

# Developing competitive rice value chains

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## Abstract

In a number of African countries, major advances were made in rice competitiveness some years ago through liberalization of rice marketing and milling. This led to the introduction of small rice hullers, which were able to process rice relatively inexpensively compared with larger mills, often owned by the state. There were also substantial savings in the cost of transporting paddy and the value for animal feed of the hulling by-products. However, with rice prices having risen on world markets and with advances in milling technology, it is time to revisit this question. The imported rice with which domestic production competes is of a quality standard not met by most small hullers, resulting in price discounts and lost profits. Evidence from Rwanda and a few other countries suggests that milling technology currently exists that allows for upgrading of quality without necessarily losing the advantages of operating on a relatively small scale. Better milling should take care of the problems of impurities, lack of uniformity, and high percentage of broken grains. Complementary investment in storage should also ensure that adequate supplies of local rice are available year round. This will not necessarily solve problems of taste, storability, cooking time, water absorption and other characteristics that are not apparent to the eye. Further testing will be required to determine the extent to which price discounts on local rice are due to these factors or to consumer prejudice.

## Introduction

This paper describes how value-chain analysis can be used to identify key constraints in the rice commodity chain and how these constraints can be overcome through infrastructural investment, institutional change and policy reform. It applies this analysis to the specific case of rice in Rwanda, where a major goal is to slow the growth of rice imports. The analysis reveals that the chief problem is lack of competitiveness of local rice *vis-à-vis* imports due to the poor quality of milling and a policy environment that discourages investment in mills capable of producing rice that is competitive. This problem of the competitiveness of local rice production is also prevalent in much of west Africa.

The paper is organized as follows. The first section sets out some of the broader dimensions of competition between rice produced and milled in sub-Saharan Africa (SSA) and rice that is imported from outside the continent. Much of this discussion is focused on west Africa and on some of the empirical research that has been undertaken within this sub-region. The second section applies value-chain analysis to this problem in Rwanda. The final section draws some conclusions and looks at the implications for SSA. It raises a number of questions regarding the role of locally grown rice, both as a substitute for imports and as a means of assuring food security.

## Can African rice compete?

Growth of rice consumption in SSA has been outstripping that of rice production. Between 1961 and 2005, rice consumption in SSA grew at 4.52% annually, compared with growth in production of 3.23% (WARDA, 2007). Imports increased dramatically to fill the gap, as the self-sufficiency ratio (production/consumption) declined from 112% in 1961 to 60% in 2005. The international market thus supplied 40% of SSA's rice needs, and this share is continuing to increase.

Most growth in production has been due to an expansion of the area under cultivation rather than to an increase in yields. This is partly because of the dominance of rainfed cultivation, both upland and lowland, which accounts for 63% of the area planted to rice in SSA (compared with 37% worldwide). In fact, substantial increases in yields have been achieved under irrigation systems involving total water control, but these have not been sufficiently important in aggregate to offset the relative stagnation of yields under rainfed conditions.

Among the major staple foods in SSA, rice consumption is growing most rapidly (Diagne, 2010). There are a number of reasons for this. Rice is an important convenience food. It requires less time and energy to cook than most of the other staples such as beans, cassava, banana and potato. This is an important attribute given women's increased participation in the labor market and the growing importance of food consumption away from the household. Other desirable features include its ease of storage and handling, and its long shelf life. These make it a highly desirable food in urban areas. Furthermore, when processed, rice gives off several useful by-products, which can be used in the animal feed sub-sector, breweries and other industries. This lowers the price of milled rice to consumers.

If past trends continue, consumption will reach close to 44 million tonnes (Mt) in 2020 compared with 23 Mt of milled rice production. This will imply a self-sufficiency ratio of only about 52%. However, this growing imbalance is based on past trends and does not have to reflect the future. Africa has a number of advantages that

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may put it in a better position. Production has been increasing, in part spurred on by the food crisis of 2007–2008, and a number of pro-active measures have been taken. The fact that most rice is grown under rainfed conditions means that there is substantial potential for investment in irrigation, and a consequent increase in yields up to 7 t/ha or more. Furthermore, the new NERICA varieties developed by the Africa Rice Center for rainfed cultivation mean that gains in yields are not limited to irrigated rice. Finally, a number of studies suggest that SSA has a comparative advantage in rice production in competition with imports, and that comparative advantage appears to be growing, especially given the price increases since 2005 (Lançon and Benz, 2007).

Given this potential to expand production, it would seem that there is a good possibility that the growth in the gap between rice consumption and production could be reversed, and that imports could decline, at least in relative terms. But for this to happen, there needs to be more attention paid to post-harvest dimensions of the rice value chain. For it is not at all clear that most of the rice being produced in SSA is competitive with imported rice — not so much in terms of comparative costs as in terms of quality and other dimensions in which these grains compete.

