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POLICY OPTIONS FOR ACCELERATED GROWTH AND COMPETITIVENESS OF THE DOMESTIC RICE ECONOMY IN NIGERIA

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The Nigerian government has embarked on an ambitious plan to make the country self-sufficient in rice production by 2015 under its current Agricultural Transformation Agenda (ATA). The plan is in response to the perceived threat to the Nigerian economy of larger volumes of milled rice imports into Nigeria, with an import bill currently exceeding US$2 billion. To reverse the growing trend in rice imports, the Nigerian government has introduced a number of key policies and investment strategies to increase domestic rice production and improve its competitiveness with imports. This is being done through a combination of import restrictions, input policy and institutional reforms, and direct investments along the rice value chain. However, little is known as to whether this ambitious short term goal can be achieved and what would be needed over the long term to sustain increased production. This policy note synthesizes the results of various analyses assessing the potential for Nigeria to transform its domestic rice sector to become competitive with imports. A number of key messages emerge: (1) import restrictions alone are insufficient because they are costly to implement and likely to be ineffective; (2) given agro-ecological conditions and biophysical potential, current rice technologies, and farmer characteristics, short term increases in rice production are unlikely to meet domestic demand; (3) sufficient support to small-to-medium scale rice processers to improve quality will be even more important than promoting large-scale milling technologies; and, (4) a combination of rice production technology growth and market improvement are fundamental prerequisites for raising rice self-reliance without hurting the overall economy.

INTRODUCTION

The Nigerian government aims to achieve self-sufficiency in rice production by 2015 under its new policy, the Agricultural Transformation Agenda (ATA). Nationally, the ratio of domestic production to consumption declined from 75 percent in the 1990's to 53 percent in 2010, while the import bill rose to US$2.2 billion. The growing dependency on rice imports has the potential to deplete the country's foreign currency reserves and to increase its vulnerability to global price shocks, and raises concerns about food insecurity. In consequence, the Nigerian government has introduced several policies and investment strategies to stop the trend. Rice import tariffs are being steadily increased, with a complete embargo planned for 2015.Public resources are being provided to expand access to modern agricultural inputs such as fertilizer and improved seed. The government has also been pursuing innovative financing mechanisms to supply credit and physical investments for the establishment of staple crop processing zones (SCPZs). These are intended to encourage clustering of food processing industries in proximity to raw materials and end markets.

Historically, rice self-sufficiency policies in Nigeria have been pursued without success. This brief summarizes IFPRI's assessment of the current strategy and what would be needed for it to succeed. The assessment is based on an analysis of the challenges of rising demand, the implementation of rice import restrictions, and the required improvements to the current structure and performance of the rice value chain. From this assessment, the potential to rapidly increase productivity, output, and quality along the rice value chain is estimated. These estimates are used in a simulation model of the Nigerian economy in order to assess whether the rice self-sufficiency goal can be achieved. We show that pursuing the technology change and the market improvement policies of the ATA is more likely to make Nigeria self-sufficient in rice than the imposition of import barriers.

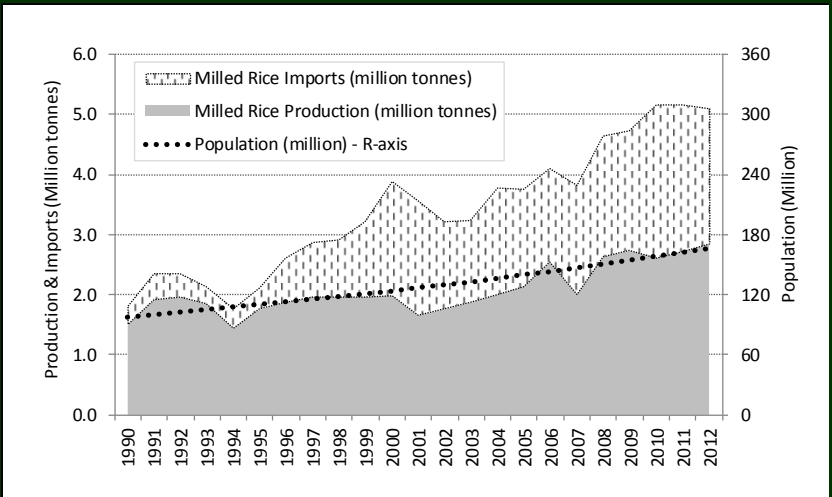
THE CHALLENGE OF RISING DEMAND AND IMPORTS

Annual rice production in Nigeria has remained stagnant at about 28 kg/person since 1990, while annual per capita consumption has increased from 18 kg to 34 kg in the same period. Rice yields have remained at below 2 mt/ha. Rice imports have generally grown faster than both rice production and the population with the latter two growing at about the same pace (Figure 1). In particular, rice imports have grown at about 11 percent per year since 1990. The growing dependency on rice imports threatens to deplete Nigeria's scarce foreign currency reserves, increases its vulnerability to global price shocks, and raises overall concerns about food insecurity.

