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Rice Markets in Madagascar in Disarray:

Policy Options for Increased Efficiency and Price Stabilization

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Abstract

Faced with a production shortfall in early 2004 and a sharp rise in the price of imported rice due to a depreciation of the Malagasy franc and a spike in international rice prices, Madagascar attempted to stabilize domestic rice prices through public tenders for rice imports and subsidized sales at official prices. This paper discusses the 2004 rice crisis, chronicling the events that triggered the crisis and the subsequent interventions by the government, and analyzes the impacts of the policies adopted and steps taken to spur development of the domestic rice market. Using a partial equilibrium model, the paper also quantifies the overall costs and benefits of a change in import duties for various household groups, and compares this intervention to a policy of targeted food transfers or security stocks. as well as other options for price stabilization, including a reduction in import duties and a security stock policy.

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1. Introduction

Bart Minten and Paul Dorosh

Agricultural markets play an important role in the welfare of the population in agricultural economies. If markets function badly, they lead to lower incomes for producers, higher prices for consumers and reduced household welfare. In Madagascar, rice markets are particularly important, since rice is the most important staple and rice production is a major source of income and employment. Levels and stability of rice prices thus have major effects on welfare of rice farmers (about 60 percent of the population) and consumers (essentially the entire population).

Rice markets in Madagascar, however, do not function well, in large part because of high transactions costs that limit trade and lower market efficiency. High transport costs within the country as well as to international markets are one major component of transactions costs, but other institutional and policy factors also play a role. Insecurity arising from theft of stocks or rice shipments limits profitability of rice trade. Lack of institutions to effectively enforce contracts and to resolve contract disputes inhibits the use of contracts and therefore the development of more sophisticated trade. Similarly, absence of institutional credit constrains grain storage for many farmers and small traders (Fafchamps, 2004).

Government policies to spur development of rice markets, stabilize prices and provide appropriate price incentives for producers and consumers have varied considerably over time, alternating between government interventionism and market liberalization. From the early to mid-1980s, the government intervened heavily in rice markets, as government parastatals were the sole legal purchasers of rice from producers and government sales of subsidized rice dominated urban markets. Market liberalization in the later 1980s resulted in far less government intervention, but with mixed results. Liberalization did not lead to widespread rice shortages as some critics had feared, but did not lead to a large positive supply effect, either, in part due to other constraints on production and markets. While margins were large and seasonal variation high (especially in rural areas), there was no evidence that this did not reflect costs. However, a production shortfall in early 2004 and subsequent sharp price increases led the government again to intervene in markets, imposing restrictions on rice imports and prices, and re-starting direct distribution and sales of rice.

The objectives of this report are to describe the functioning of rice markets in Madagascar and to analyze policy options for rice market development and price stabilization, with a special focus on the 2004 rice crisis. Although the analysis has implications for medium-term rice policy and social protection, the report is not intended to be an overall review of these broader issues. Section two presents an overview of the rice economy of Madagascar, including production and consumption patterns over time and the structure of the rice value chain. In section three, we discuss the 2004 rice crisis, including the events that triggered the crisis and the subsequent interventions by the government. Section four discusses the aftermath of the crisis and lessons learnt. Section five lays out options for price stabilization, discussing the benefits and costs of a reduction in import

duties and a security stock policy. The last section includes a summary and policy conclusions.

2. The rice economy of Madagascar

Bart Minten, Marie-Hélène Dabat and Ziva Razafintsalama

2.1. Production

2.1.1. Historical context and trends

Madagascar is a rice economy par excellence as documented by different studies and datasets.[2] For example, a commune census that was conducted in 2001 shows that the rice crop is stated to be the most important crop in the majority of the communes of the country, in terms of both area and value of production (Graphs 1 and 2). The only region where the rice crop is stated to be less important is in the eastern part of the country – where cash crops are a more important source of incomes - and the south where maize and cassava are the main crops. The latter region is characterized by a drier climate that makes rice production more problematic than in the rest of the country.[3]

However, performance in the rice sector has been sluggish (World Bank, 2003a; Bockel, 2003). While the total production of rice increased from 1,9 million tons in 1970 to 3,0 million tons in 2004, the per capita production has fallen from 237 kg per year in 1970 to 179 kg per year in 2004 (FAO). Population growth, at an annual average of almost 3%, has thus mostly outpaced production growth (Graph 3). As the cultivated area in rice has increased on average by 0,6% per year and yields by 0,5% per year over the period as a whole, total production increased by 1,1%, i.e. significantly below population growth.

Rice productivity in Madagascar started off on the same, or even better, footing as other countries, such as Mali and Indonesia (Graph 4). While yields stayed relatively stable in Madagascar, they increased significantly in these other two countries. Yields in Indonesia and Madagascar were similar in the beginning of the 1970s, but today yields in Indonesia exceed those in Madagascar by 2.5 tons per hectare. Yields in Mali were significantly lower than those in Madagascar in the beginning of the 1970s, but are now approximately the same as those in Madagascar.

The rice production technologies used in Madagascar are still largely traditional. The Green Revolution that increased rice yields in other rice economies has largely bypassed Madagascar. Local rice production is characterized by high labor intensity and few external inputs. The adoption of improved agricultural technologies is low. Nonetheless, there have been some changes over the years (Table 1). For example, using statements based on recall questions to focus groups in a nationally representative commune survey in 2004, it is

[2] See Bockel, 2002; Fraslin, 2002; IFPRI-FOFIFA, 1998; Le Bourdiec, 1974; Minten and Zeller, 2000; Pryor, 1990; Razafindravonona et al., 2001; Roubaud, 1997; UPDR-FAO, 2000; World Bank, 2003; Dorosh et al., 1990; Dorosh, 1994; Dorosh et al., 2003.

[3] Compared to ten years earlier, little change has been noted: the number of communes that reported rice as their main crop in value terms decreased by about 8%. However, this is partly explained by the high prices of cloves and vanilla in the year 2001.

estimated that the use of improved seeds, chemical fertilizer and in-line transplanting has slightly improved over the last fifteen years.

The lack of big changes in production and productivity is reflected in the trend of the real price levels (Graph 5). The real price of rice in the period 2000-2003 (as measured by the retail price of rice in Antananarivo divided by the non-rice consumer price index for Antananarivo) is similar to the level in the middle of the 1980s (i.e. just after the market liberalization measures that had been taken). This is in contrast with countries such as Bangladesh that saw a drop in the real price level of rice over time due a change in productivity driven by government investments in roads and irrigation infrastructure (Dorosh et al., 2004).

2.1.2. Current situation

85% of current agricultural producers, representing 60% of the total population, cultivate rice, illustrating the importance of rice in the agricultural sector. Rice productivity varies according to cropping system (Bockel, 2002; Keck et al., 1993; Minten et al., 2003; Le Bourdiec, 1974; UPDR-FAO, 2000). These include lowland rice, rainfed upland rice and tavy (or upland slash-and-burn) rice. Most of the rice in Madagascar is produced on lowlands: Based on the data of the national household survey of 2001 (the 'Enquête Permanente auprès des Ménages' or EPM), 89% of the rice plots are estimated to be situated in lowlands. Yields are highest on these lowlands, especially on plots with good water management (UPDR-FAO, 2000). Yields are significantly lower in upland rainfed cropping systems (4% of the plots) and are lowest under slash-and-burn conditions (7% of the plots).[4]

To get at the current problems in Malagasy rice productivity, rural focus groups were asked at the end of 2004 to evaluate the importance of different constraints to improve rice productivity (Table 2). For each constraint, they were given the choice between four categories, ranking from 'not important' to 'very important'. 85% of the population stated that inadequate irrigation was the most important constraint to increasing rice productivity. The two other most important constraints as reported by these focus groups were access to cattle to work the land and access to better equipment. Thus, lack of capital and investments are among the major perceived problems for improved rice productivity.[5]

The low adoption of improved technologies and low productivity is explained by a multitude of reasons and is difficult to link to one specific cause (Bernier and Dorosh, 1993;

[4] The highland plots might be larger in size as UPDR-FAO (2000) estimates that about 10% of the rice area is in rainfed uplands.

[5] It is also interesting to note the constraints that are *not* considered to be that important. They include more secure property rights and silt in the rice fields. While security in property rights is in general an important determinant for soil investment and thus higher productivity (Feder and Feeny, 1991), it seems that the overall land tenure situation is such that little land conflicts exist that would make such investments risky. An alternative explanation might be that credit markets, that might allow for such investments, are imperfect or missing and might not be linked with improved property rights as farmers currently know them. Silting of ricefields is often linked to deforestation but this might cause less production problem than is commonly assumed, especially in the highlands (Brand *et al.*, 2002; Larson, 1993).

De Laulanié, 2003; Bockel, 2002; Droy, 1997; Freudenberger, 1998; Goletti et al., 1997; Robbiliard, 1999; UPDR-FAO, 2000; Moser and Barrett, 2003). Chief among them are the lack of road and irrigation infrastructure (Stifel and Minten, 2003). Table 3 shows to what extent roads make a difference in the productivity of major agricultural products. However, other factors matter as well (Minten and Barrett, 2005). They include a badly functioning and under-funded research and extension system, lack of credit, the lack of a local seed industry, the high climatic risks, an unclearly defined role of the state and insecurity problems.

Increased use of chemical fertilizer was a major component of increased yields achieved through the green revolution in other countries. However, chemical fertilizer use in Madagascar is one of the lowest in the world and has changed little over time. Only 6% of the plots are reported to receive any chemical fertilizer and the average application is only 3 kg of nutrients per hectare during a typical year. The spatial distribution shows further that fertilizer use is heavily concentrated along roads (Graph 6 and Table 3). The low fertilizer use is largely explained by economic reasons. The ratio of the price of one kg of fertilizer over the price of a kg of paddy in rural areas hovers over time above 2. This is significantly above the ratio in Asian economies (in the case of India, the ratio of urea prices over paddy prices in 2004 was estimated at around 0.8). As paddy prices are similar to Asian rice economies, this unfavorable ratio is due to the high price of fertilizer in Madagascar due to the type of fertilizer that is being used[6], the thin market, the high transport costs to bring fertilizer from abroad into the country, and government interventions in this market (Bockel, 2002, 2003).

2.2. Consumption

Table 4 shows average calorie consumption in Madagascar over time. It illustrates the low overall calorie intake and the worsening trend over time: it is estimated that average per capita calorie consumption declined by 16% over a thirty year period. Rice is the most important plant product in Madagascar. It is estimated that it counted for about 48% of the total calorie consumption in 2002 (Table 5), with consumption per capita at about 95 kg per year (in 2002).[7] The importance of rice in consumption is relatively and absolutely on the decline, however. Rice accounted for 51% of total calorie consumption in 1970, compared to 48% in 2002/2003. Over the same period, cassava, the second most important crop, has become more important because of increasing poverty and its lower cost per calorie. It also serves as a buffer crop in the off-season. As a result, cassava's share in the supply of calories increased from 12% in 1970 to 20%(16%) in 2002 (2003). Meat consumption has declined relatively most over this 30-year period, i.e. by almost 30%, given declining incomes and the high income elasticities for meat products (Ravelosoa et al., 2000).

The budget shares of rice in total (food and non-food) expenditures differ significantly by type of household. While the average weight is estimated at 26%, based on the household survey of 1993, this varies from 34% for the rural poor to 11% for the richest urban group (Ravelosoa et al., 1999). Rice consumption is shown to be more price and income elastic for

[6] The most common type of fertilizer used in Madagascar is NPK 11:22:16.

[7] This compares to 164 kg per year in Bangladesh, 103 kg/year in Thailand and 75 kg/year in Senegal. Madagascar has the highest rice consumption per head in Africa.

poorer socio-economic groups.[8] Most of rice consumption is from own production. Based on the national household survey data of 2001, it is estimated that about two thirds of the production of rice is auto-consumed. About 22% is purchased by the rural population and 13% is bought by the urban areas. These numbers reflect the lower importance of urban markets in total local rice consumption. This is partly due to the large share of the population that lives in rural areas.

Imported rice makes up the difference between local production and consumption. It is important to note that imported rice is not only consumed in urban areas: based on the numbers of the national household survey of 2001, it is estimated that about 60% of the consumption of imported rice was in rural areas. This compares to 40% in urban areas. However, urban areas depend relatively more on imported rice. Graph 7 shows geographically the presence of imported rice in rural areas. As expected, it shows that the presence is highly influenced by distances to a port and to good roads.

Overall consumption, and rice consumption in particular, is further characterized by significant seasonality. Dostie et al. (2000) estimate that caloric intake declines by more than 10% in the lean period compared to the harvest period (Table 5). The drop is highest for the poorest households. The composition of caloric intake also changes. The part of rice drops between 6% and 13% in rural areas and by a little over 1% in urban areas. This drop in the importance of rice is made up by a relative increase in consumption of cassava, other tubers and maize (Dostie et al., 2000). This seasonality in consumption is confirmed by other studies and shows up in welfare indicators. Based on a national survey, Unicef estimated for example that malnutrition rates were 15% higher during the lean period than during the harvest period (Seecaline, 1996). Mortality rates are also found to be higher in the lean period (Waltisberger et al., 1998).[9]

2.3. The rice value chain

2.3.1. Households

Sales of rice are concentrated in the hands of a minority of agricultural producers (Table 6). Based on the national household survey of 2001, it is estimated that only a quarter of the agricultural households report sales of more than 250 kg of rice a year. Their sales represent 90% of all the local rice that is marketed in Madagascar. Almost half of the agricultural producers report no rice sales at all. They however are still producing more than a quarter of total Malagasy rice production. The households that report larger sales are also richer: their consumption level is almost a quarter higher than the average consumption level of agricultural producers.

[8] Ravelosoa et al. (1999) show that the overall income elasticity for rice consumption is about 0.47 and that this increases to 0.75 for the poorest group (based on an AIDS – Almost Ideal Demand System – estimation). The same trends are seen in own price elasticities which vary from -0.48 for the richest rural group to -0.62 for the rural poor. We see thus high sensitivity in consumption with respect to prices and income. Similar results are found by Minten and Zeller (2000) based on a smaller survey.

[9] This is also partly due to the more humid conditions and the higher disease incidence during the lean period.

Net buyers of rice make up a large part of the population in Madagascar, also in rural areas (Barrett and Dorosh, 1996; Minten and Zeller, 2000; Minten et al., 2003). Estimates based on annual production and consumption data from the EPM 2001 indicate that 19% of the households in Madagascar are net sellers of rice, 11% are self-sufficient and 46% are net buyers (Table 7). 23% of the households are urban households and most of them can be considered net buyers (there is about 3% in the 24% that is a net seller). Almost 60% of the purchased rice in Madagascar is estimated to be consumed by the net buyers in rural areas.

The location of net buyers and sellers differ. The most populated province of Antananarivo has the largest number of net buyers of rice (more than 800,000 households), partly due to the presence of the capital city of Antananarivo, while only a little over 100,000 households in the province are net sellers (Table 8). This province thus depends significantly on other provinces (and countries) for their rice supply. The province of Mahajanga has relatively and absolutely the largest number of net rice sellers, and is a net exporter of rice in most years.[10] Almost a quarter of the net rice sellers in Madagascar are located in this province. This compares to only 8% of all the net buyers. The Lac Alaotra area in the province of Toamasina contains the largest rice plain in Madagascar (with about 84,000 ha rice fields connected to a modern irrigation system (UPDR-FAO, 2000)). Its rice production counts for almost 15% of the national production but its commercial surplus is relatively much more important. UPDR-FAO (2000) estimates that about 220,000 tonnes of paddy are marketed in this area. It is thus a large provider of rice for the capital Antananarivo.

The selling and buying activities in rice markets show strong links with poverty (Table 9). For the population as a whole it is estimated that 66% is a net buyer of rice, 13% is self-sufficient and 21% is a net seller. Self-sufficiency in rice decreases significantly with an increase in poverty. While a quarter of the poorest quintile does not participate in rice markets, this is only the case for 7% for the richest quintile. The percentage of net buyers increases systematically from the poorest (54%) to the richest households (81%). Even though the number of net buyers in the poorest quintile is the lowest of all, the percentage of net buyers in this category is still 2,5 times higher than the percentage of net sellers. Richer households purchase significantly more rice on the market (Table 9): the average quantity of rice bought varies from 132 kg per household for the poorest quintile to three times as much, i.e. 391 kg per household for the richest quintile. These differences are partly driven by the difference in activities as 44% of the richest quintile lives in urban areas compared to only 8% for the poorest quintile.

