The Changing Asian Rice Economy and its Implications for the Development of the Rice Subsector in West Africa[1]

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Introduction

This paper reports preliminary results from ongoing research that examines the evolving competitiveness of West African value chains vis-à-vis those of major Asian rice exporters. West Africa (WA) consumes more rice than other parts of the continent. Despite significant increases in rice production, WA still procures half of its rice needs through imports, which account for about 20% of the world's rice exports. Asia (particularly Thailand, Vietnam, Pakistan, and India) is the major source of these imports (USAID, 2009). The 2008 rice crisis provided impetus to expanded rice production in West Africa, as countries sought to increase rice self-sufficiency rather than relying as heavily as they have had in the past on international trade to meet their food security goals. Such efforts will be economically sustainable only if West African rice value chains are cost-competitive with their Asian counterparts.

The aim of the paper is to assess the changes in dynamics of both West African and Asian rice economies and derive their implications for the development of the rice subsector in WA. The paper provides: (a) a brief overview of the evolution of the world rice market, highlighting the importance of Asia; (b) a description of current trends in the Asian rice economy, highlighting potential changes in the main drivers of supply and demand; (c) a synthesis of major projections over the coming decade of world rice consumption, production and prices, including for Asia and WA; and (d) discussion of the implications of current and future trends in both Asia and WA for West African rice promotion strategies.

The importance of Asia in the global rice market

Global rice consumption, production, and trade[2]

About 90% of rice is grown and consumed in Asia, with China and India being the largest Asian producers, accounting collectively for nearly half of world production and consumption in 2011. World per capita consumption of rice is about 57 kg per person. Most Asian countries consume more than 100 kg of rice per capita on average, with Cambodia (292), Laos (289), Bangladesh (218), and Vietnam (217) having among the highest per capita consumption levels in the world. Global rice production increased from 409 million tons of paddy to nearly 700 million tons between 1980 and 2011, with a compound growth rate of 1.8% per year. The overall growth in production over the past 30 years was primarily the result of yield increases, averaging 1.4% per year over 1980-2011, while there was little growth in area harvested (0.4%). Although rice yields are still growing, the rate of growth has been declining for many years, from a compound rate of 2.5% per year over 1962-1979 to 1.4% per year over 1980-2011. Most growth in area harvested has come from West Africa,

which grew 3.1% per year between 1980 and 2011 (harvested area only grew by 0.4% in Asia over the same period).

International rice trade has expanded rapidly over the last three decades, increasing more than 2.5 fold between 1980 and 2010. However, the global rice market remains thin, with trade representing only 7% of total production. With 90% of the world's rice produced in Asia, most rice tends to be eaten where it is produced and does not enter international markets. The international rice trade is also characterized by a relatively small number of exporting countries interacting with a large number of importing countries. Moreover, the concentration of exports has increased over time. In the early 1980s, the top five exporters (Thailand, Vietnam, India, United States and Pakistan) had about 70% of the world market; this share rose to nearly 80% in the late 2000s. In contrast, imports are widely dispersed across countries. In 2010, the top five importing countries (the Philippines, Nigeria, Saudi Arabia, Iran and Iraq) accounted for only 25% of the world total; the share of the top 10 countries was less than 40%. However, Asia accounts for about 45% of total world's imports, with over 90% of these imports being procured through regional trade. For instance, over the period 2005-2010, the Philippines, the world's largest rice importer, purchased most of its rice imports from Vietnam (84%), Bangladesh from India (84%) and China from Thailand (83%).

The global rice market is also characterized by substantial market segmentation in terms of rice type and quality. Rice trade occurs for rough rice, brown rice, milled rice, parboiled, fragrant and brokens. Further differentiation by grain length (long, medium, and short), cooking quality (stickiness), and milling quality (percent brokens) add complexity. This complex level of market segmentation makes price discovery costly and amplifies price movements, as substitution in demand for rice type and quality tends to be price-inelastic (USAID 2009).