Growing importance of rice as a food staple

Eighty-four percent of households in Nigeria consumed rice at home in 2011 (authors' calculation based on Living Standard Measurement Survey – Integrated Survey on Agriculture, LSMS). The average Nigerian household spent 6 percent of its total income on rice, the highest amongst all staples in both urban and rural areas. Of the 5.2 million metric tons of rice consumed in Nigeria in 2011,

FIGURE 1: TRENDS IN RICE PRODUCTION, IMPORTS AND POPULATION IN NIGERIA, 1990-2012



Source: USDA international database (2012) for production and imports; FAOSTAT (2012) for population.

only 2.7 million tons were produced domestically. Imports accounted for 2.45 million tons. Although Nigeria has long produced and consumed rice, demand has grown recently through rapid urbanization, increased population and per capita income growth, and changes in family occupational structures (Akande, 2002). Urbanization requires foods that are easy to prepare, such as rice. Urban households also prefer imported rice, as it tends to have a higher swelling capacity, better taste, and preferred grain shapes and is clean, polished, not broken, without stones or other debris, and suitable for a variety of dishes (e.g. jollof rice, fried rice). Most local rice cannot adequately compete with imports on a quality basis, as it is often improperly processed and contains foreign matter.

Local rice is mostly consumed in rural areas, where it represents a large portion of a typical household's budget for staples, as illustrated by the higher marginal budget shares (MBS) in Table 1. The MBS for rural households is higher for local rice than for imported rice, while the opposite is true for urban households. Similarly, the income elasticity of demand for rice in general, as estimated by a semi-log inverse function (King and Byerlee 1978), is higher for rural (0.77) than for urban (0.43) households. The income elasticity of demand for imported rice is much higher (above 1.00) among rural consumers and can be considered a luxury good. Overall, the average income elasticity of demand for rice in Nigeria (0.63) is similar to those of other African countries, but higher than most Asian countries. Such evidence implies that demand for both local and imported rice will continue to grow as income levels in Nigeria continue to rise.

Resulting trends in imports and prices

Total reported rice exports to Nigeria in the United Nations COMTRADE database stood at 2.1 million metric tons in 2010, while official reported import figures from the same source was 711 thousand tons, implying an underreporting of rice imports. This discrepancy points to the challenges and likely insufficiency of import tariffs for deterring rice imports (Figure 2). Most of the rice imported into Nigeria does not follow formal channels.

Much of the estimated $800 million or 120 billion Naira per year of potential import tariff revenue from rice from mid-2009 through 2012 might have been captured as rents by traders or regulatory officials. This observation implies that high import tariffs will be costly to manage and likely ineffective due to smuggling, under-reporting, and rent-seeking activities.

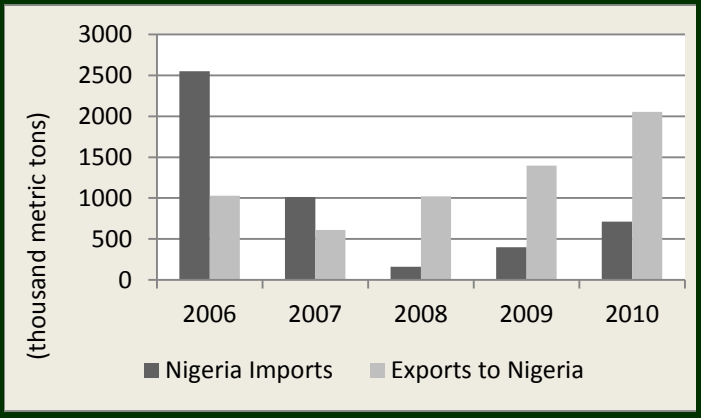
Moreover, import tariffs may be insufficient for controlling the domestic price of rice. Through December 2007, domestic prices of imported rice (Enugu) generally followed import parity prices, with a 100 percent import tariff. But this was not the case after 2008 (Figure 3). The rice import parity price dropped to below 130 Naira/kg by June 2008, while domestic prices for imported rice remained high despite a sharp tariff reduction. This price pattern implies that local brands of rice may not be perfectly substitutable for imported brands.