The poverty – purchase linkage still holds when we calculate the purchase statistics only for agricultural producers. The richest quintile of agricultural producers produces, sells, purchases and uses significantly more rice than the poorest quintile (Table 9). Almost one third of the poorest quintile sold and bought rice, often at significantly higher prices, during the same year. 20% did so for the richest quintile. This illustrates to what extent liquidity constraints might lead some of the poorer farmers to participate in rice markets.

2.3.2. Seasonality

[10] This explains why rice price decreased in this province (and increased in the province of Antananarivo) during the political crisis of 2002 when transport and trade between the two provinces was almost impossible.

The annual figures presented above ignore important seasonality. Even more households will buy rice in the lean period but this number will drop significantly during rice harvests. In the commune survey of 2004 a question was asked on the percentage of people that are net buyers or net sellers of rice during the four quarters of the year. The numbers illustrate the large seasonal swings. About half of the rural households were reported to be sellers of rice in the harvest period. During the lean period, 70% of the rural population is estimated to be a buyer of rice while only 8% of the rural households sell rice.

Malagasy communes also often show a pattern of seasonal flow reversals in rice. While 66% of the communal focus groups state to have exported rice after the main harvest in April-June, 51% of the communes imported rice at the end of the year (Graph 9). As is the case in many developing countries, the rice flow occurs primarily during the harvest period and may actually reverse in the pre-harvest season (Barrett, 1996; Moser et al., 2005). Even if the flow itself does not reverse, interseasonal price variability might still be higher in rural areas than in urban ones. Some of the reasons cited for this include inadequate storage, market thinness, and intermediary market power in rural areas (Barrett 1996; Moser et al., 2005). When rural areas experience significantly higher price variability, rural households are much more vulnerable to seasonal undernutrition. These statistics further illustrate that also rural areas are suffering from the high price of rice and other agricultural products in the lean period as they are often net buyers in this period.

Moser et al. (2005) found, based on a nation-wide commune survey in 2001, that communes experienced an 84 percent increase in the rice price over the year and urban communes experience statistically significantly lower price changes. Given that both the urban and rural price changes considerably exceed prevailing interest rates (even adjusted for stock loss due to spoilage, etc.)[11], there appears to be considerable foregone intertemporal arbitrage opportunities in Madagascar's rice markets (Moser et al., 2005). Part of the seasonal price movements stems from seasonality in production and storage costs (due mostly to opportunity costs of funds). It is estimated at the national level that almost three quarters of the Malagasy rice production happens in four months, i.e. between March and June (Graph 10). The number of lowlands where double rice harvests are possible is relatively limited, due to lack of irrigation and to water problems. The lowlands where two rice harvests are possible are mostly found in the west of the country. While most households store and auto-consume part of their harvest over the year, the rice sales seem to happen in a period shortly after harvest. Richer households sometimes postpone sales and might therefore profit of higher prices (Graph 11).

2.3.3. The trading sector

Since the liberalization of the trading sector and before 2004, government refrained from intervention in rice trade and rice storage and rice traders are currently subject to few government interventions (Berg, 1989; Barrett, 1997; IFPRI-FOFIFA, 1998; UPDR-FAO, 2000). Storage of rice by the government and the donors is limited to emergency stocks of

[11] Micro-finance institutions in rural areas typically charge 3% monthly interest rates.

about 10,000 tons that is held by the World Food Program. These stocks are used for distribution in case of natural disasters.

In the private rice trading sector, we see a myriad of traders, ranging from micro-retailers to large rice millers/traders. While Barrett (1996) finds higher profits and high entry costs for the more profitable segments of the rice markets, Fafchamps et al. (2004) do not find any economies of scale. Based on a nation-wide trader survey, UPDR-FAO (2000) and IFPRI/FOFIFA (1998) find rice margins to be reasonable and to reflect capital, transportation and entrepreneurial costs of trade. For example, UPDR-FAO (2000) estimates that a high proportion (85%) of benefits of the rice value chain is captured at the production level in the form of income and salaries of agricultural workers.

The liberalization of the rice market has also led to a restructuring of the trading sector. The importance of vertically integrated firms, that were previously widespread in the rice plains, has greatly diminished. They have been replaced by numerous small and highly specialized traders that work with their own capital and that show little sophisticated linkages (credit, orders) between layers (Dabat et al., 2004; Fafchamps and Minten, 1999).

While the trade of local rice is mostly in the hands of small traders, this is less so for imported rice given the important financial requirements. Madagascar imports substantial quantities of rice from international markets. Imports in 2003 were estimated at 250.000 tons, representing more than 10% of the total consumption of the country and about 1% of the world trade in rice. Rice is mostly imported from Asian countries, mainly from Pakistan, India, and Thailand. These imports arrive in lots of about 1,000 to 4,000 by boat mostly from Asia. Imports are exclusively done by private importers and the total number of importers in a regular year amounts to about a dozen. The rice trade was fairly concentrated in 2004, with the largest 5 importers of rice accounting for almost 60% of all imported rice in Madagascar (Table 10).[12]

The average annual imported quantity of rice over the last decade amounts to 120,000 tons (Table 11). However, an increase is noticed over time, going from less than 60,000 in 1996-1998 to 150,000 tons or more since 2000 (except for the crisis year 2002 when the political crisis disrupted regular trade). Imports are characterized by significant seasonality, arriving relatively more in the lean period and less during local harvests. The percentage of imports during the first six months of the year is usually higher than 50% of the total of the year. It was lowest in the year 2004 (except for the political crisis year 2002). We will discuss reasons for this later on.

[12] This relatively high concentration of the import trade does not suggest that a competitive import trade is not possible, but it does suggest why the government is concerned about the possibility of collusion. In contrast to the structure of the Madagascar market, over two hundred traders imported rice across land borders from India to Bangladesh following major production shortfalls in Bangladesh in 1997 and 1998 (Dorosh, 2001).

2.3.4. Pricing

To a large extent, Madagascar has opted for a policy of market stabilization through private sector trade since a period of structural adjustment in the late 1980s.[13] Private sector imports have occurred almost every year, stabilizing rice prices in the months prior to the major rice harvest. Although structural adjustment policies in sub-Saharan Africa have often led to increased price variability, the private sector rice import trade generally has kept rice prices in Madagascar more stable than prices of major staples in other African countries, such as Ethiopia and Zambia (Table 12).

Since Madagascar is a net importer of rice, in the absence of trade and market restrictions, the price of imports in the local market is determined by the full cost of imports (including the c&f cost, tariffs, taxes, transport, handling and marketing costs). Table 13 shows the different costs required to bring imported rice into the Malagasy market in the beginning of 2004.[14] Two types of duties are levied on imported rice: an import duty that was about 20% in the beginning of 2004 and a VAT tax of 20%.[15] Combined with other duties, this raises the price level by 43%. Taking further transportation costs, wholesale and retail margins into account, it is estimated that retail prices in the Antananarivo market are almost 130% above the wholesale international FOB prices (World Bank, 2004).

Imported and local rice are close substitutes in Madagascar. Using the retail prices in Antananarivo, the ratio of the price of domestic rice to the price of imported rice averaged 1.00 from 2000 through 2003. However, we see consistent seasonality differences: the seasonal index of the price ratio (price of domestic rice over the price of imported rice) ranged from 0.93 in June-August to 1.09 in March-April. In rural areas, imported and local prices are also strongly related, i.e. if both types of rice are available. However, as in urban areas, imported rice prices are slightly higher in the harvest period. In communes where no imported rice is found, local prices are significantly lower (explaining why there is no imported rice as it is unable to compete).

While import parity prices and local prices in the city of Antananarivo are closely correlated, the setting of rural rice prices on the other hand suffers from the lack of market integration. Moser et al. (2005) estimate that that there is very little integration of markets at the national level, mostly due to prohibitively high transport costs. While they find that markets are fairly well integrated spatially at the sub-regional level, where nearly 70 percent of communes appear to be in competitive equilibrium, most of the evidence points to significant spatial and inter-temporal rural market fragmentation.

[13] The rice subsidy reached 25% of the government budget in the mid-1980s prior to market reforms (Dorosh and Bernier, 1994).

[14] In the past, Madagascar has regularly changed rice taxation levels. In 1996, the tariff on rice was 30%, going down to 10% in 1997 and to 5% in 1999, before increasing, on top of a new value added tax of 20%, to 15% in 2000 and to 20% in 2004. The current import tax on rice import is 15%. In 2005, the VAT was reduced to 18% and import duties to 10%.

[15] This VAT is in most cases not levied on locally produced rice and can thus be considered as a hidden import duty.

It has been shown that Malagasy rice production is highly competitive at the international level (Razafimandimby, 1999). The low production costs, due to low labor costs and the little use of inputs, make local rice production cheap. A domestic resource costs (DRC) analysis showed that DRCs are about 0.3, indicating that rice production is economically very profitable. However, competitiveness with international markets is lost in the value chain due to the large marketing costs involved due to remoteness, transport costs and the multiple actors involved in the value chain (Razafimandimby, 1999).

However, there is no evidence of the existence of excessive rents in rice marketing. UPDR-FAO (2000) did a large nationwide survey on the structure of the margins between producers and consumers for local as well as imported rice in 1999. For local rice, about 58% of the final retail consumer price went to the producers, 7% to millers, 27% to traders and 8% to retailers. For imported rice, CAF price levels represented about 61% of the final retail price. Import duties made up 22% of the final price and wholesalers/traders and retailers each had a margin of about 8%. The larger margins for traders in the case of local rice reflect partly the larges costs related to local transport and assembly.

3. The 2004 crisis

Marie-Hélène Dabat, Olivier Jenn-treyer, John Magnay and Bart Minten

3.1. Description of the crisis

The situation in the rice markets in 2004 turned it into a major concern for consumers and policy makers. The average price of rice increased by 100% for the country as a whole at the end of 2004 compared to the end of 2003 (Minten and Ralison, 2005). This large price rise was found consistently in all provinces (Graph 12). Compared to the lean period of 2003, the harvest prices (April-June) changed very little. This is abnormal as rice prices normally decline significantly after harvest (Moser et al., 2004).[16] The price rise after harvest on the other hand was significantly higher and faster than in a normal year. Graph 13 shows to what extent the year 2004 was exceptional over the last five years. We take the region of Lac Aloatra, the rice basket of Madagascar, as an example. Paddy prices in that area, as in the rest of Madagascar, are characterized by significant but fairly regular seasonal patterns, with high prices in the lean period and low prices in the harvest period. The average price rise between the lean period and harvest period price before the year 2004 was about 52%. In 2004, this increase was 150%.

As major price increases for rice - as well as other major staples - happened after the main marketing season, most small farmers benefited little or not at all from these price increases. Graph 12 indicates that the price levels for agricultural products in most areas only started their increase from July-September 2004 on. The price levels during the period April-June 2004, i.e. the main marketing season in Madagascar (Minten and Zeller, 2000), were only slightly higher than one year earlier. The increase in prices at the end of the year led thus to significant hardship for consumers. Graph 14 shows the percentage of communes that reported to be in the lean period in the year 2004 compared to a relatively normal year 2001 (Minten and Ralison, 2005). The lean period in 2004 started considerably earlier than normal. While in a normal year, 50% of the communal focus groups state to be in the lean period in the month of November, this year this percentage was almost as high as 70%.

The same price changes were noticed in urban consumer markets. For example, the price evolution in the city of Antananarivo is shown on Graph 15. Following its usual pattern, local rice prices increased in the beginning of the year, reached a peak (at about 3000 Fmg/kg) in April and then declined or stabilized for two months. However, rice prices started then a rapid increase from the month of June onwards. In the beginning of 2005, prices were close to 6000 Fmg per kg. While the graph shows that imported rice was cheaper at the end of the year, it was however only available in rationed quantities.

[16] Given the importance of rice in the diet and agricultural production systems in Madagascar, it seems that it is the price setter for agricultural produce (Ravelosoa *et al.*, 1999). Prices of other agricultural products followed the trend that was noticed for rice and paddy. The price of maize increased by 58% compared to the same period of the year before while the price of cassava increased by 69%.

3.2. Events that triggered the crisis

Faced with high prices that were partly beyond their control, the government intervened in rice markets in the second half of the year. To better understand the reasons why, we make a chronology of the important events that happened in the beginning of 2004 that triggered the crisis and that put pressure on the government to intervene.

Two cyclones in the beginning of the year 2004, Elita at the end of the month of January, and Gafilo in the beginning of the month of March, caused significant losses to a rice harvest that was expected to be good. It was estimated that there was damage - because of floods and heavy winds - on almost 500,000 ha of the 1,4 million hectares that were planted in the country overall. The loss in paddy was evaluated[17] at 362,000 tons of paddy or 250,000 tons of white rice, more than 10% of the rice production in a normal year. The commune survey of 2004 seem to confirm this bad year as 40% of the communes estimated to have had lower yields than in a normal year.[18]

During the months of April-May, the situation seemed to normalize itself as the first harvests came in and put some downward pressure on rice prices. However, rice prices did not decrease as in normal years. Nervousness started increasing in June linked with the rapid depreciation of the Malagasy currency. The exchange rate changed from about 7,500 Fmg/US in March to 11,500 Fmg/US in June, a rise of 53% (Graph 14).[19] There were also less rice imports in the first six months of the year seemingly caused by this rapid change in the exchange rate but also because of the increase of international prices in rice. Thai (5% broken) rice prices increased from 212$/ton in January 2004 to 245$/ton in April 2004, an increase of 15% (Graph 16). Vietnamese rice (25% broken) increased by 21% during that same period.

As local rice was quickly sold off after the harvest in the province of Antananarivo, suppliers started looking elsewhere and started earlier than normal bringing in rice from the Lac Alaotra area. While paddy prices were there about 1000 Fmg per kg in the beginning of June, prices increased by 100 Fmg per week and were already at 1400 Fmg/kg at the end of June, i.e. a 40% increase in one month. In August, paddy prices in the Lac Aloatra reached 2700 Fmg/kg and rice prices increased to 4100 Fmg/kg in Antananarivo. These changes led to large concerns on the effect on consumption. There was however no clear statement by the government on how it would deal with the situation. Opposite positions were taken by different ministries. Some argued that the government had to let the markets deal with it while others proposed a straight fixation of the price.

The private sector was also not passive under these events. As to reduce the price levels of imported rice, the private sector wanted to meet the Minister of Finance to propose that the government would take care of some of the costs (port charges, transport costs,

[17] Joint evaluation mission of the PAM and the FAO.
[18] To mitigate the effects of these cyclones, the government started a rice distribution program where 4,000 tons of rice were distributed at a “prix bonifié” of 2400 Fmg per kg.
[19] This depreciation seems to have been partly due to a decline in the reserves of the Central Bank and the effects of a policy of lowering taxes on a large array of investment and consumption goods.

import duties) which would allow them to sell imported rice at a price that would be lower than 4500 Fmg. However, it never received any response to this request. Importers were hesitant to import given unclear signals of the government and rapidly changing import conditions (exchange rates and international prices of rice). Under these circumstances, local banks were also unwilling to provide credit and they actually discouraged importers to bring in imported rice.

It thus seems that several factors combined to produce a large shock to the rice market between January and August 2004. The two most important ones were the rise in international rice prices and the exchange rate devaluation. The relative importance of these two in the setting of import parity price levels is shown in Graph 17. The exchange rate devaluation was the largest contributor to the nominal price increase in the markets of Antananarivo, especially in the beginning of the year. When the exchange rate appreciated slightly at the end of the year, the international rice prices started its increase, keeping the rice import parity levels about constant since June 2004. Actual prices increases on the market in Antananarivo started later due to lagged effects.

Other factors might have contributed, but to a lesser extent than the two previous factors to the high price rise. The cyclones contributed to less availability of local rice, and especially so in rural areas, but this should have been equilibrated by international imports under a well-functioning market system. Other factors that played a role were the increase in international transport costs due to the increase in gasoil prices and the increase in demand for transport from China. It is estimated that transportation costs from Bangkok and Toamasina increased from 30 US$/ton to 45 US$/ton between 2003 and 2004. The optimistic official production statistics also seem to have been too high and might therefore have underestimated the need for rice imports. Finally, the higher tax rate that was decided in the beginning of 2004 (20% instead of 15%) increased the import parity price with another 5% compared to previous years. All these factors combined led to a significant increase of the real price of rice in 2004 (Graph 5).