Rice continues to be one of the most protected commodities in both developing and developed countries, through high tariff and non-tariff barriers, export restrictions and aid, state trading and other domestic market interventions. Most Western nations heavily subsidize their rice producers, and major exporters such as Thailand, Vietnam, Pakistan and India have national rice strategies for supporting production and sustaining market prices, although they generally do not heavily subsidize rice exports.

The performance of global rice markets

Because of these structural characteristics of the world rice market (i.e., thin and highly segmented), a small change in production and consumption brings a relatively large change in total trade, resulting in high degree of volatility. Although international rice prices have fluctuated dramatically in both nominal and real terms over the three decades, the long-term trend of real prices has been downward, with real rice prices of Thai rice 5% broken declining by 0.22% per year over 1985 -2007[3]. However, the large rice price increases in 2007/08 reversed this trend and called into question the reliability of the international rice market as a source of supply for importing countries. Even before the recent world price surges, few countries allowed domestic prices to be driven directly off world prices. After these price surges, even fewer countries are willing to rely as heavily on international rice trade. Many of them, including West African countries, have adopted very aggressive strategies with the aim of improving their levels of self-sufficiency.

Structural change and emerging trends in Asia

The economic transformation that has unfolded in South Asia over the past 40 years, in part as a result of the Asian Green Revolution (GR), has changed the economic context for agriculture. Sustained increases in average per capita incomes and urbanization led to diversification of national diets, with rapid growth in demand for many high-value foods, particularly livestock products, fruits and vegetables, while the growth in demand for food staples, such as rice, has been slowing (Pandey et al., 2010, Hazell, 2008). Matriz et al. (2010) argue that in recent years, income elasticities of demand for rice have even become negative for high-income and emerging economies such as Japan and South Korea, Thailand, Vietnam, China and India, which accounted for 60% of rice consumption in 2010.[4] For most of the lower income Asian countries, including Bangladesh, Cambodia, Pakistan, Myanmar, and the Philippines, which account for 15% of rice consumption in 2010, rice is still a normal good.

In this evolving context, the priorities for many Asian countries changed from a narrow GR-era focus on the productivity of food grains to increasing the productivity and quality of high-value crops, trees and livestock (Hazell, 2008). With rapid growth in international agricultural trade, some Asian countries have become important exporters of cereals (including rice) and high-value agricultural products while others have become more dependent on imports to meet their national food needs.

While the GR led to rapid growth in rice yields and total factor productivity (TFP), annual growth rates of production are slowing in Asia, meaning that farmers now have to use higher levels of inputs to obtain the same yields as before (Hazell, 2008). Reasons include (1) displacement of cereals on better lands by more profitable crops such as groundnuts and horticultural crops, (2) diminishing returns to modern varieties when irrigation and fertilizer use are already high, and (3) falling cereal prices relative to input costs, which makes additional intensification less profitable.

Moreover, the GR introduced new environmental concerns, especially related to the overuse and poor management of irrigation water, fertilizers, and pesticides, leading to degradation of soils and build-up of toxins. The sustainability of intensively farmed systems, which led to off-site externalities, including water pollution, silting of rivers and waterways, and loss of biodiversity, has been questioned. Many Asian countries have taken steps to address these issues (i.e., adoption of improved soil nutrient, water, and integrated pest management) at high social costs, and much more remains to be done (Hazell, 2008; Pandey et al., 2010).

Rapid urbanization, industrialization and development of infrastructure in many Asian countries have further limited the scope for bringing new good agricultural land into cereal production. New sources of irrigation water are also limited, while nonagricultural uses of water for urban, industrial, and environmental purposes are growing rapidly. Increasing rice production is constrained not only by worsening land and water scarcities but also rising energy and fertilizer prices. Continued strong growth in the production of high-value foods and biofuels is also adding to the competition with cereals for land and water. Climate change will exacerbate the problem by adversely affecting yields and increasing evapotranspiration. All these factors will potentially affect the relative competitiveness of Asian versus West African rice systems.