TABLE 1: MARGINAL BUDGET SHARES AND INCOME ELASTICITY OF DEMAND

	Urban		Rural		National	
Commodity	Marginal Budget Share (%)	Income elasticity	Marginal Budget Share (%)	Income elasticity	Marginal Budget Share (%)	Income elasticity
Rice	2.4	0.43	5.4	0.77	4.2	0.63
Rice-local	0.4	0.20	3.0	0.64	1.7	0.46
Rice-imported	2.0	0.54	2.4	1.04	2.4	0.87
Maize	0.7	0.64	1.9	0.71	1.4	0.64
Wheat	1.2	0.70	1.8	1.18	1.6	0.99
Sorghum/millet	0.1	0.07	0.7	0.13	0.3	0.07
Other grains	0.2	1.35	0.0	0.41	0.0	0.34
Cassava	0.7	0.21	2.2	0.47	1.4	0.33
Yam	2.1	0.47	3.4	0.64	2.9	0.57
Other roots	0.8	0.60	1.2	0.74	0.9	0.62
Pulses	1.2	0.41	2.2	0.57	1.7	0.48
Oils and fats	1.8	0.38	3.6	0.54	2.9	0.47
Fruits/vegetables	2.6	0.50	4.0	0.57	3.4	0.52
Milk	1.1	1.04	1.1	1.04	1.1	1.02
Poultry	2.0	2.27	2.1	1.92	1.9	1.85
Other meat	4.3	0.81	7.7	1.26	6.3	1.07
Fish	2.4	0.44	4.2	0.72	3.6	0.62
Other food	2.8	0.90	3.5	0.92	3.2	0.92
Dining out	20.0	1.57	14.2	1.52	16.9	1.62
Nonfood	53.6	1.36	40.7	1.54	46.3	1.52
Total	100		100		100	

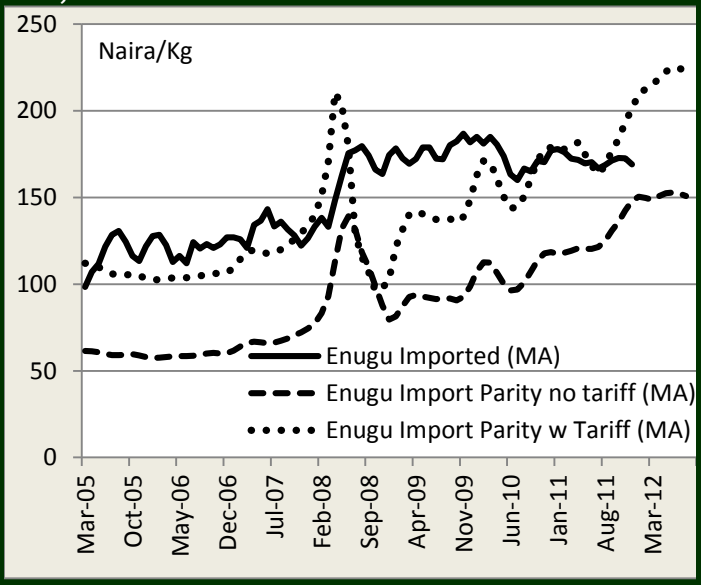
Source: Author calculation from LSMS, 2011

FIGURE 2. RICE IMPORTS BY AND REPORTED EXPORTS TO NIGERIA



Source: Authors' calculation based on COMTRADE data

FIGURE 3. NIGERIA: DOMESTIC AND BORDER PRICES OF RICE, 2005-12



Source: Authors' calculation based on Nigeria, National Bureau of Statistics data, and various sources (see Johnson et al. 2013)

STRUCTURE AND PERFORMANCE OF THE RICE VALUE CHAIN

Nigerian rice is produced all across the country—in lowland, upland, and (fully- and semi-) irrigated systems (Table 2). The lowland system is found in river valleys (*fadama*) and shallow swampy areas, accounting for about 43 percent of total domestic production. Most rice producers are small scale, cultivating 1 to 2 hectares. Water control methods, such as bunding, are rare in the lowlands. Rice is either directly seeded or transplanted, and grown only once a year. In the uplands, rice is sometimes intercropped with maize, cassava, yams and vegetables. Rice is seeded directly or broadcasted on level and sloped hill sides. Upland rice performs better in the south due to higher rainfall. Irrigated rice systems are rare and limited to a few large irrigation schemes and some fadama areas.