3.3. Intervention by the government

The major objectives of government rice policy during the crisis period in mid-2004 were to avoid a rice shortage and to reduce and stabilize the domestic price of rice for consumers. Two major factors seem to have influenced the policy of the government. First, the slow pace of private commercial imports in mid-2004 suggested that the private sector would not supply Madagascar with sufficient imported rice. Second, the policy option of lowering the tariff on imported rice was not adopted. While there was pressure of some donors to reduce tax duties as a way to help in the reduction of price levels, the government resisted this call, partly due to concerns to reach the HIPC targets for fiscal revenues. However, reducing the import duties would have reduced the cost of rice imports and would have led to an increase in private sector imports and lower prices of imported as well as local rice.

Faced with this crisis, the full cabinet met in the middle of August and decided to explore the options of food aid and of importing rice commercially at advantageous

conditions. A mission of the Ministry of Commerce (including the Minister) traveled to Asia and signed a commercial deal with Thailand to import 100,000 tons of rice at a price of 272$ CAF. At the end of the month, the government announced officially that it would import 100,000 tons of rice from Thailand.[20] The government rice entered the Malagasy market between October 2004 and March 2005. However, the first loads of the government negotiated rice only started arriving in October (the first load of 13,000 tons arrived on 20/10/2004 in Toamasina). This late arrival was explained by the difficulty of finding means of sea transport and the increase in the costs of sea transport. Given that the contract was negotiated on a CAF basis, the Thai suppliers had little incentive to look for a speedy - but were rather looking for a cheap - solution.

The 100,000 tons of government rice that were initially agreed upon increased in reality to almost 200,000 tons in total in the beginning of 2005 (Table 14). Five companies took part in the import of the government rice: Magro, Rabenaivo, Silac, Mifidy and SCAA. The biggest beneficiary was the company Magro, a company with close connections to the government and a newcomer in rice imports, which imported about 70% of total government negotiated rice. These companies signed a "contrat de mandat" where the government accepted to delay the payment of import duties and to use rice donations to compensate for their losses. There was however no transparency on the exact import conditions and the level of duties that these companies had to pay and this situation remains unclear.[21]

The importers that participated in the contract were asked to sell the government negotiated rice to wholesalers at 3,300 Fmg per kg and to retailers at 3,400 Fmg/kg. This rice was then being distributed by retailers at the price of 3,500 Fmg per kilo, i.e. significantly below market prices of imported as well as local rice.[22,23] This low price led to huge demands for government rice. The government therefore resorted to a rationing scheme: a limited quantity was sold per person (3 to 5 kg) and significant opportunity costs were required for queuing. The distribution of the government rice was also largely focused on the big urban centers. This rice was, at least initially, rare in the smaller urban centers and non-existent in rural areas. There were also complaints about the quality of the imported rice.

As the government did not import enough rice to be sold at 3500 Fmg and as the commercial importers reduced imports due to the lack of transparency and uncertainty with respect to the government interventions, there was less rice on the market than in a normal year and this showed up in the local prices which increased above import parity levels. In some cases, prices increased extremely high: for example, rice was sold at 8,000 Fmg in

[20] 5000 tons would be received as a gift.

[21] The government also asked for solidarity and aid towards reducing the effect of rice crisis at the national as well as the international level. However, this had little effect. Gifts from foreign countries were limited: 5000 tons by China and 5000 tons by Thailand. National solidarity was limited to help by the army, some members of the National Assembly who helped in local distribution, and some private enterprises that organized local transport in the areas where they are active.

[22] However, the government often still helped in the distribution of this rice. In the region Analamanga, distribution was done by the army. Five trucks were used to help the regional authorities to distribute the rice at the communal level. Local mayors financed the costs of the transport personnel.

[23] Given the costs involved to get the rice in some more remote communes, rice was sold higher than the recommended 3500 Fmg/kg

Farafangana and at 11,000 Fmg in Vangandraino (in the Southeast of the country) in November. In Antalaha, prices went even up to 17,500 Fmg.

In an effort to control price hikes in their regions, some local authorities (often the 'sous-prefet') prohibited or limited the export of rice from their fivondronana through the use of 'barrières économiques' (Minten and Ralison, 2005). For example, traders that exported rice from the Lac Aloatra area needed a special authorization to export rice to Antananarivo. Mostly only larger traders and traders that were original from the area itself were given this type of permission. In some areas in the province of Antsiranana and Mahajanga, rice trade was limited to 5 bags per truck. This was for example the case in the Sofia (the fivondronana of Befandriana Nord, Madritsara, Bealanana) and the Sava region (the fivondronana of Vohemar and Andapa).

These prohibitions in rice trade had the intended effect and led to a relatively lower rice price in these fivondronana where the prohibition of rice exports was the case. On the other hand, it led to higher prices in rice importing regions. For example, while transport costs between Andapa and Sambava were about 400 Fmg per kg, rice prices were in the latter city about 4000 Fmg per kg higher. Prices in Sambava were almost as high as 20,000 Fmg per kg at the end of December. These local regulations might therefore have increased rice price volatility in the country as a whole.

Government interventions in rice markets seem to have exacerbated the effects of these shocks on the domestic rice market. Different factors contributed to uncertainty. First, the possibility of waiving or rebating import tariffs (equal to 45 percent of the c&f value of rice imports) on government-sponsored commercial imports of rice increased uncertainty for private imports through non-government sponsored trade. Second, the government announced a target price that was less than import parity so that imports would not be profitable.[24] Third, when the government announced this policy and an importer wanted to leave the country with his shipment, the government detained the ship and obliged the owner to sell at the prices fixed by the government.

Hence, the government policies discouraged private imports and reduced the total volume of imports and the total rice supply of Madagascar. Ultimately, imports in 2004 were only 151 thousand tons, compared to 254 thousand tons in 2003.[25] The sales of government rice at an official price of 3500 FMG/kg led to a parallel market. The official price was below the import parity price (including tariffs) so that private sector imports were not profitable**.** Since the government did not have sufficient rice to meet all demand at the official price, sales at a price below open market prices resulted in rationing and a parallel market. This rationing is seen by the increases in local prices above the import parity levels at the beginning of 2005 (Graph 18).

[24] For example, the largest rice importer in 2003, who did not take part in the import of government rice, canceled a contract for the import of 48,000 tons from Thailand in 2004 for which it had to pay 130,000 USD of cancellation fees. The importer preferred to do so instead of facing the uncertain Malagasy rice market.
[25] Note that this change in the level of imports is due not only to the changes in world prices and trade policy: other factors including the size of the rice harvest and changes in household income also have a major influence on rice trade flows.

The rice crisis in 2004 and interventions by the government led to clear losers and winners. Most of the rise in agricultural prices in 2004 happened when the majority of smaller farmers had sold their production. They were then faced by significantly higher prices in the lean period when most of the smaller farmers become net buyers of agricultural produce. The winners were the people that stored rice until the later part of the year and production areas where rice is harvested later (the Lac Alaoatra area and the Marovoay plane). At the consumption level, especially the poorest urban households seem to have benefited from the government negotiated rice. While the targeting worked reasonably well in urban areas[26], this was less the case in rural areas: the government negotiated rice did not reach these areas very well; in the case it did reach them, it was often sold at a higher price than 3500 Fmg/kg. There were also reports of incidences of corruption (Dabat, 2005). Given the importance of the net buyers in rural areas, hardship increased significantly in the lean period of the year 2004 in rural areas: in the commune survey of 2004, a high 84% of the focus groups stated that their purchasing power went down in 2004 compared to earlier years.

[26] However, there were large opportunity costs due to queuing. Dabat (2005) evaluates these overall costs at more than 10 million $.

4. The 2004 crisis aftermath and some lessons learnt

John Magnay and Olivier Jenn-treyer

4.1. The 2004 aftermath

The year after the crisis, 2005, benefited from the absence of large exogenous shocks that had led to the crisis in 2004. Little change was noted in exchange rates and international rice prices. 2004/2005 was also a very good production year, with no major natural disasters, and producers responded to high rice prices by planting significantly more paddy than in normal years. The Ministry of Agriculture, Livestock and Fisheries estimated the national rice production in 2004/2005 at 3,4 million tons, an increase by more than 12% compared to 2004. If true, this annual increase would be the largest in Madagascar in the last 45 years (cfr. Graph 3).

After some hesitation on the best way forward, the government decided to eliminate the import tariffs at the end of July 2005; (the VAT remained, but was reduced for all products, from 20% to 18%). The government also declared formally that it would stay out of the rice market. Despite these (late) announcements, the markets were still not in their normal state in 2005, though. Rice prices did not follow regular season patterns, with prices relatively higher at harvest and lower in lean periods than in normal years, indicating that farmers may have stored excessively in expectation of high prices in the lean period.

For example, Graph 19 shows that prices after the harvest dropped slightly but quickly started rising again. Evidence of the increased storage by rice farmers is evident from anecdotal information from farmers groups: Much more was stored in the GCV (Greniers Communs Villageois), a warehouse receipt system, in 2005 compared to a regular year. For example, Cecam, an important local micro-finance institution, provided financing for around 25,000 tons in the GCVs compared to 17,500 tons that it originally planned. Given liquidity constraints, it even had to refuse some potential participants.

The high prices attracted new imports, perhaps even more than demand would warrant. About a dozen firms had substantial stocks by the end of the year of 2005. However, given that most imports were arranged on 90-days letters of credit with overseas suppliers, through commercial banks, imported stocks had to be sold at the end of 2005/beginning of 2006. As a result, there was further downward pressure on rice prices at harvest time. Some evidence suggested that as much as half of the imported stock was not sold at the end of the lean period of 2005/2006.

4.2. Some lessons learnt

The 2004 crisis put rice markets back upfront in the policy arena. While the events of 2004 were an unusual combination of events that will unlikely be repeated in the next years, lessons can however be learnt for a better organization of rice markets. The objectives for the government to allow for efficient functioning rice markets should be clear. It should prevent market shortages and high prices for consumers. However, it should also insure good prices

for producers and reduce government interventions to promote increased market efficiency. Achieving these objectives can be done through different actions in the short- and long-run. We focus here on the short-run

4.2.1. Trust and transparency in policies

The rice markets in Madagascar were at the time of the crisis characterized by little trust between the main agents (especially between the government and the private sector). Traders are often referred to as speculators and few people understand their costs and the type of services they provide. Lack of trust and poor communications lead to lack of transparency and therefore possibly higher margins and volatility. One of the objectives of better functioning rice markets should therefore be the development of clear and transparent policies with a level playing field for all actors. This would for example imply that the government is committed to fixing import tariffs at the start of the year and keep it fixed and the same for everybody.

To improve trust and transparency, an industry dialogue, a forum for private sector to express its concerns to the government and others, should regularly be organized. The type of information that should freely be available and discussed by the different players in the chain would be that related to the identification of specific sectors for intervention, local and international rice markets, the identification and development of export and local markets for Malagasy rice, the adoption of quality standards and transformation technologies, etc.

As a follow-up on these recommendations, a 'Platforme de Concertation pour le Pilotage de la Filière Riz' (PCP riz) was put in place at the end of July 2005. Government representatives and private operators are present in this group and have now a regular healthy dialogue on different issues with respect to rice trade, and the rice sector more broadly.

4.2.2. Monitoring and evaluation

Regular and updated monitoring and evaluation methods (a market information system) on rice - or agriculture produce in general - need to be put in place. This market information system would broadly disseminate statistics and analysis of rice markets, or agricultural markets in general. The type of data and analysis disseminated would be related to prices at the producer, wholesale and retail level and this in different parts of the country; production, storage and commercial surplus levels; international market evolutions; as well as import conditions.

This information could be made available in a timely matter by using all kind of media that is currently widely available in Madagascar, even in rural areas (Andriantsoa et al., 2005). Diffusion of information could be done through internet and e-mail, newspapers, local and national TV, local and national radio, SMS, and simple blackboards in market places. Examples on the functioning and on lessons learned from this type of information system can be gotten from other countries in Africa (for example, Uganda).

In the middle of 2005, the government put in place a 'Observatoire Economique de la Filière Riz' which now publishes a weekly bulletin on prices that are now regularly collected in different parts of the country. It also collects, analyzes and disseminates other type of economic information related to the rice subsector (international prices, imports, legislation, etc.). Both initiatives have seemingly contributed to a more orderly rice market in 2005.

5. Price stabilization options

Paul Dorosh and Bart Minten

5.1. Introduction

Fluctuations in rice prices can have major adverse effects on poor households in Madagascar. High rice prices reduce real incomes of net rice consumers, leading to lower rice consumption. Low rice prices harm net sellers of rice, reducing incentives for domestic production. Even for households that are approximately self-sufficient in rice, large seasonal fluctuations in prices result in income losses as they sell rice from their own production at low prices and later buy rice from the market at higher prices.

Various policy measures can be implemented to reduce price fluctuations and increase welfare of selected groups. Government direct purchases of rice from producers or in markets can help support producer prices. Similarly, government sales of rice from public stocks or imports can add to supplies and lead to reduced market prices. Adjustments to import tariffs can also be used to insulate domestic markets from fluctuations in the costs of imported rice. Alternatively, government subsidized sales can be targeted to particular groups, such as government workers or the urban poor. Other interventions can also increase price stability, such as provision of credit and increased rural security to enable farmers to profitably store grain and establishment of export markets.

This chapter focuses on the relative merits of two major price stabilization options to protect against high consumer prices: subsidized sales of government rice to target groups and adjustments in the import tariffs. We first present the basic analytical framework involving supply, demand and price determination in Madagascar's rice markets. We then present model simulations estimating the effects of tariff adjustments on prices and household welfare. Finally, we compare the costs of tariff adjustments with the costs of targeted subsidies.

5.2. Analytical framework

The effects of tariff changes on domestic rice prices, rice demand, domestic production and import levels can be estimated using a simple analytical framework as described below.

Net supply of rice in Madagascar is calculated as the sum of net production and imports. We use a production estimate of 1.787 mn tons of rice (equivalent to 2.978 mn tons of paddy multiplied by 0.61 to adjust for milling, seed, feed and wastage). Assuming a base level of imports of 200 thousand tons (and no change in stocks), net availability (consumption) is equal to 1.987 mn tons.

As discussed in chapters 2 and 3, domestic rice prices in Madagascar have generally tracked the import parity price of rice, indicating that these two broad types of rice are very close substitutes in demand for Malagasy consumers. Thus, the analysis assumes that, as long as Madagascar is a net rice importer, domestic prices are equal to the import parity price

of rice, i.e. the US$ cost and freight price of rice times the FMG/$ exchange rate, and adjusted for import tariffs (including the TVA) and marketing costs (transport, handling, storage, etc.) to domestic rice markets.

Under these assumptions, any change in world prices, exchange rates or tariffs will result in a corresponding change in the import parity and domestic prices of rice. Given these exogenous price changes, new levels of domestic demand and production can be calculated using assumed price elasticities of demand and supply. Effects of these price changes on various household groups are estimated using data from the EPM on household rice consumption and production. Sensitivity analysis is done using alternative estimates for these key parameters.

Note that this simple annual model does not take into account seasonality of rice prices. The implicit assumption in the model is that seasonal price fluctuations remain unchanged (in percentage terms) when average annual prices change. Thus, in each simulation, producer prices in the immediate post-harvest season rise by the same percentage (relative to the base) as consumer prices.

Moreover, this model implicitly assumes an integrated market across regions of Madagascar, i.e. prices throughout the country are assumed to be driven by the import parity price. This does not necessarily require that markets are directly integrated with the Toamasina and Antananarivo markets, since rice is also imported into ports besides Toamasina. Nonetheless, as discussed in chapter 2, even though imported rice is found in many rural markets in Madagascar, there remain large areas in which rice markets are effectively isolated from the national rice market throughout the year due to high transactions costs. In the absence of effective price transmission from import parity to local rice prices, household demand and supply will not respond to changes in the import parity price. Because of this, the model will tend to overstate the overall price responsiveness of domestic demand and supply. For this reason, the elasticities of supply and demand used in this analysis are deliberately chosen to be low.

5.3. Implications of changes in rice import tariffs

Effects on rice imports and tariff revenues

Table 15 presents simulation results of the effects of the elimination of the 10% tariff on rice imports. Since some of the marketing costs are assumed to be fixed in FMG terms, the percentage change in the domestic rice price is only 6.9%. Four scenarios illustrate the effect of the elimination under different assumptions of price responsiveness of consumers and producers in Madagascar. Under the assumption of no change in quantities demanded or supplied (Simulation 1 with elasticities of supply and demand both equal to zero), the change in tariff rates results in a proportional decline in tariff revenues, which fall from $20.7 mn to only $13.8 mn (a 33 percent decline).