Review of major rice outlook studies

Three major organizations have developed outlook reports on probable trends over the coming decade in world rice markets, which are mainly driven by the major Asian rice economies: the USDA (2013) – covering the period 2011-2022; the University of Arkansas (Wailes and Chavez, 2011) – covering 2010-2021; and the OECD-FAO (2013) – covering 2013-2022. These projections were developed assuming that no major domestic or external shocks would affect global agricultural markets in the next decade (e.g., normal weather with, in general, continuation of current trends in crop yields). The projections also assume: (i) an overall increase in economic growth in developing countries at around 3.8-4.2% per year, with strongest growth expected in Asia and Africa; (ii) population growth at around 1% per year, with the fastest growth occurring in Africa while rates decline in the major Asian rice exporting countries; (iii) subdued inflation in most part of the world, at around 2%, with higher rates in the range of 4-8% for high-growth emerging countries; (iv) continued depreciation of the U.S. dollar, which will further decrease rice import prices (quoted in US dollars) to countries whose currencies are not linked to the US dollar; (v) further increases in crude oil prices, which are expected to increases faster than the general inflation rate; and (vi) continuation of domestic agricultural and trade policies, including long-term economic and trade reforms in many developing countries.

Based on these assumptions, the three studies all projects global rice consumption to grow at an average rate of 1% annually, with higher rates in Africa and in the Middle East. For instance, Wailes and Chavez (2011) estimate total rice consumption in Africa to rise particularly fast (about 3% per year over the next decade) while the opposite is expected in China (0.3% per year). Moreover, all three studies project global rice production to increase by about 1% annually mainly as a result of improvements in yields, although new investments in the sector in Africa are expected significantly contribute to area expansion. Most of the expected growth is likely to come from India and Asian LDCs, including Cambodia and Myanmar, but also African countries, especially Nigeria, Mali, Sierra Leone and Ghana. However, China, the current world's largest producer, is projected to significantly cut output in response to declining per capita domestic consumption and strong competition for land. As a result, Wailes and Chavez (2011) expect Asia's share of world production to slightly decline from 89.9% to 89.3% over 2010-2021 while Africa's share will increase from 3.4% to 4.2% over the same period.

Moreover, world prices, on average, are projected to remain on a high plateau compared to the previous decade in both nominal and real terms, although they are likely to be lower than the 2007/08 price hikes levels. In fact, the OECD/FAO projections foresee the world rice/coarse-grain price ratio falling from 2.5 in recent years to 1.9 by 2022 and the rice/wheat price ratio falling from 1.8 to 1.7 (OECD/FAO, 2012). The three studies also expect trade to continue to grow within a range of 2.0-2.5% per year, likely fueled by increased import demand by countries in West Africa, especially Nigeria and Côte d'Ivoire, and in the Middle East, especially Iran and Iraq, as well as traditional rice-deficit Southeast Asian countries, such as the Philippines and Bangladesh. However new trade patterns are expected to emerge. While China and India are projected to remain the largest rice economies, still accounting for nearly half of global rice production and consumption in the next decade, China will significantly reduce its rice exports while India will increase its. Although Thailand, Vietnam, India, Pakistan, and the U.S are projected to remain the top 5 rice exporters, accounting for over fourth-fifths of global net trade, Vietnam may surpass Thailand as the leading exporter by 2020 depending on whether Thailand will pursue its high producer price

policies, which has eroded its competitive edge in recent years. Myanmar and Cambodia are also expected to increase exports by about 10% per year to 2020.