Major constraints are weeds, soil nutrient deficiencies, high labor costs, and reduced fallowing. Drought, disease (e.g., blast and leaf scald, Rice Yellow Mottle Virus), and pests (e.g., birds and rodents) also substantially constrain rice production in Nigeria.

Rice variety development by domestic agricultural research institutions has slowed since the mid-1980s due to funding cuts; incapacitating critical adaptive research building on varieties originally bred by IITA and the Africa Rice international agricultural research institutions. Maximum yields are rarely realized due to limited access and inefficient use of complementary technologies, such as the application of fertilizer, improved land cultivation and weeding techniques, and water control, because of the relatively high costs of these inputs.

Most rice traders invest very little to upgrade the product. Similarly, small-scale millers rarely upgrade to better paddy varieties and processing technologies and are only weakly linked to retail markets. The quality of the final domestic rice product in market outlets differs substantially and is considered inferior to import brands in quality, taste, and texture. As such, production is not linked directly to consumer preferences.

In Nigeria, rough paddy goes through parboiling before it is milled because this enhances the taste and texture for preferred local rice dishes. Rice processing involves many actors with varying degrees of skills and access to technologies. However, most post-harvest handling and processing in Nigeria is still a cottage industry made up of small scale operators. Although there is little information on the current state of the rice milling sector in Nigeria, past surveys show that the small and medium-scale milling channels (processing less than 500kg per hour) likely handle up to 80 percent of the total rice in domestic markets (Lançon et al. 2003). They generally are located in clusters near paddy production areas, organized as businesses. Most such millers process rice paddy from smallholder farmers and traders for a fee. In 2010, 14 percent of the harvest was milled for own consumption and the rest entered the market, 63 percent in rural and 22 percent in urban markets (LSMS, 2011).

Among the large, industrial scale millers in Nigeria, only a handful of company brands exist (e.g. Olam, Veetee, Stallion, Dana

TABLE 2. DOMINANT RICE PRODUCTION SYSTEMS IN NIGERIA

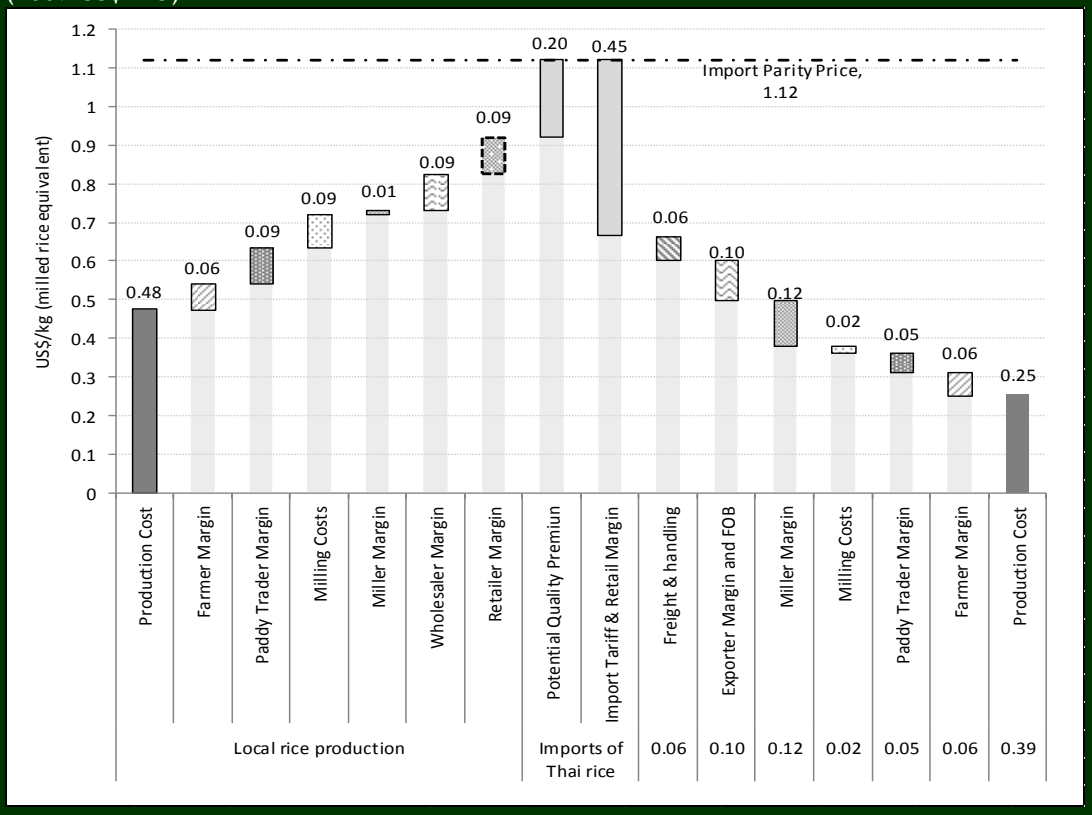
Production system	Average share of national area (%)	Average share of national production (%)	Average yield range per year (mt/ha)
Lowland (rain-fed)	52	43	2.0 – 3.0
Irrigated[1]	16	29	3.0 – 4.0
Upland (rain-fed)	30	27	1.0 – 2.0
Mangrove	2	1	-