If consumer demand falls with rising rice prices, the elimination of a tariff increases rice demand by 1.4 percent (with an elasticity of demand of -0.2, simulation 2) or 2.9 percent (with an elasticity of demand of -0.4, simulation 3). To supply this demand (assuming

production is fixed), imports also rise from 200 thousand tons in the base scenario to 229 and 258 thousand tons in simulations 2 and 3, respectively. With greater import volume, tariff revenues decline less than in simulation 1 – by only $4.9 mn (24 percent) in simulation 2 and only $2.9 mn (14 percent) in simulation 3.

If producers are also price-responsive, the 6.9 percent decrease in prices results in a 30 thousand ton decline in rice production (1.4 percent, assuming an elasticity of supply of 0.2, simulation 4). Combined with the effects of lower prices on consumer demand, this leads to an increase in imports to 283 thousand tons (13.8% of supply, compared to only 10.1% of supply in the base). Tariff revenues are $19.6 mn, only $1.1 mn (6 percent) below the base levels.

Thus, these simulations indicate that, taking into account price-responsiveness of supply and demand for rice in Madagascar, elimination of the 10% tariff on rice has little effect on overall tariff (plus TVA) revenues for rice imports, because the volume of rice imports increases as the tariff rate is reduced.

Impacts on households

The effects of changes in rice tariffs and rice prices on household rice consumption and welfare depend to a large extent on whether the household is a net producer or consumer of rice. Most households in Madagascar grow some rice (even urban households), so the beneficial effects of a decrease in rice prices for consumers is not as large as it would be if most households purchased all their rice. For the poorest 60 percent of households in Madagascar, the ratio of production to total consumption is 98%; for the urban poor, this ratio is 74% (Table 16). Even for rural rice deficit households,[27] own production is equal to 50% of rice consumption. Moreover, there are significant numbers of almost self-sufficient poor households (1.36 million people in 269 thousand households, EPM 2001 data) that suffer net welfare losses when rice prices rise.

Eliminating the 10% rice tariff and thus reducing the domestic rice price by 6.9% results in net benefits to the rural poor net buyers and the urban poor by a total of $9.6-9.9 mn (Table 17), with the estimated benefit increasing as the price responsiveness of supply and demand increase. However, rural poor surplus producers suffer a welfare loss of $7.8 to 8.2 mn because of the lower rice price.[28] Thus, the net benefits to all poor (including also the rural self-sufficient households) are only $0.7 to $1.5 mn.

In a year of high import parity prices of rice that raises domestic prices, producers of rice gain relative to normal price years, even with a decline in the rice tariff. Reducing the

[27] The rice deficit households are those household that purchase at least 25 kg more rice (calculated based on the consumption section of the national household survey) than they sell (estimated based on the agricultural section of the survey). The self-sufficient are those than sell about equal quantities than they buy (plus or minus 25 kg).

[28] Note that net sellers gain in simulation 4 (relative to the other simulations) with an elasticity of supply greater than zero. This is because, since their production falls, they have less net sales and are harmed less by the decline in prices caused by the reduction in tariffs.

rice tariff simply mitigates the welfare loss of high rice prices to net consumers (and reduces the windfall gains to net rice producers). In these simulations, the government forgoes $1.1 mn (Simulation 4 with high price responsiveness) to $6.9 mn (Simulation 1 with no price responsiveness) in revenues in order to transfer benefits of $9.6 to $9.9 mn to poor net consumers. The ratio of benefits to poor net rice consumers to lost tariff revenues is 1.4 to 8.7, with the most plausible estimates ranging from 2.0 to 8.7 (simulations 2 through 4).

It is also important to note that reductions in rice tariffs have substantial benefits for non-poor net rice consumers, as well as costs for non-poor net rice producers. Most of these non-poor households are net rice consumers; including these households into the estimated benefits to net rice consumers raises total estimated benefits substantially, i.e. ranging between $30.5 mn and $31.5 mn (compared with $8.4 mn to $8.7 mn considering only poor net consumers). Thus, the most plausible estimates of the ratio of benefits to net consumers relative to lost tariff revenues rises overall to a range of 6.3 to 27.5. Net gains to all households also rise to a range of $8.1 mn to $9.8 mn (compared to only $0.7 mn to $1.5 mn considering only poor households). These net benefits to the non-poor come at no additional cost to the government (in terms of additional lost tariff revenues), but are not necessarily the major objective of the price stabilization through tariff reduction policy.

In order to help the poorest consumers, the government might also want to pursue a policy of targeted transfers. In theory, a targeted direct cash transfer (or targeted subsidized sales of rice of the same value) could avoid the welfare losses for net sellers, while providing the same benefits to net consumers as a general rice price reduction. However, good targeting of the poor would be hard to achieve in a country such as Madagascar where information on income or assets is not easily available. [29] Administrative costs of targeting and distribution, as well as the likelihood of leakages, would raise the costs of such a program significantly (Pinstrup-Andersen, 1988). For illustration purposes, we calculate the cost of the type of targeted program that the government set up during the crisis of 2004 (Table 18). We assume in this calculation that 5 kg of rice is sold at a reduced price for the two poorest quintiles - and not only the urban poor that the government focused on during the crisis - during a six month period (the lean period). Under the assumption that all households would use their ration - and imputing administrative costs of 25% and leakage costs of 10% -, the annual cost of such a program would amount to 31 million$.

5.4 Medium-term rice price stabilization options

Although the above analysis suggests that lower tariffs have large net benefits in Madagascar, frequent tariff adjustments could undermine the transparency of government rice policy, increasing uncertainty and thus reducing incentives for private sector imports. Moreover, changes in rice tariffs could lead to strong political pressure to reduce tariffs on other products in an ad hoc fashion, resulting not only in a distorted and complex trade

[29] Targeting can also be accomplished by using economically inferior foods. Cassava could potentially fulfill this role. Ravelosoa et al. (1999) and Minten and Zeller (2000) illustrate the negative income elasticity for cassava and its characteristics as an inferior crop mainly consumed by the poor. Ravelosoa and al. (1999) estimate that the income elasticity for cassava is around –0.88, meaning that if income goes up by 1%, cassava consumption declines by 0.88%.

regime, but also in a substantial loss of tariff revenues and a flood of imports. Thus, it is important that tariff adjustments be kept to a minimum and that a clear and transparent rice price stabilization is put into place.

In this section, we discuss two main options for rice price stabilization: liberalized private sector trade to provide an import parity ceiling price of rice, and liberalized trade in combination with a government stock (not necessarily directly managed or held by the government). This latter policy entails additional complications beyond that related to adjustable import tariffs – the risk that government domestic market interventions will increase over time and result in large fiscal costs and market inefficiencies.

Option 1: Liberalized private sector trade

One option to stabilize prices in Madagascar would be to rely on international trade and periodic tariff adjustments to set the ceiling price of rice. This policy would involve no government or publicly managed stocks, no restrictions on private market imports (apart from tariffs), and import tariff adjustments to be set each year at time of major harvest (March/April) and fixed for one year.[30] These import tariffs would be set at a price to maintain private sector incentives for imports at expected world prices. The key to this price stabilization through private imports policy, however, would be transparency and a level playing field, i.e. a common set of tariffs, rules and information for all market participants.[31]

The above analysis suggests that reductions in rice import tariffs in years with high import parity prices can effectively mitigate the adverse effects of sharp increases in prices on poor consumers in Madagascar. In years when world prices and exchange rates have not risen substantially relative to the previous year, no tariff adjustments would be needed to maintain a substantial degree of price stability. In case of local production shortfalls coinciding with very high import parity prices, the government might want to intervene by lowering import tariffs or even by providing an import subsidy (negative tariffs). Donor food aid stocks could also provide a small emergency stock for targeted safety net distribution in such a case.

Option 2: Liberalized trade with rice security stocks

[30] General tariffs are set in the context of the Loi des Finances, which is sent to Parliament at the end of October each year and is voted before the beginning of the calendar year. If the import tariff is to be changed at the time of major harvest, some special steps would need to be followed.

[31] Bangladesh successfully implemented such a policy in 1998 following major production shortfalls. By encouraging private sector import trade, domestic prices were stabilized at import parity levels (Dorosh, 2001). In contrast, during the Asian financial crisis of 1997 and 1998, Indonesia tried to maintain domestic rice prices 40 to 50 percent below import parity levels, a policy which resulted in large-scale smuggling of rice out of the country. Ultimately, in mid-1998, the government was unable to supply enough imported rice to domestic markets, domestic rice prices rose sharply, and by August 1998, the government abandoned its general food price subsidy policy (FAO, 2003; Tabor and Sawit, 2001). From January 1999 to January 2004, private imports were liberalized (albeit with a fixed nominal tariff beginning in January 2000), though licensing restrictions were re-imposed in 2004 (World Bank, 2004b).

A second broad policy option would involve a rice security stock, not necessarily managed by the government, but under government control. This government stock would not need to be large: A set fixed target amount equal to 2 to 3 months of normal seasonal imports (about 60 thousand tons) would likely be sufficient. To avoid disincentives to local producers, the sales/release price should be announced prior to main planting season and held fixed for one year. And to avoid disincentives for private sector imports, the sales/release price should be significantly higher than the expected import parity price. This would also avoid that the private sector sees a government stock as a threat to prevent normal upward price movements between harvests and the government stock would thus simple displace private storage. Stocks could be rotated through government sales at import parity (including tax) and government tenders for commercial imports. To avoid having impact on prices, it would be needed to have sales and purchases of rotations take place simultaneously or within a short period of time.

Such a policy of government stocks and domestic market interventions risks substantial fiscal losses, corruption, and private market disincentives if government expands stocks, the policy is not transparent, or the government intervenes heavily in local markets. Unfortunately, this has been the usual experience in Sub-Saharan Africa and elsewhere (Pinstrup-Andersen, 1988). Given the small size of typical rice market shortfalls, very rough initial calculations suggest that costs of even relatively small stocks in Madagascar may not outweigh advantages. Assuming a stock of 60,000 tons with $30/ton annual storage costs, the total annual costs would be $1.8 mn. Major production shortfalls in Madagascar occur about one in four years. Average costs (including costs of stock rotation, etc.) per major production shortfall may thus amount to almost $8 million.

Under either of these options, flexibility in adjusting the import tariff, once per year, in line with expectations of the world price of rice is needed. This differs from a variable tariff policy in that it is more transparent and less complicated – important considerations in Madagascar's current atmosphere of mistrust between government and many private sector traders.

6. Summary and conclusions

Paul Dorosh and Bart Minten

The rice economy of Madagascar is heavily dependent on international trade, but urban consumers of rice in the country typically pay prices significantly higher than the world market prices while producers receive prices below the world market. This seeming paradox is explained by government trade policy and high internal marketing costs. Given import tariffs and taxes on imported rice totaling over 30 percent in recent years, prices of imported (and local) rice in wholesale and retail markets in urban centers in Madagascar are above world price levels. At the same time, high costs of transport, rural insecurity, lack of credit and other problems in the marketing chain result in high transactions costs that limit trade and depress producer prices.

Moreover, production and price instability is a major threat to food security. The experience of 2004, where a production shortfall coincided with a sharp increase in the local price of rice imports, highlights the fragile nature of rice supplies to Madagascar. Government policies, particularly a lack of transparency, harassment of importers, uncertainty regarding tariff levels and enforcement, and an official sales price that made private sector imports paying full tariffs unprofitable, ultimately made the situation worse.

Major public investments and sound policies are essential to increase rice production and improve the efficiency of rice markets in Madagascar. Investments in irrigation are needed to solve problems of inadequate volume and timing of irrigation water which are major constraints on domestic production. Fertilizer use and agricultural productivity are limited in part by high marketing costs and inappropriate composition of available fertilizers. Low producer prices, reflecting the high costs of transport and marketing provide inadequate incentives for production in most years in most parts of the country.

Investments in road infrastructure can help reduce marketing costs and increase welfare of producers and consumers, particularly in isolated communities. Other measures to reduce transactions costs of rice trade and trade in other commodities include improved credit systems, increased rural security to prevent thefts of stocks and goods in transit, and better functioning mechanisms for enforcement of contracts. Market information systems that disseminate information on prices and production levels can help farmers, traders and consumers make better decisions on purchases, sales and storage. Restoring trust and improving communications between rice traders and government agencies is further crucial for improving the efficiency of imported and local rice trade flows.

The results in this report also show the importance of stable macro policies - since the exchange rate devaluation was the biggest contributor to the price spike in 2004 - and of policies to encourage private sector storage. Direct imports by the government should also be discouraged because, as seen in 2004, a lack of transparency surrounding government imports can discourage private imports, resulting in overall imports that might actually be lower than in a liberalized market.

Appropriate public policies might protect poor net consumers from high prices resulting from domestic production shortfalls and adverse international price and exchange rate movements. Since Madagascar is a net rice importing country, and since domestic and local rice are very good substitutes, changes in the cost of imported rice in domestic markets (the import parity price) to a large extent determines the price of local rice. In this situation, as long as incentives for competitive private sector trade are maintained, this import parity price provides a price ceiling for domestic prices in the country, and transparent and pre-announced tariff reductions can be used to mitigate the effects of increases in the price of imported rice on poor consumers.

Initial estimates presented in this report suggest that these tariff adjustments result in small losses of tariff revenues (since reductions in tariff rates also increase the quantity of imports) with benefits to poor net rice consumers estimated to be between 2.0 to 8.7 times the value of lost tariff revenues. Moreover, these benefits are achieved without the high administrative costs of a direct transfer program or maintenance of government stocks.[32]

Finally, more and ongoing analysis of price stabilization options and market developments are needed, as market conditions change over time. Regular consultation between government and the private sector is part of this process; long-term efforts at building analytical capacity of the government are required, as well.

[32] This discussion of adjustments to rice tariff levels has not addressed the issue of what should be the base level of tariff on rice imports or whether rice imports should be exempt from the value-added tax (since domestic rice production is not subject to this tax). A full analysis of this issue would require considerable further analysis of costs of rice production, supply constraints, various distortions in the economy and other factors, and is beyond the scope of this paper. Instead, this discussion assumes that rice tariffs broadly defined (including the import tariff and the value added tax) are greater than zero, so that the government has the option, in principle, to adjust the rate if international market and domestic economic considerations so warrant.