Implications of the changing Asian rice economies for the future comparative advantage of West African rice sector

In this evolving world rice economy, increased maritime freight rates between Asia and West Africa and the reduction of exports from countries like China suggest a favorable environment for expansion of West African rice production. Yet, declining real prices for rice as per capita consumption in major Asian countries decreases due to rising incomes, probable expansion of output from new potential low-cost producers such as Cambodia and Myanmar, possible weakening of the US dollar (and hence lower costs for dollar-denominated rice imports) and continued volatility due to the thinness and segmentation of world rice markets also suggest that West African countries will need to pay careful attention to production, processing and marketing costs as well as risk management tools if they are to capture an increasing share of their home markets. Furthermore, higher fuel costs will likely also spur higher input costs (including costs of pumping water) and restrain regional trade in bulky products like rice within the subregion. The future competitiveness of West African rice value chains will therefore depend critically on three factors: (i) continuing to improve productivity and hence drive down per-unit farm-level production costs, (ii) reducing per-unit costs in the off-farm parts of the value chain (both upstream—for inputs—and downstream—for processing), and (iii) improving product quality and more effective exploitation of the various quality niches that exist in West African rice markets.

Increasing farm-level productivity

Farm-level economic productivity is reflected in the level of unit-costs of production. Although consistent, comparable data on costs of production across rice-producing countries are very limited, recent studies (Mendez del Villar et al., 2011; Diallo, et al., 2012) suggest that West African production costs at least at the farm level were comparable to those in Asia under market conditions prevailing in 2008-10, with costs ranging from $140/t in Benin to $220/t in Nigeria comparable $190/t in Thailand . However, these production costs do not take into account the various input subsides and taxes, raising issues regarding the sustainability of rice production given limited financial resources in West Africa.

The scope for productivity increases vary significantly across West Africa's three major rice-growing ecologies (irrigated, lowland, and upland). From an economic standpoint, increasing productivity, in terms of total factor productivity, is measured in terms of the value of additional output obtained from an incremental expenditure of inputs. It thus is not equivalent to partial physical measures of productivity, such as yield per ha, which may be high in full water-control systems but are sometimes purchased at the cost of very high levels of expensive input use. In addition, bringing additional areas under gravitational full water-control in West Africa can cost up to $3,500/ha while more basic water control in the lowlands can cost about three times less (Adjao, 2011). Thus, while, irrigated land is a high-value productive asset, especially in a context of climate change, assessments of ways of increasing farm-level productivity need to cover the full range of production systems. In particular, lowlands in West Africa often tend to have low social opportunity costs because few African staple crops are able to withstand the flooding conditions prevailing in this ecology, giving rice a comparative advantage in compared to other crops (Lançon and

Erenstein, 2002). Estimates of available rainfed lowland areas range from 113 million ha to 238 million ha (Seck et al., 2010). However, irregular rainfall patterns have historically discouraged rice farming in lowlands because the amount of moisture available to the rice plant is often insufficient to ensure acceptable yields, so some investments in better water control are likely necessary to exploit these areas.

Decreasing per-unit costs throughout the value chain

While increasing farm-level productivity is crucial, the competiveness of West African rice systems vis-à-vis Asian imports depends on reducing per unit costs all the way from input provider to final rice consumer. Studies by the World Bank (summarized in World Bank and FAO, 2009) have shown that for a number of different staple foods, African countries are frequently have comparable farm-level production costs to major Latin American and Asian competitors, but lose the competitive battle for their own coastal markets due to high internal transport and transaction costs in the off-farm components of the value chains. The competitiveness of West African rice value chains vis-à-vis imports is typically measured by the domestic resource cost (DRC) ratio, an indicator of the value of domestic resources used to save a dollar of foreign exchange in the import of rice. A DRC ratio of less than unity indicates that the country can produce the rice at a lower cost than importing it (as measured by the import-parity price of the Asian rice at a given market in the country). Typically DRC ratios exclude subsidies and taxes, thus reflecting the economic cost to the country as a whole of producing the product (Tsakok, 1990).