Source Adapted from Table 1 in Ezedinma (2005).
Note: [1] This category may include some rain-fed lowland production with partial water control. The rice area under fully developed irrigation scheme should be much smaller.

Foods, and Isiaku Rabiu Group). These millers typically serve as importers as well. This dual role is commonly seen in West Africa, as it helps guard against uncertainties in supply related to global price volatility and domestic policies (Demont & Rizzotto, 2012). Such firms typically operate well below capacity due to inadequate paddy supplies. High upfront capital investments required to set up a large industrial rice mill discourages more investors from entering the industry.

Along the entire rice value chain, costs are higher in Nigeria than in Thailand for rice paddy production, trader, milling and marketing margins (Figure 4). Compared to Thailand and Bangladesh, the farm gate price makes up a lower share of the final retail price for both standard and premium rice (Figure 5). Nigerian farmers also earn lower margins per hectare due mostly to their lower yields—about $123 per year per hectare compared with $177 and $207 for Thailand and Bangladesh, respectively. Therefore, improving the competitiveness of rice producers in Nigeria will require lowering production, processing, and marketing costs to increase incentives for producers to upgrade and expand output.

FIGURE 4 COMPARING COSTS IN RICE VALUE CHAINS BETWEEN NIGERIA AND THAILAND (2009 US$/KG)



Source: For Nigeria, based on authors' own field visits in Niger and estimates by Chemonics 2009; for Thailand, based on Maneechansook 2011 and FOB data from the Thai Rice Exporters Association for "parboiled rice 100%" (www.thairiceexporters.or.th).

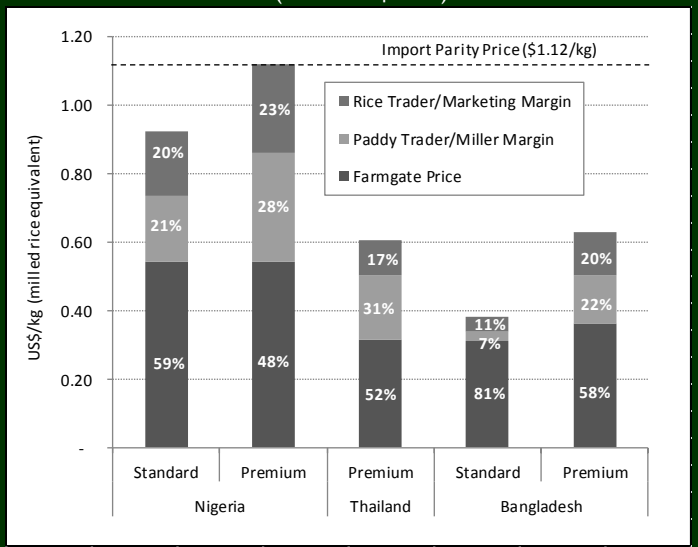
Notes: Processing costs for Nigeria here are for small and medium-scale processors (local standard rice). For Thailand is for premium export rice. The "import and retail margin" component of Thai rice assumes an import tariff of 30 percent and a domestic transport and marketing cost of about 30 percent of the price with cost, insurance, and freight.

ANALYZING THE POTENTIAL TO INCREASE COMPETITIVENESS

The biophysical rice production potential in Nigeria was assessed using various simulation models, including the Spatial Production Allocation Model (SPAM), the Global Agro-ecological Zone (GAEZ), and the Cropping System Model (CSM), that account for solar radiation, temperature, rainfall, soil nutrients, and use of improved seeds, nutrients, and water. In Nigeria, 71,000 ha of rice production are currently located in a high suitability zone for rice, while 946,000 ha and 573,000 ha are in medium and low suitability zones, respectively. Given the existing irrigated area in Nigeria, most rice irrigation can be expanded only in medium to low suitability areas in the short term, replacing other irrigated crops. This limits the capacity to increase rice production in the short to medium run.