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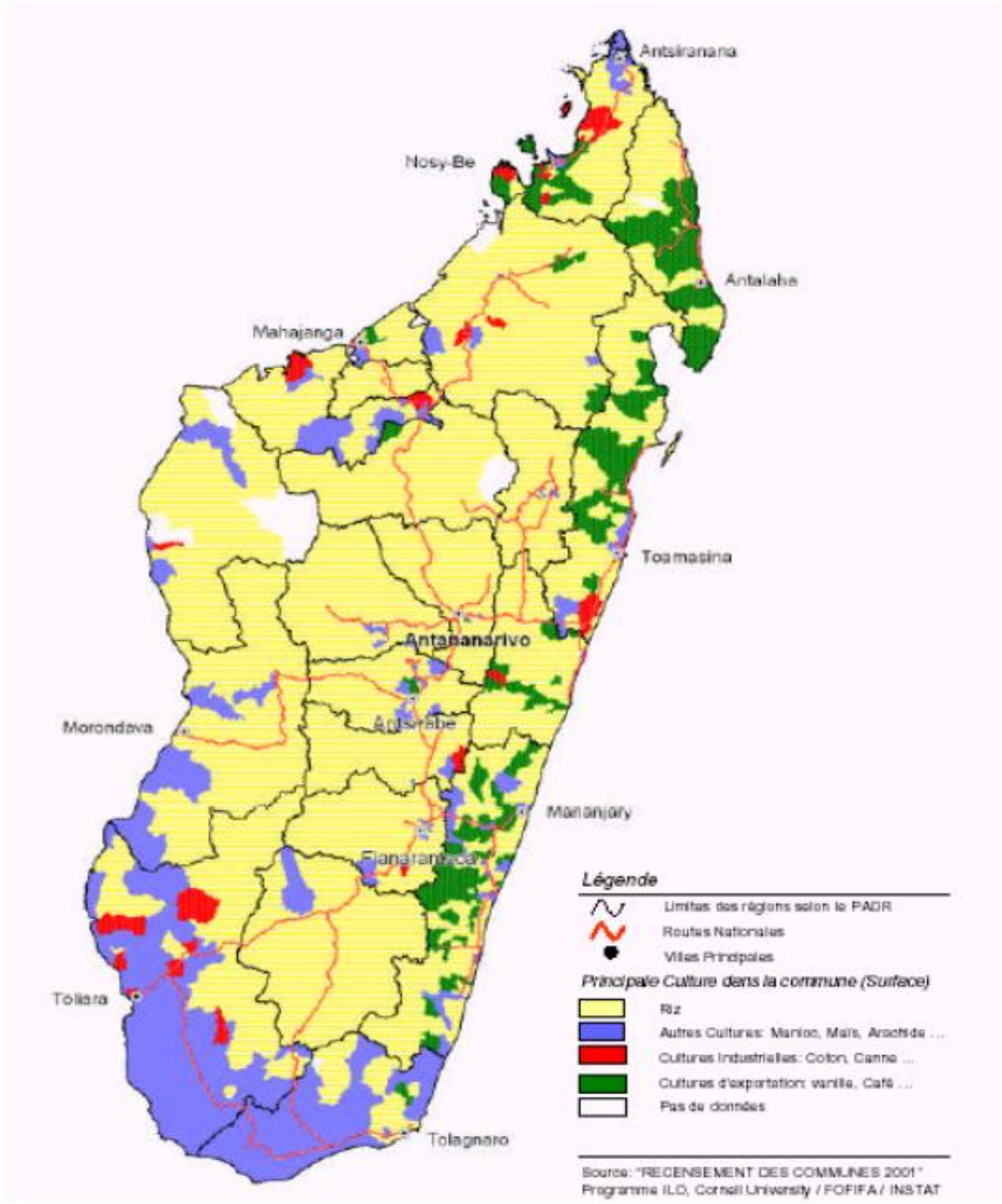
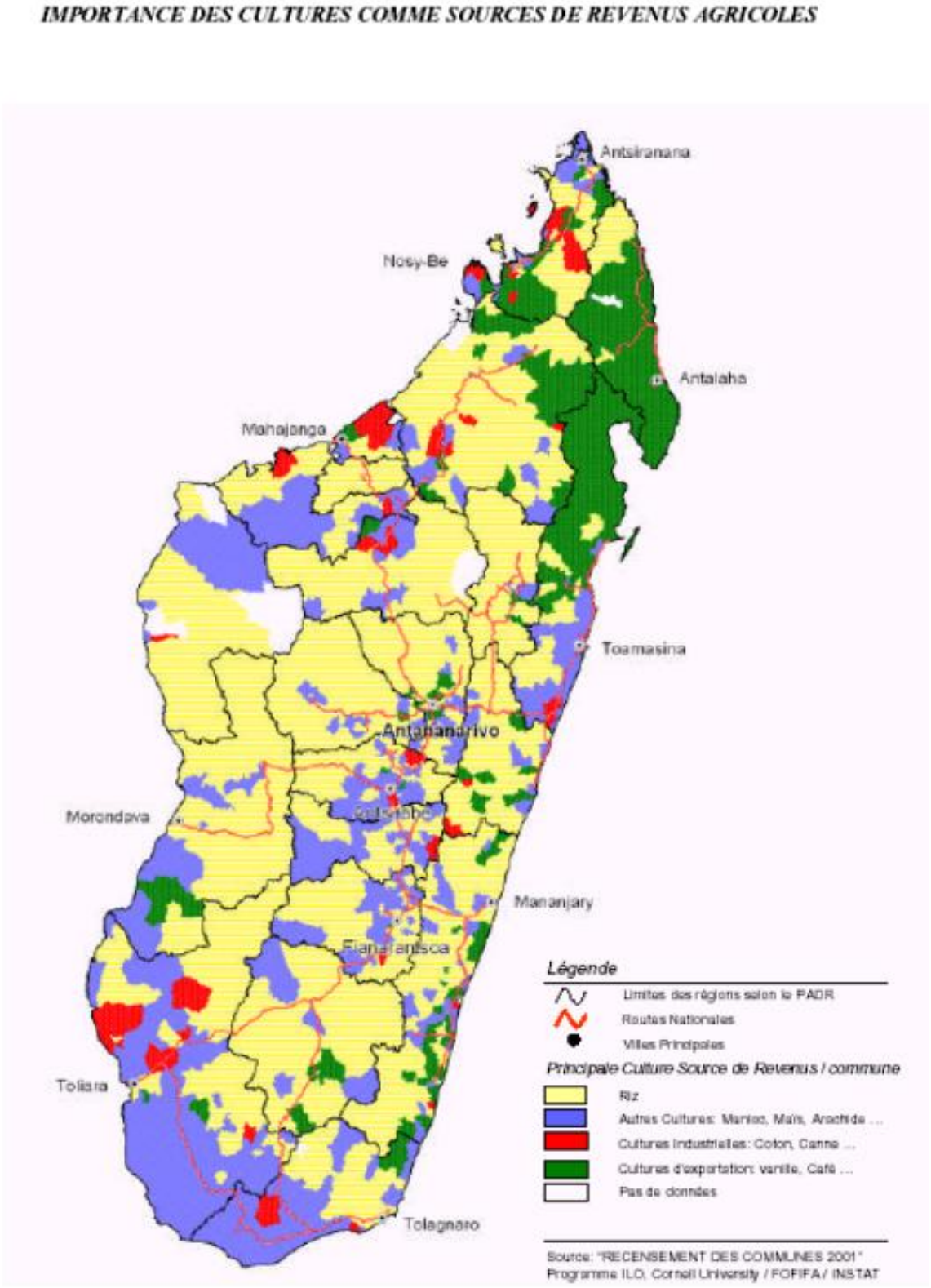
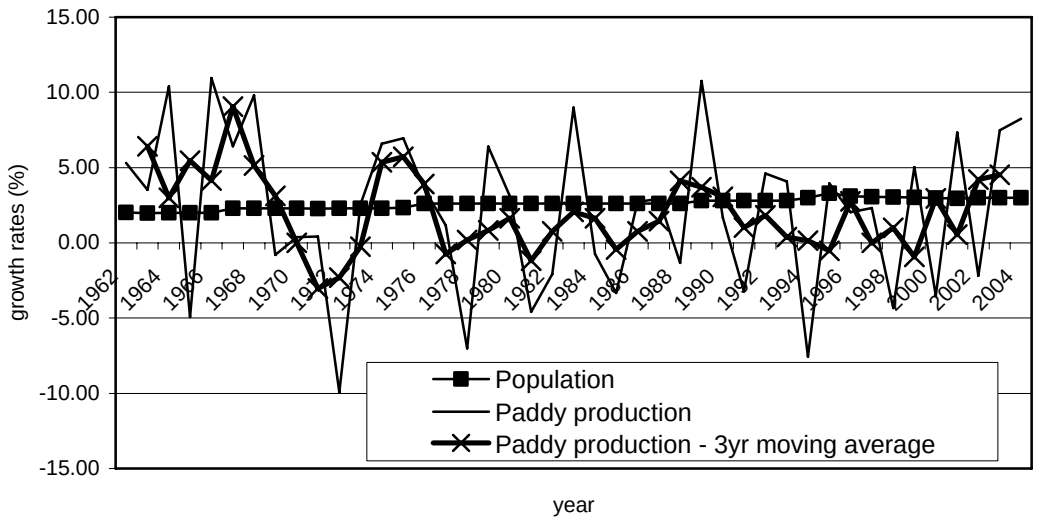
Graph 1: Most important crop area wise by commune, as stated by focus groups (2001)



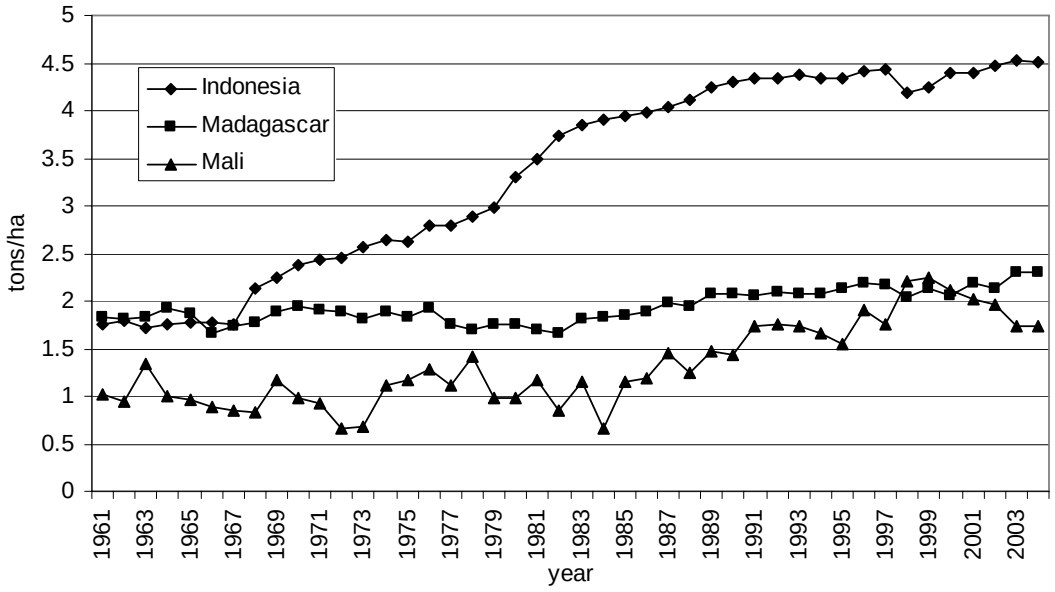
Graph 2: Most important crop value wise by commune, as stated by focus groups (2001)

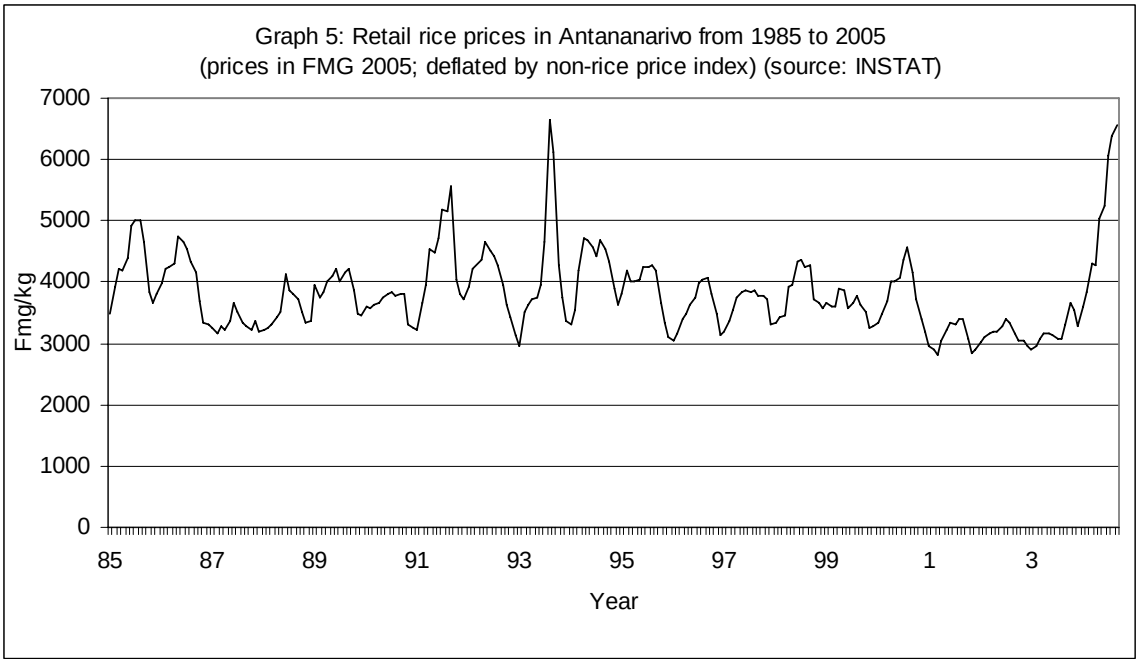


Graph 3: Annual growth rates in paddy production and population

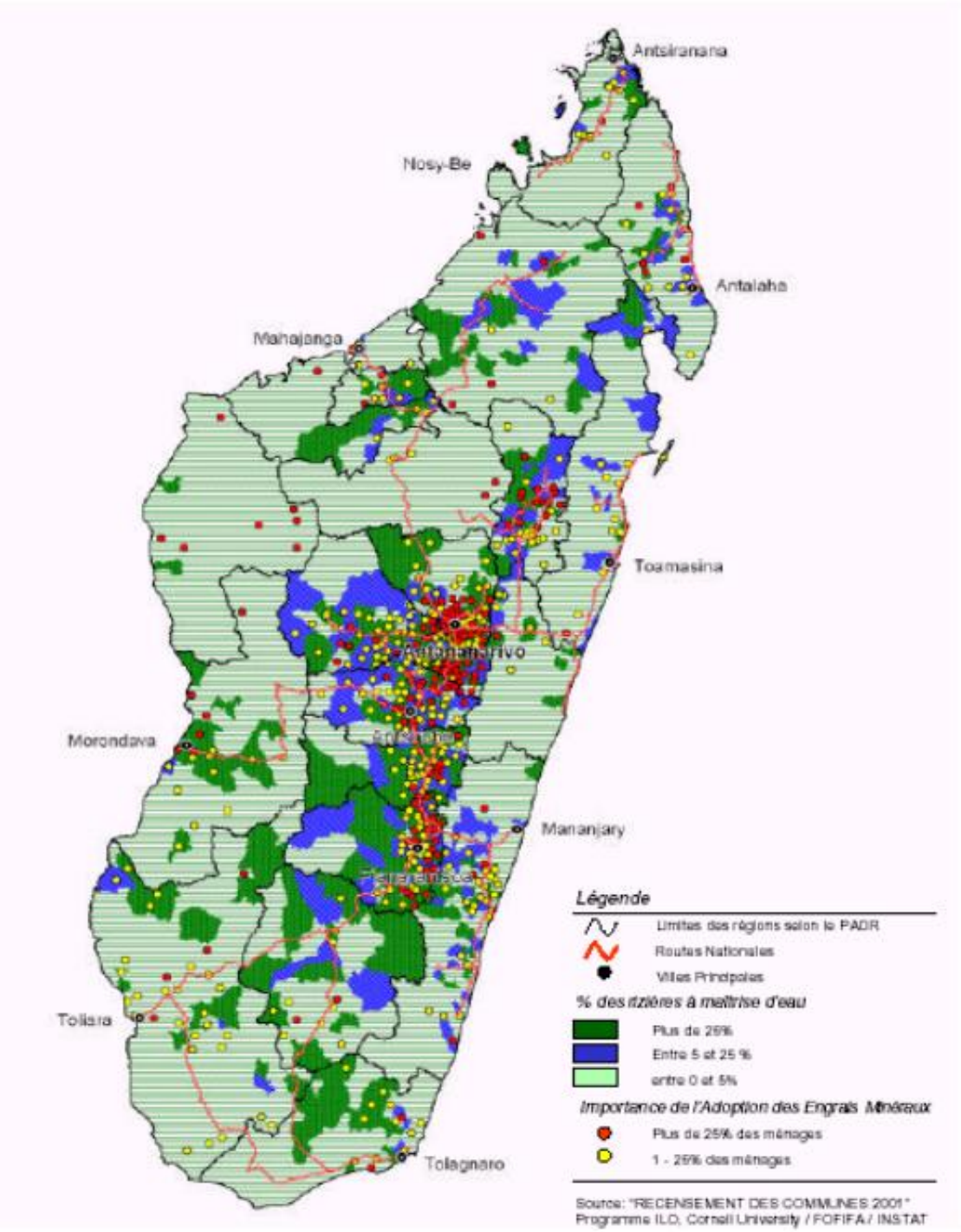


Graph 4: Evolution of rice yields (1961-2004)