A review of DRC studies carried out since 1978 indicates an overall improvement of the competitiveness of West African rice systems over the past 30 years. Whereas a study conducted in five West African countries (Côte d'Ivoire, Liberia, Mali, Senegal, and Sierra Leone) in the mid-1970s indicated that only Sierra Leone and Mali exhibited a comparative advantage on domestic markets in 1978 (Pearson et al., 1981), subsequent studies carried out in several countries in the region revealed a gradual decline in the DRC ratios, suggesting an overall improvement in the comparative advantage (Lançon and Erenstein, 2002). Recent multi-country studies conducted in Benin, Guinea, Mali, Nigeria, and Senegal (Seck et al, 2010) and Benin, Burkina, Côte d'Ivoire, Mali, Niger, Guinea and Senegal (Diallo et al., 2012) further displayed a trend of decreasing DRC ratios in the region. These studies suggest that the countries having the greatest potential for translating their natural resources into a competitive advantage in rice production are Mali, Sierra Leone, Nigeria and Burkina Faso (USAID, 2009). The factors that were put forth to explain this positive trend include an increase in the parity price of rice on the output market side (reflecting the general increase in world rice prices) combined with a reduction in the production costs associated with gains in factor productivity on the input market side.

There is scope for further gains in system-wide productivity through improvements in post-harvest operations, which are critical not only to the final cost to consumers of West African rice but also equally important for increasing the value of rice through improving quality (see below). In particular, improved systems for paddy aggregation and assured delivery to processors, and improvements in wholesaling, packaging and marketing of the milled rice are all areas needing attention. These fall under two broad rubrics: improved contractual linkages between smallholders and processors and improvement in the wholesaling function, two areas that have received relatively little attention in CAADP programs aimed at spurring agricultural production in West Africa (Hollinger and Staatz, forthcoming).

Improving Product Quality and Market Segmentation

The West African rice market is segmented based on quality attributes, including aroma, swelling capacity, and cooking time, preferences for which vary by country, rural/urban location, and the importance of rice in the diet. With the exception of Mali and Guinea where local rice is preferred for its taste and freshness and sells at a price premium over imported rice of comparable quality, there is a perceived gap in quality between imported and local rice. Local rice often contains high levels of impurities and lacks uniformity as a result of using artisanal processing in small volumes.

Milling is largely small-scale, using Engelberg-type dehullers that are frequently up to 30 years old and require relatively low investment cost. While they have the advantage of being located close to the farmer, reducing assembly costs for paddy and allowing the farmers to recover the husks easily for livestock feed, they often produce variable quality milled rice (USAID, 2009). Producing more consistent quality would allow capturing a larger portion of the growing middle-class demand for rice as well as to separate different qualities of rice and sell them to various segments of the West African market (e.g., 100% brokens to Senegal and long-grain to Ghana). Efforts to improve quality through the introduction of medium- and large-scale mills and improvements to small-scale milling systems (e.g. use of de-stoning machines for paddy prior to milling and increased use of mills with rubber rollers) have, however, frequently run into problems of millers being unable to attract adequate volume of paddy in competition with small mills and poor post-harvest drying of paddy that leads to inconsistent milled product. These problems highlight the need mentioned above for further work on improving contracting systems between farmers and millers (perhaps mediated through farmer organizations and a private wholesalers) to create stronger incentives for farmers to respond to the need for improved quality of milled rice.

However, it is vital that future promotion strategies of rice in West Africa recognize that approximately three-quarters of the West African population still lives below the poverty line of US $2/day (African Development Bank (AfDB), 2011) and thus is willing to make some trade-off between the cost of their rice and some degree of product quality. While larger mills produce a more homogenous product than do the small local mills, the small mills have to date exhibited a lower unit cost of processing than the large facilities. There is a danger that in the quest to improve the quality of domestically produced rice, policies will subsidize industrial mills (e.g. via tax exemptions for imported equipment), thereby favoring a shift to the higher-cost processing and denying low-income consumers access to cheaper rice.