Based on the model simulations, rain-fed rice yields in high suitability zones could increase from 1.4 to between 2.1 and 2.4 tons/ha through increased adoption of improved varieties and nitrogen, respectively (Table 3), comparable to rice yields obtained in some Asian countries. National production is expected to increase

FIGURE 5 PRICE STRUCTURES OF THE RICE VALUE CHAIN IN SELECT COUNTRIES (2009 US$/KG)



Source: : For Nigeria and Thailand, see sources cited in Figure 4. For Bangladesh, this is taken from Minten, Murshid, and Reardon 2013, referring to course (standard) and fine-quality rice (premium) grain.

from 2.45 to 3.97 million tons through increased use of improved seeds and nitrogen and irrigation expansion (Table 4). Although the production increase is substantial, it likely is still insufficient to totally replace current rice imports of 2 million tons.

TABLE 3. RICE YIELDS UNDER DIFFERENT TECHNOLOGY INPUTS

	Rice suitability		
	High	Medium	Low
Current Area (1000 ha)	71	946	573
Average yield (mt/ha)			
Baseline, Rain-fed	1.4	1.4	1.2
Seed Simulation, Rain-fed	2.1	1.7	1.2
Seeds + Fertilizer Simulation, Rain-fed	2.4	2.0	1.2
Seeds + Fertilizer Simulation, Irrigated	5.8	5.5	4.7

Source: Authors' calculations based on cropping system model.

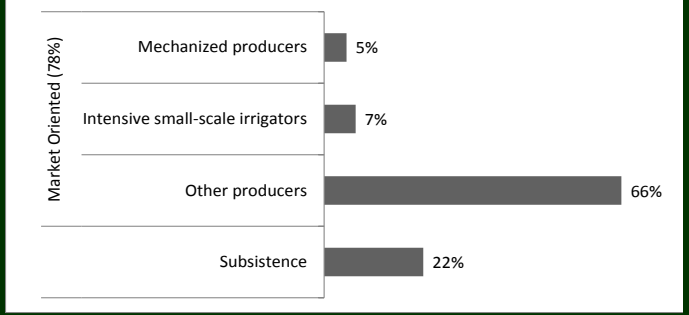
TABLE 4. RICE OUTPUTS UNDER DIFFERENT TECHNOLOGY INPUTS (MILLION TONS)

	High	Medium	Low	Total
Baseline (current)	0.11	1.57	0.77	2.45
Seeds Simulation	0.15	1.84	0.77	2.76
Seeds + Fertilizer Simulation	0.18	2.25	0.88	3.31
Seeds + Fertilizer + Irrigation Expansion	0.19	2.37	1.41	3.97

Source: Authors' calculations

Approximately 78 percent of rice farmers in Nigeria are market-oriented, while 22 percent are subsistence farmers – producing mostly for own consumption (Figure 6). Of the market-oriented rice producers, a small proportion use small-scale intensive irrigation and mechanization, each accounting for 7 and 5 percent of all rice farmers in Nigeria, respectively. Among the small-scale intensive irrigators, they typically operate on one-acre plots, and practice labor and input-intensive rice irrigation. They enjoy a higher farm gate rice price, cheaper labor and sometimes practice mechanized land preparation. Approximately 68,000 producers in Nigeria produced 89,000 tons of intensively irrigated rice in the 2010 rainy season, and sold more than half of their harvest. Mechanized rice producers typically intensively use tractors and modern inputs (fertilizer, chemicals) together with some irrigation. Approximately 51,000 producers of this type produced 108,000 tons of rice in the 2010 rainy season. The rest of the market-oriented rice producers use inputs less intensively and produce smaller quantities of rice output per farm household.

FIGURE 6. SHARE (%) OF MAJOR TYPES OF RICE PRODUCERS IN NIGERIA



Source: Cluster analysis by authors based on LSMS data

Scaling-up competitive rice production may be challenging. Labor is often scarce in rural Nigeria and likely to be a constraint. Seed for profitable varieties that attract higher farm gate prices may not be easily available. Mechanization may not be applicable in the short to medium term for the majority of rice producers who are asset and income poor, with limited access to credit.