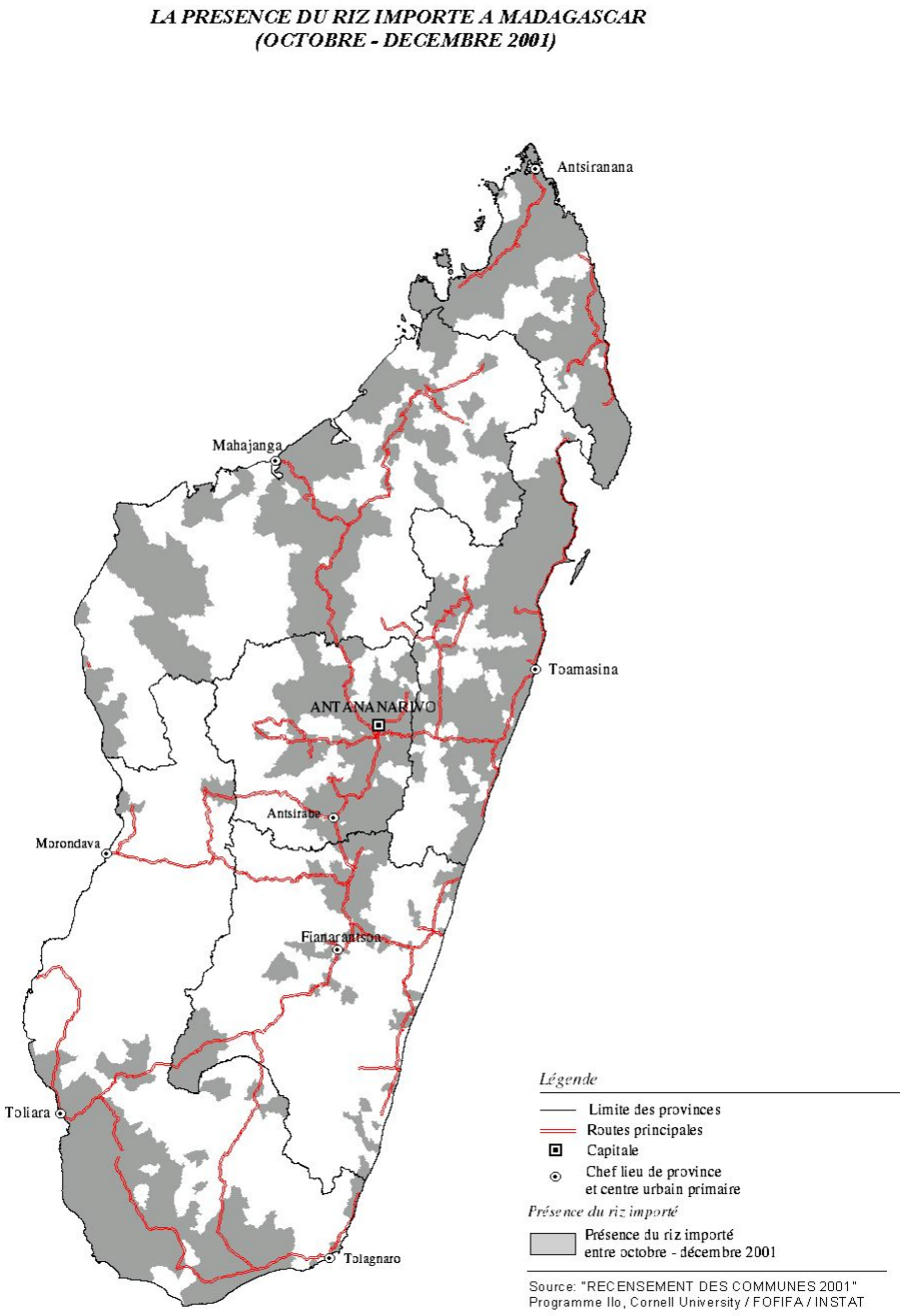



Graph 5: Retail rice prices in Antananarivo from 1985 to 2005
(prices in FMG 2005; deflated by non-rice price index) (source: INSTAT)
7000
6000
5000
4000
3000
2000
1000
0
Fmg/kg
85
87
89
91
93
95
97
99
1
3
Year

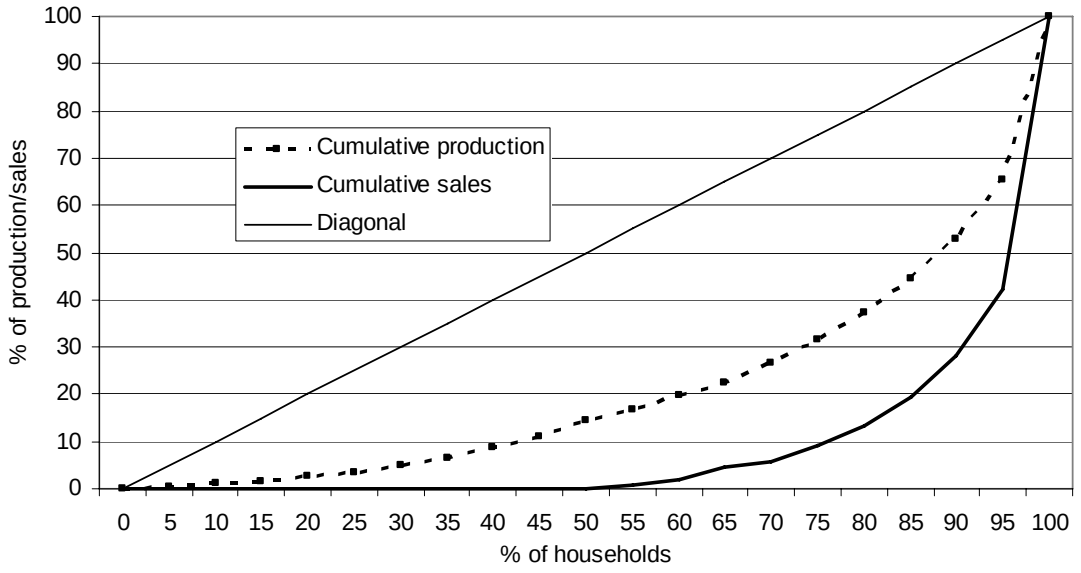
Graph 6: Adoption of chemical fertilizer, as stated by focus groups



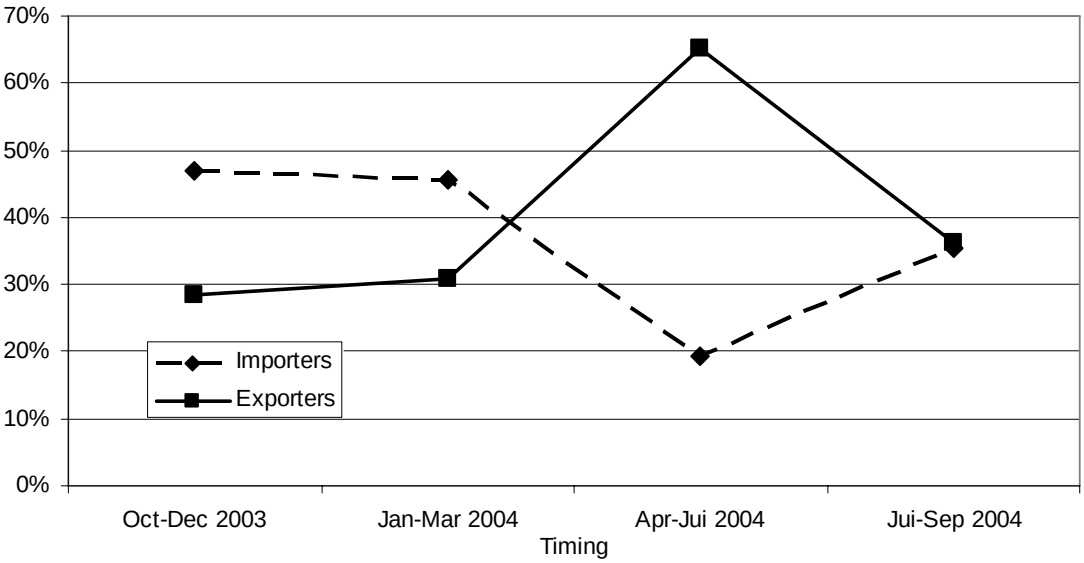
Graph 7: The presence of imported rice by commune at the end of 2001



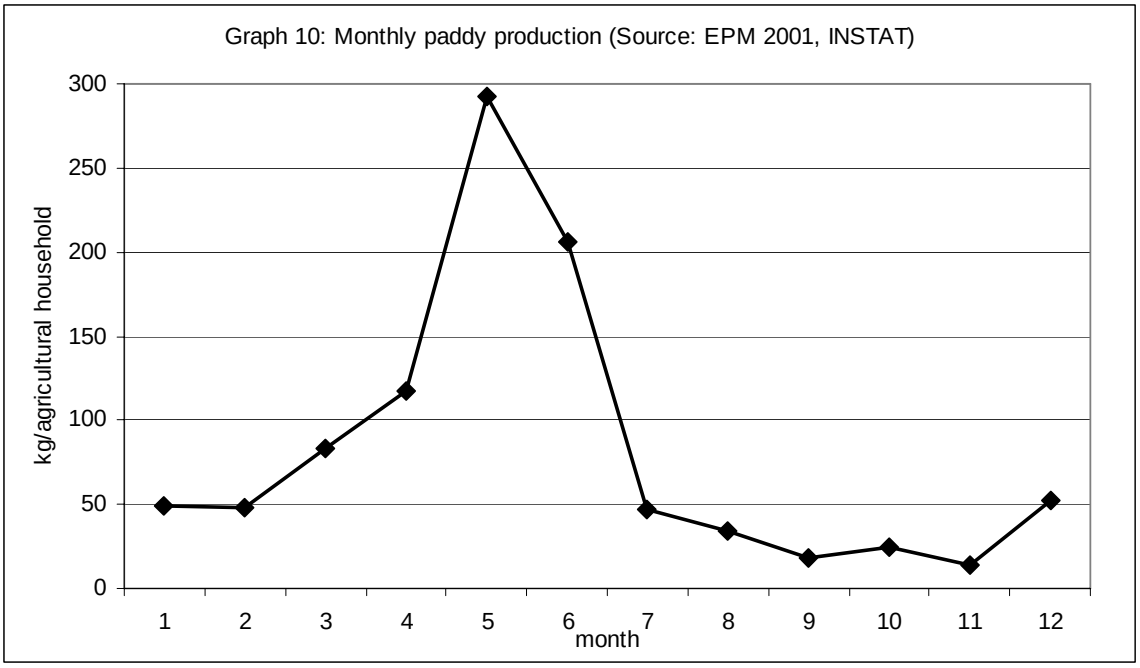
Graph 8: Lorenz curve of rice production and sales for agricultural producers in Madagascar (Source: EPM 2001, INSTAT)



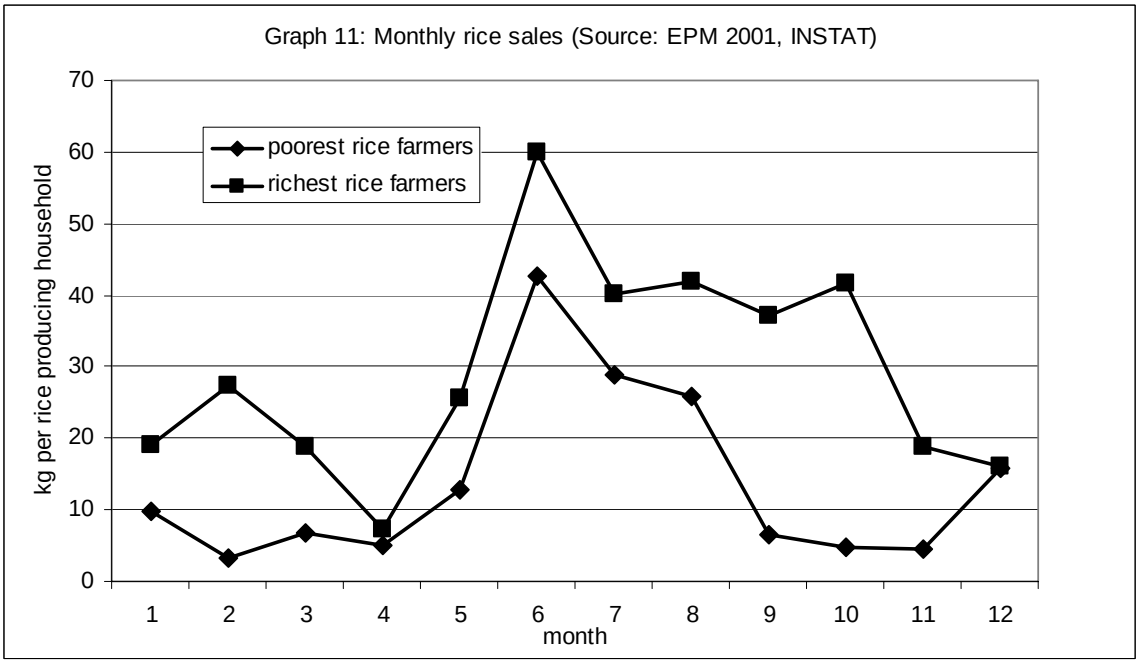
Graph 9: Percentage of rural communes that import rice from and export rice to other communes in lean and harvest period

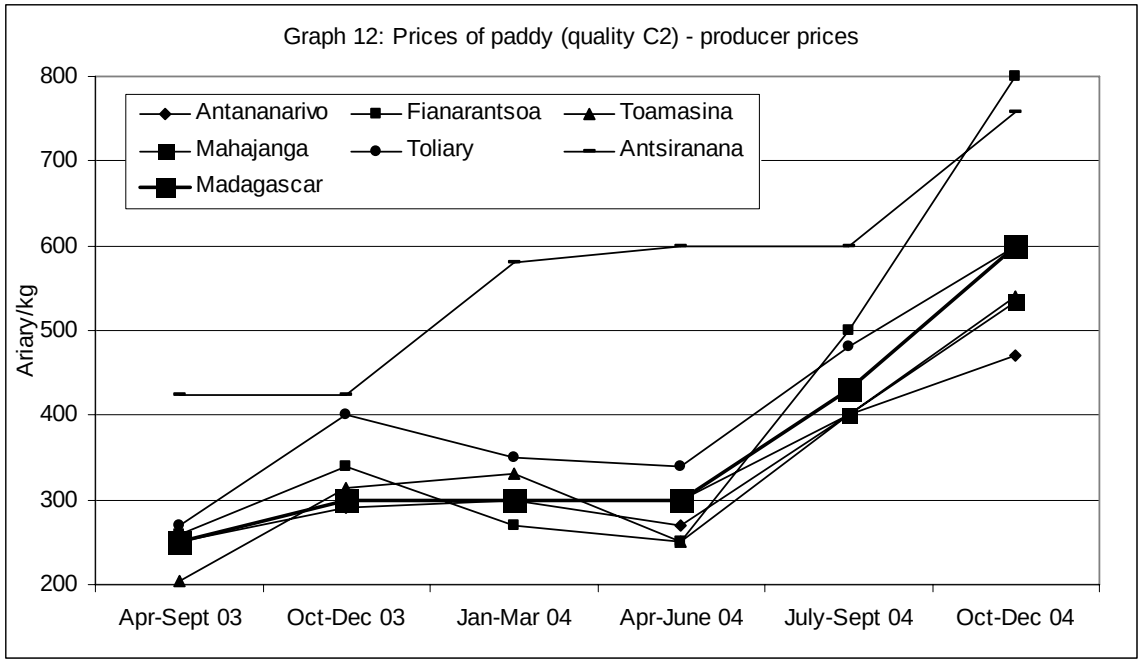


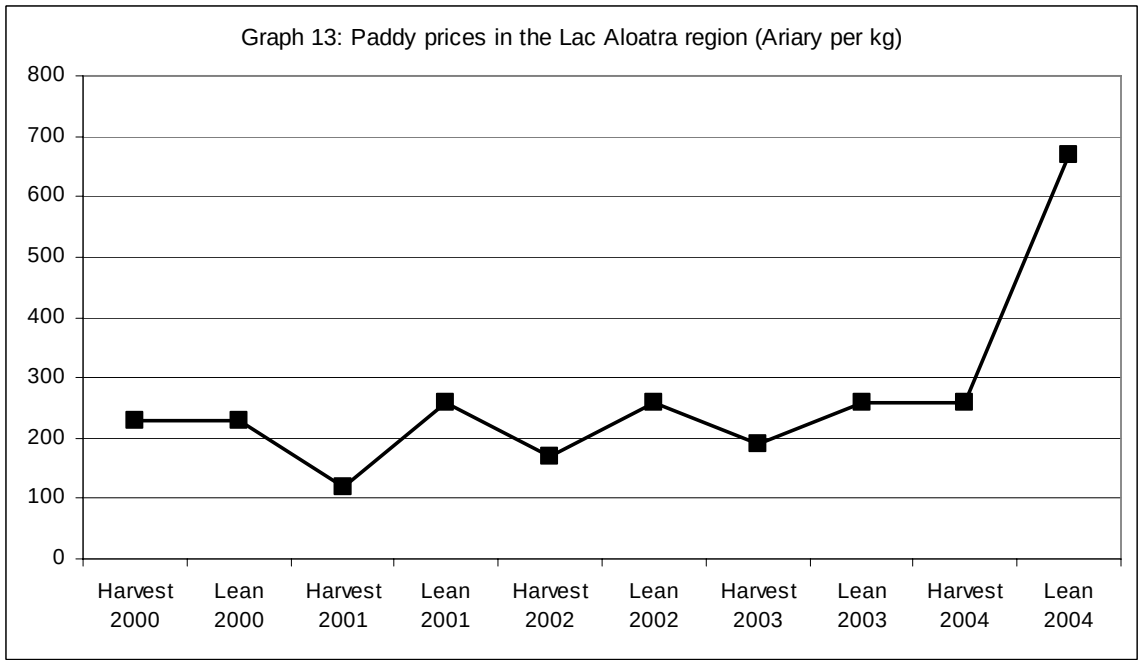
Graph 10: Monthly paddy production (Source: EPM 2001, INSTAT)