It is well recognized that rice produced locally in SSA suffers a significant price discount in comparison with imported rice (Lançon and Benz, 2007). This appears to be at least partly due to perceived differences in quality. Local African rice generally has more impurities mixed with it and is not of uniform grain size and color (Campbell *et al.*, 2009, p 31).<sup>1</sup> Lack of product uniformity leads to longer cooking times and unpredictable preparation. Cleaning and sorting this rice prior to cooking is time-consuming and laborious.

Lack of ready availability of local rice throughout the year may also be a problem. Imported rice tends to be consumed mostly in urban areas, whereas local rice is consumed more in the countryside, close to the production areas. Traders in urban areas are reluctant to carry local rice because of lack of credit from wholesalers, whereas credit is generally available from importers and the wholesalers to whom they sell (Campbell *et al.*, 2009, p 32). In addition, supplies of local rice, which are abundant just after harvest, tend to dwindle thereafter because of lack of adequate incentives for storage.

There is other evidence that local rice and imported rice are not very good substitutes in consumption. In most SSA countries, prices of local rice tend not to follow the movement of prices on the international rice market, at least not very closely. Consumers' price elasticity of response to movements of the prices of imported rice appears to be very low. For example, following the devaluation of the CFA franc in 1994, consumers in Burkina Faso, Côte d'Ivoire, Mali and Senegal responded by reducing their consumption of other foods, such as meat and wheat products, while maintaining their consumption of rice at relatively constant or only slightly reduced levels (Diagana *et al.*, 1999). Consumers tend to set minimum quality standards and are unlikely to shift from imported rice to local rice just because the price of the former has risen. Instead they tend to shift to lower-quality but cheaper imported rice — for example, one with a higher percentage of broken grains (Campbell *et al.*, 2009, p 28).

There is evidence from Senegal that the rise in rice prices on the world market in 2007–2008, which was transmitted into higher retail prices for imported rice in Senegal relatively quickly, did not spill over into a parallel increase in the price of local rice. In fact, prices of local rice actually decreased and there was a substantial widening of the gap between the two (Rutsaert *et al.*, 2010). This has important implications for policy. If there is very little substitutability between imported and local rice, then increased production of local rice, in the face of very inelastic demand, could result in a decline in its price rather than a replacement of imports (Rizzotto and Demont, 2010).

Another question that arises is whether the price discount to which local rice is subject in comparison with imports occurs because of inferior quality, particular consumer preferences, or prejudice in favor of imported rice because it is 'foreign'. This is an important question for policy because, as seen in the case study of Rwanda, the cause will have direct implications for the actions necessary to reduce this discount. Unfortunately, little research has been done that would shed some light on this issue. One exception is a study that was undertaken in Senegal to test the hypothesis that consumers prefer imported rice because it is foreign (Rutsaert *et al.*, 2010). This involved allowing consumers to bid in an auction for four different rices, judged on the basis of their appearance, a sensory taste test, and their own experience.

Each participant was endowed with one kilogram of the 'benchmark' mediocre-quality SRV (Senegal River Valley) rice and was presented with the option to exchange this kilo into the three alternative rice types. The benchmark rice is a mix of varieties (Sahel 108 and Sahel 201) and is commonly available on the market. The imported Thai-25 rice has a grain quality somewhere between the benchmark and the high-quality SRV rice and contains some impurities. The unlabeled and labeled rice types are equal, i.e. high-quality SRV rice (Sahel 108 variety) which is purified, carefully sifted, and branded and marketed as 'Rival'. (Rutsaert *et al.*, 2010, p 7–8).

Senegalese consumers were willing to pay a premium of 43 FCFA/kg (€0.07/kg) for quality SRV rice relative to imported rice. They were further willing to add 29 FCFA/kg (€0.04/kg) for the branded version of the quality

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<sup>1</sup> Local rice is sometimes preferred over imported rice because of its taste characteristics, even if it has lots of impurities and is poorly graded. However, the preference given to taste is not generally great enough to offset the other negative factors.

SRV rice. Although this suggests that these consumers valued the high-quality SRV rice, especially in relation to the benchmark of mediocre quality, it does not tell us very much about how they would value this rice in comparison with similar high-quality broken rice that was imported. Furthermore, Senegalese consumers may be differentiated to some extent by their preference for broken rice and by the high degree to which they consume imported rice not just in the cities but also in the countryside. Thus, they are more familiar than consumers in many other countries with the differences between imported and local rice.