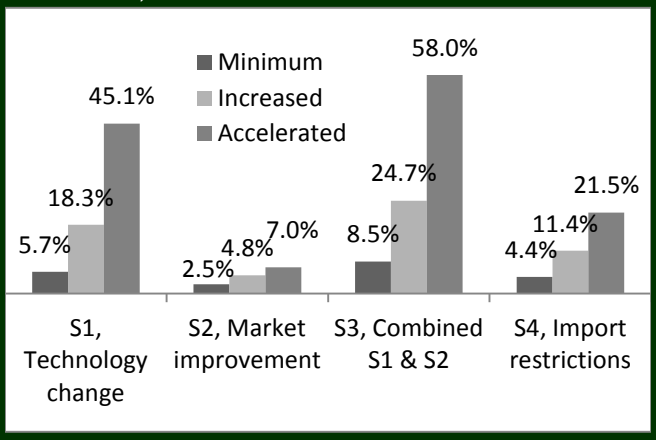
Improving the performance of rice processing and marketing

In assessing the most viable options for transforming and improving the performance of post-harvest rice processing and marketing, we believe the relative economic efficiency of the small and medium scale operators versus the larger millers is the key. In Asia, for example, small mills have been shown to be more efficient than larger milling operations for domestic rice markets because of favorable capital-to-labor price ratios, higher paddy-to-milled physical conversion ratios, higher milled-to-paddy price ratios, and higher economic rates of return. Economic rate of returns are typically lower for the large mills in a developing country context given the high economic discount rates such mills face, which result in higher upfront investment costs relative to lower present values of benefits that accrue in the future. Additionally, large scale millers typically incur added costs for procuring quality paddy and subjecting it to further processing to meet quality standards. They therefore need to be able to capture a price premium on their product. As a result, most large mills in Nigeria are commonly underutilized because the supply of sufficient quantities of paddy of desired quality is not guaranteed.

Compared with Thailand and Bangladesh, Nigerian rice millers are less efficient in making use of milling technologies and practices, as evidenced by their lower paddy-to milled conversion ratios and higher milled-to-paddy price ratios. Operating costs and margins for rice millers in Nigeria are especially high for processing and marketing. Additionally, large price swings across locations and production seasons impose higher profit risks. Among those who buy paddy to resell as milled rice, for example, the probability that they will make a profit has been estimated in the past to be about 40% (Lançon et al. 2003). This may explain why many small millers in Nigeria operate on a fee basis.

Given their lower operating costs, the dominant smaller scale milling sector in Nigeria has the potential to realize positive returns from simply upgrading post-milling activities for de-stoning, polishing and packaging to enhance the quality of domestic rice offered consumers. The potential to do so exists, considering the current large price premium between standard and premium brands of domestic rice available to Nigerian consumers. Although large scale rice millers can compete with imports on quality and branding more effectively than small and medium scale millers, they are less

FIGURE 7. CHANGE IN TOTAL RICE PRODUCTION UNDER ALTERNATIVE SCENARIOS (% CHANGE FROM BASE YEAR)



Source: Nigeria EMM model simulations.

competitive on price and volumes. The large scale milling sector likely will have to continue to rely on government interventions to ensure supplies of quality paddy, credit subsidies for capital investments, and protection from cheaper imports. Instead, by placing more emphasis on improving the smaller-scale rice milling channel, the government of Nigeria will meet a broader demand base, create jobs, and deepen the transformation of the rural economy.

As the ATA strategy calls for, government can play a key role in strengthening all rice millers by providing access to technologies and training, credit, investments in infrastructure to lower costs for energy and transportation, and access to markets and information. All of these are important inputs for transforming the domestic rice sector. However, efforts to expand the capacity of large-scale rice millers in Nigeria should not come at the expense of re-vitalizing and expanding the dominant small-to-medium rice milling sector.