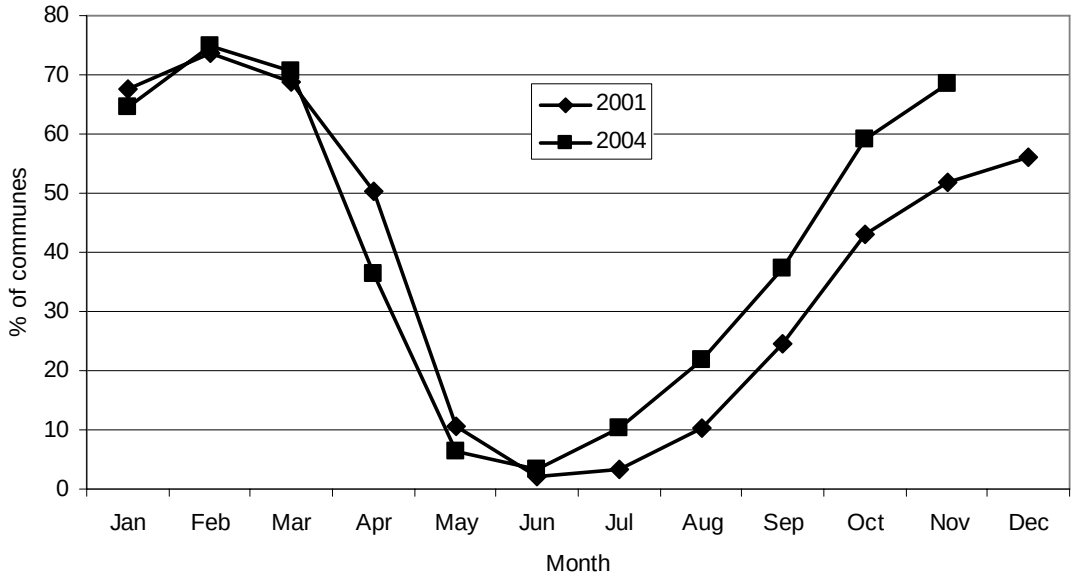
Graph 11: Monthly rice sales (Source: EPM 2001, INSTAT)



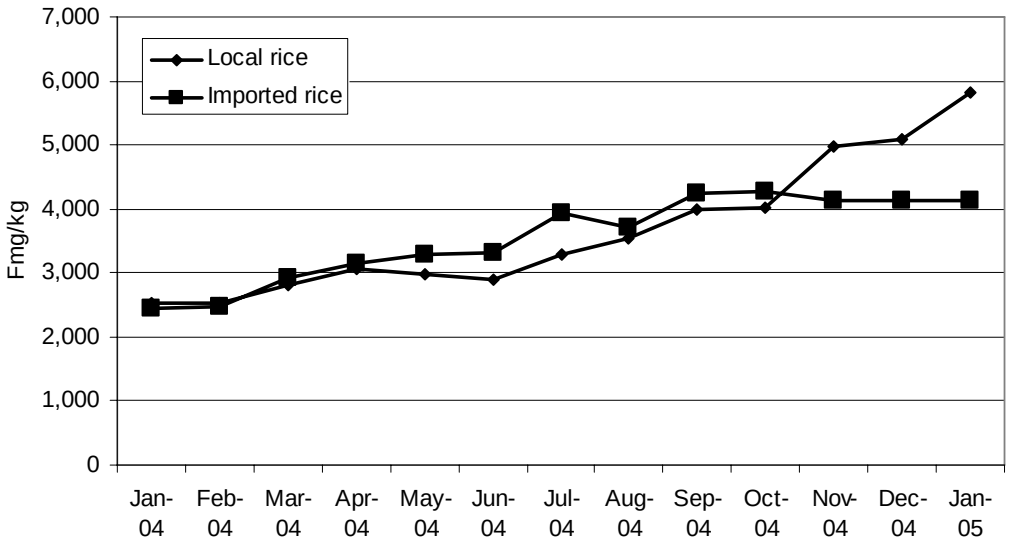

Graph 12: Prices of paddy (quality C2) - producer prices
800
700
600
500
400
300
200
Ariary/kg
Antananarivo
Fianarantsoa
Toamasina
Mahajanga
Toliary
Antsiranana
Madagascar
Apr-Sept 03
Oct-Dec 03
Jan-Mar 04
Apr-June 04
July-Sept 04
Oct-Dec 04

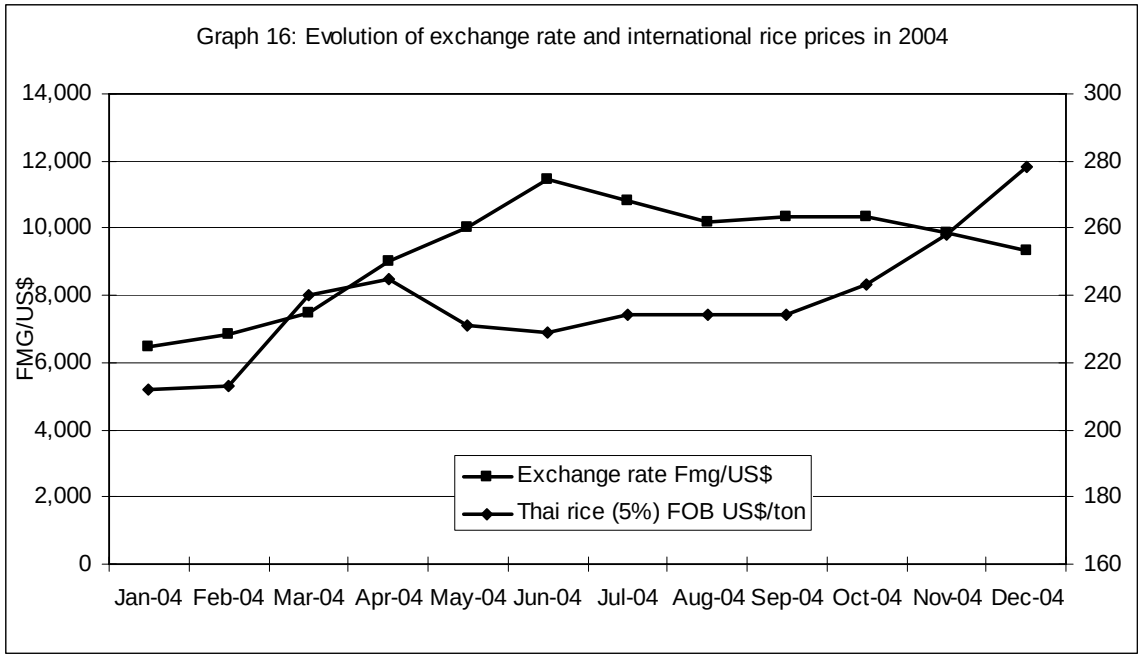

Graph 13: Paddy prices in the Lac Aloatra region (Ariary per kg)
800
700
600
500
400
300
200
100
0
Harvest 2000
Lean 2000
Harvest 2001
Lean 2001
Harvest 2002
Lean 2002
Harvest 2003
Lean 2003
Harvest 2004
Lean 2004

Graph 14: Percentage of communes that are in the lean period



Graph 15: Rice prices in Antananarivo in 2004




Graph 16: Evolution of exchange rate and international rice prices in 2004
14,000
12,000
10,000
8,000
6,000
4,000
2,000
0
FMG/US$
300
280
260
240
220
200
180
160
Exchange rate Fmg/US$
Thai rice (5%) FOB US$/ton
Jan-04 Feb-04 Mar-04 Apr-04 May-04 Jun-04 Jul-04 Aug-04 Sep-04 Oct-04 Nov-04 Dec-04

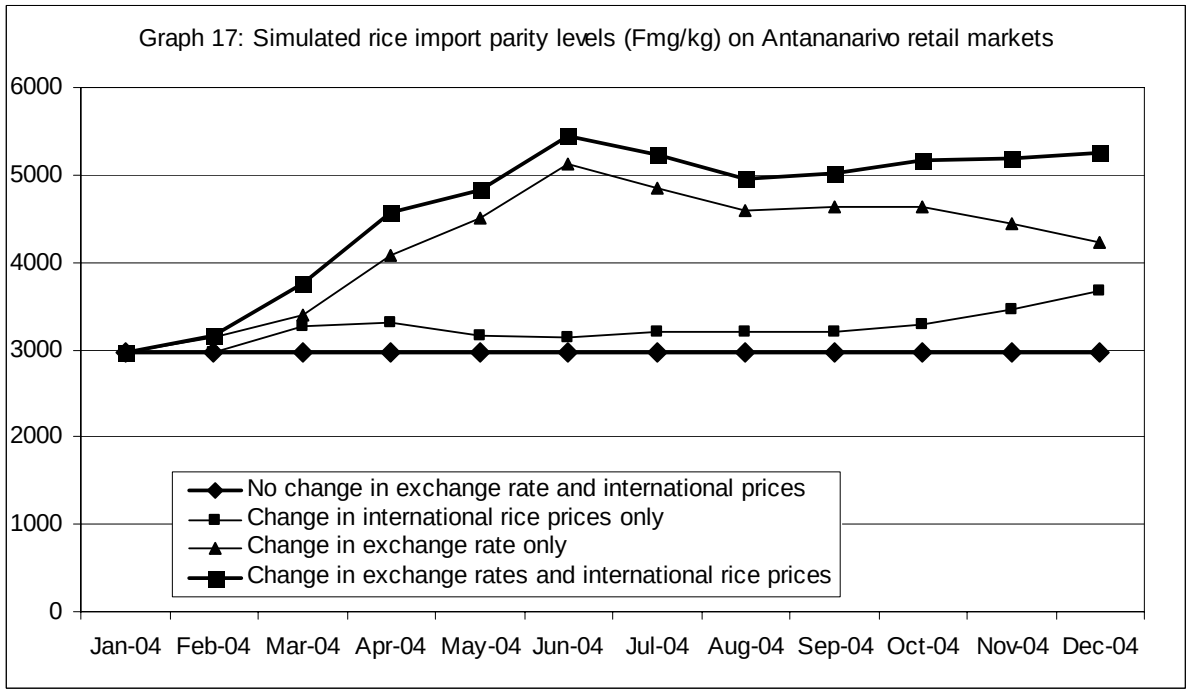
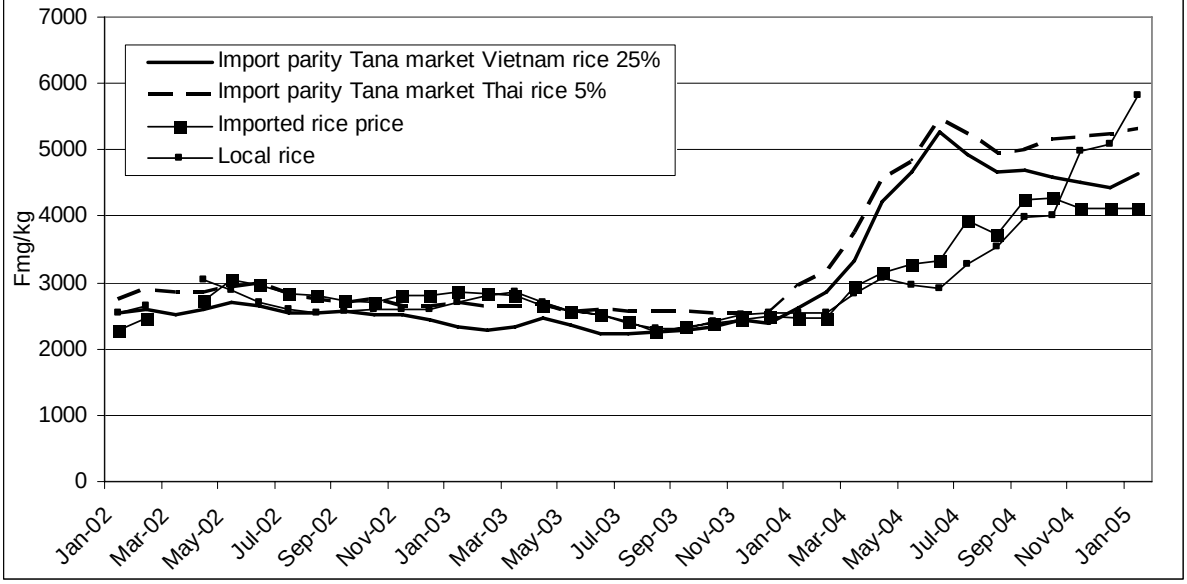

Graph 17: Simulated rice import parity levels (Fmg/kg) on Antananarivo retail markets
6000
5000
4000
3000
2000
1000
0
No change in exchange rate and international prices
Change in international rice prices only
Change in exchange rate only
Change in exchange rates and international rice prices
Jan-04 Feb-04 Mar-04 Apr-04 May-04 Jun-04 Jul-04 Aug-04 Sep-04 Oct-04 Nov-04 Dec-04

Figure 18: Rice prices and import parity levels on retail markets Antananarivo



Graph 19: Rice prices in 2005/2006

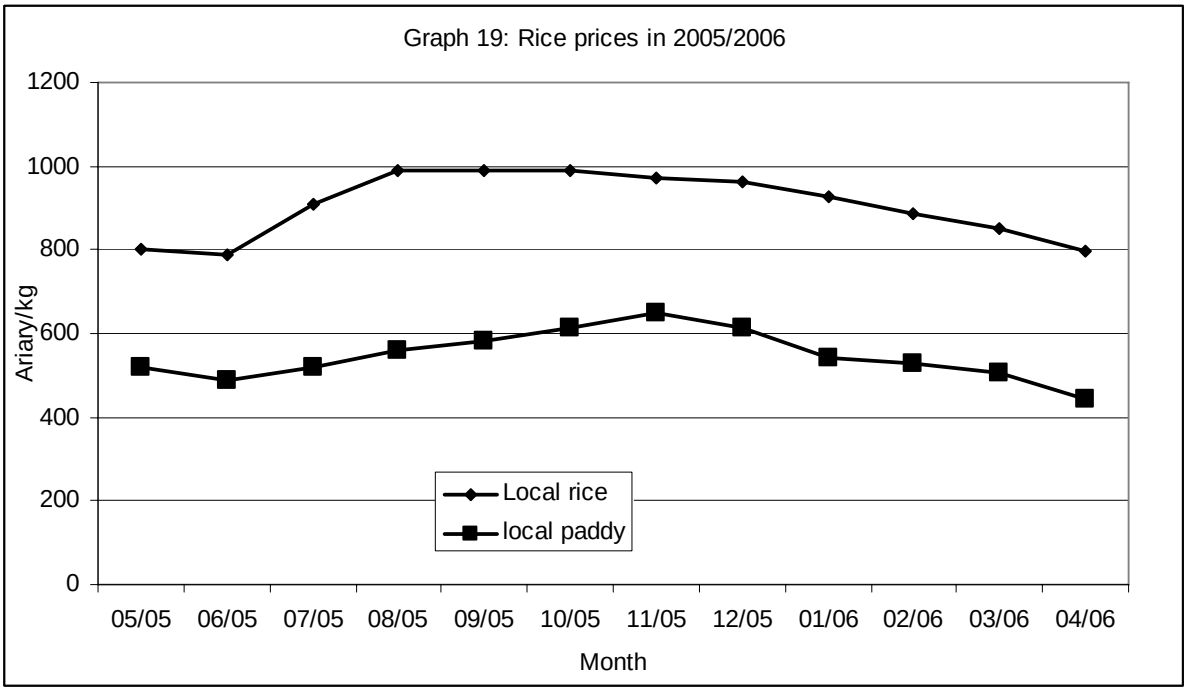


Table 1: Adoption of agricultural technologies
(percentage of adopters based on declarations of communal focus groups)