Citations

Adjao RT. 2011. *Analysis of the competitiveness of the rice subsector in mali: The case of gravitational irrigation and bas-fonds production systems*. Michigan State University.

African DevelopmentBank (AfDB). 2011. *The middle of the pyramid: Dynamics of the middle class in africa*. MarketBrief.

Diallo B, Dembélé N, and Staatz JM. 2012. *Compétitivité du riz local en afrique de l'ouestdepuis la hausse des prix alimentaires mondiaux*. *PRESAO Résultats de recherche*, 18. Bamako, Programme de Renforcement et Recherche sur la Sécurité Alimentaire en Afrique l'Ouest.

FAO (Food and Agriculture Organization) (2002) FAOSTAT, http://faostat.fao.org/.

Hazell PBR. 2008. *An assessment of the impact of agricultural research in South Asia since the Green Revolution*. CGIAR Science Council Secretariat, Rome, Italy.

Hollinger F and Staatz JM. Forthcoming. *Agricultural Growth in West Africa (AGWA): Market and Policy Drivers*. Rome: FAO.

Lançon F and Erenstein O. 2002. *Potential and prospects for rice Production in West Africa.* Paper presented at sub-regional workshop on "Harmonization of Policies and Co-ordination of Programmes on Rice in the ECOWAS Sub-Region," Accra, Ghana, February 25–28.

Mendez del Villar P, Bauer JM, Cissé M, Ibrahim L, Soumaré PB. 2011. *Rice crisis, market trends, and food security in West Africa*. CILSS, PAM, CIRAD, FEWS-NET and FAO, 60 p.

OECD/FAO. 2013. OECD-FAO Agricultural Outlook 2011-2020, OECD Publishing and FAO.

Pandey S, Byerlee D, Dawe D, Dobermann A, Mohanty S, Rozelle S, and Hardy B. 2010. *Rice in the Global Economy: Strategic Research and Policy Issues for Food Security*. Los Baños (Philippines): International Rice Research Institute. 477 p.

Seck PA, Tollens E, Wopereis M, Diagne A, & Bamba I. 2010. Rising trends and variability of rice prices: Threats and opportunities for sub-Saharan Africa. *Food Policy*, *35*(5), 403-411.

Tsakok I. 1990. *Agricultural price policy: a practitioner's guide to partial-equilibrium analysis*. Ithaca: Cornell University Press.

USAID. 2009. *Global food security response: Westafrica rice value chain analysis*. *microReport# 161*. Washington.

USDA. 2013. *USDA* Agricultural Projections to *2022. Outlook* No. (OCE-131), 105 pp.

USDA Economics Statistics and Market Information System (ESMIS, http://usda.mannlib.cornell.edu/)

Wailes EJ, and Chavez E. 2011. World Rice Outlook: International Rice Deterministic and Stochastic Baseline Projections, 2012-20211. *Rice Research Studies*, 379.

World Bank and FAO. 2009. *Awakening Africa's sleeping giant: Prospects for commercial agriculture in the guinea savannah zone and beyond. Directions in Development*. Washington, DC, FAO and the World Bank.

Endnotes

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[2] The statistics used in this section have been calculated from data obtained from the FAO statistical database (FAOSTAT Agriculture Data, http://www.fao.org/).

[3] USDA Economics Statistics and Market Information System (ESMIS, http://usda.mannlib.cornell.edu/)

[4] The income elasticity of demand for a product is defined as the percentage change in consumers' expenditures for the product given a one-percent change in the consumers' income. Goods whose income elasticity of demand is positive are termed "normal goods." If the income elasticity of demand is negative, consumer expenditures on the product actually fall as per capita incomes increase, leading economists to term such products "inferior goods." The term "inferior good", however, does not imply in any way that the good is necessarily inferior in a nutritional sense.