WEIGHING THE FUTURE ECONOMIC COSTS AND BENEFITS OF ALTERNATIVE POLICIES

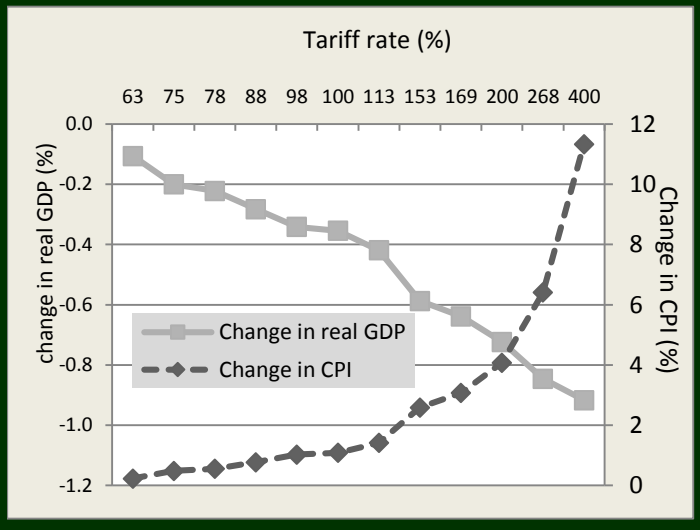
Nigeria has the potential to expand production and improve performance of the domestic rice value chain in order to compete more effectively with imports. But, this expansion may fall short of the rice self-sufficiency goal. To assess the viability of this goal and its implications for future policies and strategies, we use an Economy-wide Multi-Market (EMM) model developed specifically for Nigeria. Similar EMM models have been applied by IFPRI in other African countries to analyze alternative future strategies for realizing agricultural growth (Diao et al.(2007). Sector specifications and assumptions used in the Nigerian version of the model are described in more detail in Johnson et al. (2013). Data are taken from Nigeria's National Bureau of Statistics (NBS) (state level agricultural production), FAO data (commodity trade), World Development Indicators (industry and service value added), UN COMTRADE data (rice imports), and LSMS (food demand). We use 2010 as the base year for our model scenarios.

Four policy scenarios are considered: (S1) increase rice yields and expand area of high quality rice (technology change scenario); (S2) reduce transaction costs and improve market efficiency (market improvement scenario); (S3) combines S1 and S2; and (S4) trade protection policy and import tariffs increase. Each scenario is run in the model with three different levels of intervention: minimum, increased, and accelerated levels.

Results from the simulations clearly emphasize technological change as key for improving rice competitiveness in Nigeria (Figure 7). Under S1, rice production increases by between 5.7 to 45.1 percent. Most of the increased production in this scenario comes from acreage expansion that displaces the production of other crops. Rice production can potentially rise by about 58 percent with accelerated efforts when technology is combined with market improvement (S3). Under this scenario, rice consumption increase by 9.8 percent, without reducing production of other crops. Also, rural and urban households' real incomes increase by 13.2 and 3.7 percent, respectively.

On the other hand, if government relies on import tariffs alone to promote domestic rice production, the tariff rate has to exceed 1,000 percent (from the current rate of 50 percent) to eliminate rice imports. This level of tariff is politically infeasible and difficult to implement. Even at a 400 percent of rice tariff (S4), 21.5 percent of total consumption is still imported. Such a tariff level will hurt consumers, whose consumption decreases by 19.3 percent, and farmers who grow crops other than rice. With the 400 percent tariff, the Consumer Price Index (CPI) rises by almost 12 percent due mostly to rice price increases, while the overall GDP of Nigeria falls by almost one percent (Figure 8).

FIGURE 8. CHANGES IN REAL GDP AND FOOD PRICE INDEX UNDER DIFFERENT TARIFF RATES



Source: The Nigerian EMM model simulations

CONCLUSIONS

Nigeria has the potential to expand rice production by increasing the number of small scale rice farmers, encouraging small-scale and privately operated irrigation technologies, enabling fertilizer and other input markets to become more efficient, and promoting

mechanization policy to encourage greater intensification. However, even if Nigeria could close current yield gaps in rice production, it will still fall short of meeting domestic demand in the short to medium term – including supplying sufficient paddy to the large milling sector. Even more importantly, much needs to be done to improve milling technologies and engage in further post-harvest processing and branding of domestic rice. This implies focusing not only on the large scale milling sector, but specifically on the smaller-scale milling sector which is more likely to continue producing the bulk of domestically milled and marketed rice in Nigeria.

Import restrictions alone will be ineffective at stimulating a large supply response in production and milling. Focusing more attention on technology change and market improvement is more promising. With a modest increase in rice yields, the expansion of high quality varieties to replace low quality ones, and improved processing technologies, the competitiveness of domestic rice can increase. Government should avoid picking winners in the large milling sector and instead encourage growth and technology upgrading among all milling types, as the ATA strategy is intending to do. Small and medium size millers have the capacity to absorb higher costs associated with further processing, such as through de-stoning, polishing and colorization. By engaging in this processing and thereby producing a higher quality milled rice product, millers will be able to capture for themselves much of the existing 25 percent price premium between local rice and imported high quality rice. Additionally, growth in the smaller milling sector has the added advantage of higher growth multiplier effects given its labor intensive activities and linkages across many actors downstream and upstream in the domestic rice value chain.

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