		Percentage of agricultural households						
Improved technology		>75%	50-75%	25-50%	5-25%	<5%	Nobody	Total
Transplanting in line	2004	8	12	8	10	20	42	100
	1990	3	4	6	13	18	56	100
Use of chemical fertilizer	2004	5	6	7	12	17	53	100
	1990	2	2	4	8	21	63	100
Use of organic fertilizer	2004	22	13	6	10	20	30	100
	1990	20	10	10	7	15	39	100
Use of pesticides/herbicides	2004	5	5	5	15	24	45	100
	1990	4	1	3	10	23	58	100
Use of improved rice varieties	2004	6	5	7	7	18	58	100
	1990	4	6	5	4	13	68	100

Source: Commune survey, 2004

Table 2: Stated constraints to rice productivity
(% of focus groups that said this constraint was 'important' or 'very important')

Constraint	%
Land tenure	36
Access to livestock to work the land	70
Access to livestock for manure	42
Access to labor	56
Access to agricultural equipment	77
Access to chemical fertilizer	42
Access to improved seeds	58
Access to better irrigation systems	85
Access to credit	60
Avoid silting	41
Avoid losses due to plant diseases	58
Avoid floods	57
Avoid droughts	37

Source: Commune survey, 2004

Table 3: Effect of remoteness on agricultural practices, by commune

		Remoteness quintile				
	National	Q1	Q2	Q3	Q4	Q5
Time to get to closest urban center (hours)	11	3	5	10	18	22
Part of auto-consumption in food consumption	35	16	35	40	43	42
Poverty (head count ratio)	77	54	77	85	85	86
Rice yields (tons/ha)	2.2	3.5	2.5	1.9	1.7	1.7
Technology adoption - % of households…						
… that use chemical fertilizer	11	27	28	6	5	1
… that use organic fertilizer	28	74	51	17	12	13

Source: Stifel et Minten (2003)

Table 4: Average calorie consumption in Madagascar (per capita/day)

	Year				
	1970	1980	1990	2002	2003
Average calorie consumption	2397	2369	2138	2005	2056
vegetable products	2131	2123	1909	1815	1884
animal products	265	246	229	190	172
Calorie consumption from cereals	1385	1327	1137	1085	1174
of which rice	1239	1197	1013	973	1001
Calorie consumption from starchy roots	393	409	477	476	396
of which cassava	283	311	374	398	323

Source: FAO - Food balance data

Table 5: Seasonal consumption and substitution

Type of household	Total caloric consumption by season			Change in the composition of caloric consumption (part lean vs harvest)				
	harvest	lean period	difference	rice	cassava	other tubers	maize	others
Rural households								
Poor in the South	1979	1790	-11%	-13%	7%	2%	7%	-3%
Non-poor in the South	2975	2810	-6%	-13%	7%	2%	5%	-1%
Poor in the rest of the country	2103	1873	-12%	-8%	4%	4%	2%	-2%
Non-poor in the rest of the country	2804	2540	-10%	-6%	3%	3%	1%	0%
Urban households								
Poor	2033	1932	-5%	-1%	1%	1%	0%	-1%
Non-poor	2343	2252	-4%	-1%	0%	0%	0%	1%
				Importance as source of calories (100%=annual calorie consumption)				
Rural households								
Poor in the South				21%	25%	6%	23%	23%
Non-poor in the South				20%	28%	8%	20%	24%
Poor in the rest of the country				53%	16%	11%	6%	15%
Non-poor in the rest of the country				56%	12%	7%	5%	20%
Urban households								
Poor				60%	10%	5%	4%	22%
Non-poor				54%	3%	2%	3%	37%

Source: Dostie et al. (2000)

Table 6: Rice production and sales in Madagascar

	Unit	Type of agricultural households			Total
		No sales	Small sales (<250 kg of rice)	Large sales (>250 kg of rice)	
% of agricultural producers	%	48	28	24	100
Expenditures per capita	Fmg/capita	748618	587692	914736	742008
Rice production	kg/household	561	592	2509	1030
Rice sales	kg/household	0	110	1201	315
Total rice production	million tons	527	332	1167	2025
Total rice sales	million tons	0	62	558	620

Source: EPM 2001, INSTAT-DSM

Table 7: Purchases and sales of rice in Madagascar

		Rural			Urban	Total
	Unit	Net buyers	Self-sufficient	Net sellers		
% of households	%	46	11	19	24	100
Expenditures per capita	Fmg/capita	683746	647046	805308	909069	742008
Average per household						
Rice production	kg/household	262	490	1917	301	611
Rice sales	kg/household	15	23	849	66	187
Rice purchases (total)	kg/household	334	27	65	404	266
Imported rice purchases	kg/household	47	5	4	58	37
Local rice purchases	kg/household	287	22	60	346	229
Percentage in total						
Rice production	%	20	9	60	12	100
Rice sales	%	4	1	86	9	100
Rice purchases (total)	%	57	1	5	37	100
Imported rice purchases	%	58	1	2	38	100
Local rice purchases	%	57	1	5	37	100

Source: INSTAT-EPM, 2001

Table 8: Location of net sellers and buyers

Province	% of households		Total number of households		Share of total	
	net seller of rice	net buyer of rice	net seller of rice	net buyer of rice	net seller of rice	net buyer of rice
Antananarivo	12%	82%	114,533	800,065	16%	34%
Fianarantsoa	20%	75%	131,758	498,789	18%	21%
Toamasina	22%	67%	125,147	373,234	17%	16%
Mahajanga	45%	48%	164,872	177,544	23%	8%
Toliara	25%	68%	119,274	321,637	17%	14%
Antsiranana	22%	68%	60,685	183,907	8%	8%
Total	22%	71%	716,269	2,355,176	100%	100%

Source: INSTAT-EPM 2001

Table 9: Poverty and market participation

		Consumption quintile					
	Unit	Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5	Total
Rice purchasing status (whole population)							
Net rice buyer	% of pop.	54	59	61	66	81	66
Self-sufficient	% of pop.	25	14	15	10	7	13
Net rice seller	% of pop.	21	28	24	24	12	21
Purchases (the whole population)							
Quantity of rice bought	kg/household	132	174	234	307	391	266
Of which imported rice	kg/household	17	23	34	45	53	37
Living in urban areas	%	8	12	17	27	44	24
Rice market participation (by agricultural producers)							
Produce rice	%	86	85	83	87	86	85
Quantity produced	kg/household	427	701	950	1076	1190	844
Sold rice	%	40	46	47	46	42	44
Quantity sold	kg/household	117	156	273	269	412	232
Bought rice	%	78	78	76	70	69	75
Quantity bought	kg/household	130	163	205	202	261	187
Of which imported rice	kg/household	17	21	29	38	35	27
Sold and bought rice in one year	%	30	31	30	25	20	28
Use of rice	kg/household	440	708	881	1008	1038	799

Source: INSTAT-EPM 2001

Table 10: Import characteristics of five largest importers in 2004

Name	# of shipments	Total quantity	Value CAF	Average price	Market share in % (of commercial imported quantity)
		1000 tons	million $	$/ton CAF	
Nivoniaina	4	14.5	3.2	221	17
Felana	4	10.0	2.6	260	12
Scim	4	9.4	2.0	213	11
Cociama	7	7.5	1.7	227	9
Olam Madagascar	8	7.4	1.5	203	9
Total for 5 largest importers	27	48.8	11.0	225	59

Source: Authors' calculations based on Ministere de Commerce, 2004

Table 11: Monthly rice imports in Madagascar (in tons)

	year								
Month	1996	1997	1998	1999	2000	2001	2002	2003	2004
January	271	5 743	8 806	13 212	24 757	29 725	10 330	38 176	30 391
February	841	9 067	10 540	14 482	24 921	32 680	1 900	36 088	6 601
March	640	8 750	8 206	10 609	15 984	32 518	8	37 269	11 750
April	1 827	7 523	4 162	9 292	9 199	23 994	1 800	18 763	5 049
May	2 343	6 127	1 182	6 840	3 374	20 564	2 705	16 788	1 085
June	2 354	3 997	703	8 072	5 997	14 298	0	13 307	356
July	1 479	2 983	689	3 896	6 491	11 044	1	6 310	873
August	563	969	3 214	3 580	13 963	4 051	4 501	10 340	21 000
September	861	801	3 262	172	15 540	1 487	5 380	5 429	731
October	862	1 429	3 992	2 896	28 393	6 484	12 843	22 503	13 000
November	1 189	2 918	2 299	10 723	27 055	2 522	10 495	20 186	12 042
December	3 533	5 702	8 320	19 772	31 698	9 286	11 549	29 143	43 136
Total	16 763	56 009	55 375	103 546	207 372	188 653	61 512	254 302	146 014
Total first 6 months	8 276	41 207	33 599	62 507	84 232	153 779	16 743	160 391	55 232
% first six months over total	49%	74%	61%	60%	41%	82%	27%	63%	38%

Source: INSTAT until 2003 - MICDSP 2004

Table 12: Monthly staple price variability in some selected developing countries ($/ton)

	Bangladesh	India	Zambia	Ethiopia	Madagascar	Madagascar
	National Ave.	Delhi	Lusaka	Addis	Antananarivo	Antananarivo
	Wholesale	Wholesale	Retail	Retail	Retail	Retail
	Coarse Rice	Coarse Rice	White Maize	Maize	Rice	Rice
	$/ton	$/ton	$/ton	$/ton	$/ton	$/ton
Period	1996-2002	1996-2002	1996-2002	1996-2002	1996-2002	2003-2004
Average Price	240.9	218.7	191.8	127.7	397.2	421.3
Standard Deviation	32.0	23.0	59.4	39.6	49.4	59.7
Coef. of Variation	0.133	0.105	0.310	0.310	0.015	0.02
Maximum	307.1	266.0	352.1	225.7	538.8	572.8
Minimum	193.5	184.0	100.9	55.7	313.3	279.3
Max/Min	1.59	1.45	3.49	4.05	1.71	2.05
Max/Mean	1.27	1.22	1.84	1.77	1.36	1.36
Source: Authors' calculations.						

Table 13: Composition of marketing margins for imported rice in January 2004

	Unit	Price
FOB Bangkok price	$/MT	212
Freight	$/MT	45
Insurance	$/MT	3
CAF Price	$/MT	260
Ex Rate	Fmg/$	6451
CIF price	Fmg/kg	1677
Banking costs	Fmg/kg	50
Port charges	Fmg/kg	117
Tariff (20%)	Fmg/kg	335
Price magasin	Fmg/kg	2180
Importer's margin	Fmg/kg	109
Price before VAT	Fmg/kg	2289
VAT (20%)	Fmg/kg	335
Import parity Toamasina	Fmg/kg	2625
Wholesale margin	Fmg/kg	79
Transport to Antananarivo	Fmg/kg	175
Retail margin	Fmg/kg	86
Import parity Antananarivo	Fmg/kg	2965

Source: Authors' calculations based on World Bank (2004a)

Table 14: Rice imports in 2004 and 2005 (tons)

	Imports in 2004			Imports in 2005		
	Commercial	Government sponsored	Total	Commercial	Government sponsored	Total
January	30 391		30 391	7511	21 350	28 861
February	6 601		6 601	25695	37 900	63 595
March	11 750		11 750	25	23 175	23 200
April	5 049		5 049	???	17 800	17 800
May	1 085		1 085			
June	356		356			
July	873		873			
August	21 000		21 000			
September	731		731			
October	0	13000	13 000			
November	3 342	8700	12 042			
December	1 921	41215	43 136			
Total	83 099	62 915	146 014	33 231	100 225	133 456

Source: MICDSP

Table 15: Effects of Tariff Changes on Imports and Tariff Revenues

	Base	Simulation 1	Simulation 2	Simulation 3	Simulation 4
Elasticities (demand,supply)		(0,0)	(-0.2,0)	(-0.4,0)	(-0.4,0.2)
Production (paddy, mn tons)	2.978	2.978	2.978	2.978	2.936
Rice Production (mn tons)	1.787	1.787	1.787	1.787	1.762
Imports (mn tons)	0.200	0.200	0.229	0.258	0.283
Total Supply (mn tons)	1.987	1.987	2.016	2.045	2.045
Elasticity of demand	--	0.0	-0.2	-0.4	-0.4
Elasticity of supply	--	0.0	0.0	0.0	0.2
Import Tariff (percent)	10	0	0	0	0
Price (= import parity) (FMG/kg)	5200	4841	4841	4841	4841
% change demand	--	0.0%	1.4%	2.9%	2.9%
% change price	--	-6.9%	-6.9%	-6.9%	-6.9%

Change in imports (mn tons)	--	-	0.03	0.06	0.08
% change in imports	--	0%	14%	29%	42%
Implicit import elasticity	--	0.0	-2.1	-4.2	-6.0
Tariff revenues (bn FMG)	207	138	158	178	196
Tariff revenues (mn $)	20.7	13.8	15.8	17.8	19.6
Change in tariff revs (mn $)	--	-6.9	-4.9	-2.9	-1.1
% reduction in tariff revs	--	-33%	-24%	-14%	-6%
Imports/Supply	10.1%	10.1%	11.3%	12.6%	13.8%
Value of Imports (mn $)	57.0	57.0	65.2	73.4	80.7

Source: Model simulations. (Note that total tariffs on rice in the base case consist of a rice import tariff of 10% and a value added tax of 20 percent. The total tariff is equal to 36% of the cost and freight price of rice).

Table 16: Rice consumption and production according to household net rice sales groups, 2001

	Rural						
	Net buyers	Self-sufficient	Net sellers	Urban	Total	Rural	Net buyers
Total Population							
Total population	7.321	1.682	3.082	3.583	15.668	12.085	10.903
Total # households	1.519	0.366	0.626	0.805	3.315	2.510	2.324
Pop/HH	4.82	4.60	4.92	4.45	4.73	4.81	4.69
% of total population	46.7%	10.7%	19.7%	22.9%	100.0%	77.1%	69.6%
Rice production (kgs/HH)	231	433	1,692	265	539	625	243
Rice use (kgs/HH)	550	436	812	603	600	599	568
Rice consumption (kgs/person)	114.1	94.8	165.0	135.5	126.9	124.4	121.5
Rice consumption ('000 tons)	835	160	509	485	1,989	1,503	1,321
% production / use	42%	99%	208%	44%	90%	104%	43%
Poorest 60% of Population							
Total poor population	4.666	1.361	2.179	1.196	9.402	8.205	5.862
Total # poor households	0.851	0.269	0.377	0.219	1.715	1.497	1.070
Pop/HH	5.48	5.07	5.78	5.47	5.48	5.48	5.48
% of Total Poor	49.6%	14.5%	23.2%	12.7%	100.0%	87.3%	62.4%
% of Total Population	29.8%	8.7%	13.9%	7.6%	60.0%	52.4%	37.4%
Rice production (kgs/HH)	242	424	1,470	387	559	584	272
Rice use (kgs/HH)	485	356	935	522	568	575	492
Rice consumption (kgs/person)	88.4	70.3	161.8	95.5	103.7	104.9	89.9
Rice consumption ('000 tons)	413	96	352	114	975	861	527
% production / use	50%	119%	157%	74%	98%	102%	55%

Source: Calculated from EPM 2001 data

Table 17: Effects of Tariff Changes on Household Welfare

	Base (kgs/cap.)	Simulation 1 (mn $)	Simulation 2 (mn $)	Simulation 3 (mn $)	Simulation 4 (mn $)
Import tariff (percent)	10	0	0	0	0
Elasticities (demand,supply)	--	(0,0)	(-0.2,0)	(-0.4,0)	(-0.4,0.2)
Poorest 60% of Households					
Rural Net Buyers	88	7.4	7.5	7.6	7.7
Rural Self-Sufficient	70	-0.7	-0.6	-0.6	-0.6
Rural Surplus	162	-7.2	-7.2	-7.1	-6.9
Urban	95	1.1	1.1	1.1	1.1
Total	104	0.6	0.8	1.1	1.3
Net Buyers*	90	8.5	8.6	8.8	8.8
Change in tariff revs (mn $)	--	-6.9	-4.9	-2.9	-1.1
Net Benefit/Lost Tariff Revenue	--	1.2	1.8	3.0	7.7
All Households					
Rural Net Buyers	114	17.4	17.6	17.8	17.9
Rural Self-Sufficient	95	0.0	0.1	0.1	0.2
Rural Surplus	165	-19.8	-19.7	-19.5	-19.3
Urban	135	9.8	9.9	10.0	10.1
Total	127	7.2	7.8	8.3	8.7
Net Buyers*	121	27.1	27.5	27.8	28.0
Change in tariff revs (mn $)	--	-6.9	-4.9	-2.9	-1.1
Net Benefit/Lost Tariff Revenue	--	3.9	5.6	9.6	24.5

*Rural net buyers and all urban households.
Source: Model simulations

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