that are imported.

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