So what is to be done? Is there any way that African rice can compete on more equal terms with imported rice? If so, what does this require? Better milling? More organized marketing? Improved access to finance? Public promotion? To suggest some answers to these questions, we turn in the next section to a case study of value-chain analysis applied to the issue of the competitiveness of Rwandan rice *vis-à-vis* imported rice. This analysis involves the following steps.<sup>2</sup>

- Identifying where local rice is likely to be most competitive, e.g. as a substitute for rice imports, as a substitute for other locally produced food crops, or for export. This should be based on:
  - Projections of local demand and supply
  - Analysis of the economic cost of supplying each of these markets in relation to price
  - Identification of elements of competitiveness other than cost in each market, e.g. quality, continuity of supply.
- Mapping different value chains and their spatial relationships and modes of production, collection, milling, transportation and marketing; determining relative quantities of rice passing along each chain.
- Establishing the enabling environment, including policies related to production, input taxes and subsidies, investment incentives, trade, regulation, institutional promotion and competition policy.
- Assessing costs, value addition, and profitability at each stage of each value chain in both financial and economic prices.<sup>3</sup>
- Identifying infrastructural, institutional, financial and policy constraints at each stage of each value chain.
- Establishing benchmarks for performance indicators against international competition, e.g. quality in relation to price.
- Prioritizing binding constraints.
- Understanding political, social, economic and financial issues behind these constraints.
- Formulating actions to overcome these constraints.

#### Case study of Rwanda<sup>4</sup>

##### **Background**

Rwanda is a relative newcomer to rice. Traditionally, its staple foods have been rainfed crops such as sweet potato, cassava, beans and maize, which are grown primarily on the steep hillsides using relatively labor-intensive techniques to keep the soil in place and to preserve its fertility. However, beginning in the 1950s, Rwanda began to import rice as a convenience food, especially for urban consumers. These imports accelerated following the ending of the genocide in 1994.

Several years ago, the Government of Rwanda decided to give high priority to the production of rice in the country's marshlands, where, with adequate investment in irrigation infrastructure, the crop is capable of yielding up to 7 t/ha during each of two growing seasons (Ministry of Agriculture and Animal Resources, 2005, p 2–3). The government provided this investment and farmers responded by growing rice largely as a cash crop. However, as production increased there was a growing need to expand facilities for processing and marketing. At first, much of this processing was done with small hullers, which produced rice with substantial impurities and little uniformity of grain color and size. This was similar to much of the rice being produced and processed for home consumption or the local market in west Africa.

In addition to the hullers, the government earlier invested in a number of medium-sized mills of 1–3 t/hour capacity. By the time that the National Rice Program was going into effect, these mills were old and required substantial upgrading or replacement with more modern equipment. The government responded by privatizing these mills, turning them over to co-operatives or selling them to private investors. Often this was done as part of a joint venture arrangement between the co-operatives and the investors. However, even though these mills produced a better quality of rice than the small hullers, they had a hard time competing. Finally, in 2009, the government banned most of the small hullers in an effort to ensure adequate supplies of paddy to the larger mills.

This ban encountered strong opposition from Rwandan farmers, resulting in only about 10% of total production flowing through the mills. This was largely because the prices the mills offered to farmers were

<sup>2</sup> The elements of this analysis are drawn from FIAS (2007), Stryker and Salinger (2004), and Pearson *et al.* (1981).

<sup>3</sup> Financial prices are those found in the market; economic prices are financial prices minus taxes and plus subsidies included in them.

<sup>4</sup> The results reported here are from a study being undertaken by the author for the Ministry Agriculture and Animal Resources of Rwanda.

substantially lower than those offered by private traders. As a result, the mills continued to operate at less than full capacity, raising their costs and making it even more difficult for them to compete.

A major objective of the study of the rice commodity chain was to make recommendations concerning how the quality of milled rice could be improved so that this rice could compete more favorably with imports, and, at the same time, result in greater efficiency in marketing and processing.

### ***Key findings***

The following are some of the key findings from the study that are relevant to these objectives.

- Careful projections of the supply of and demand for rice in Rwanda over 10 years show that, while there is considerable potential for expansion of production, the growth of consumption is such that it is highly unlikely that Rwanda will be able to achieve self-sufficiency in rice — at least as long as production of rice is confined to the marshlands. Given the continuing rice deficit, the major market for locally grown rice is as a substitute for rice imports or to displace other food crops in consumption.
- There are some advantages to competing with imports. In particular, as long as rice is being imported, local production is being protected by the cost of transporting imported rice from producing countries to Rwanda. In addition, it makes it easy to protect local rice by imposing taxes on rice imports.
- Only about 10% of the paddy being produced is processed in modern mills. The rest is going to seed, feed, losses, hand pounding, or husking by small hullers. This results in a lower-quality product, which commands a lower price than imports. At the same time, several of the modern mills complain about not being able to buy all the paddy they can process. One reason appears to be the low prices that they offer compared with private traders.
- The poor quality of most local rice as currently processed, plus the separation of the market for this rice from that of imported rice, means that it is not a very good substitute for imports. To the extent that it is being sold on local markets, it is competing mostly with other foods. When processed in modern mills, the local rice appears to be of a quality that should be competitive with imported rice, but it does not command the same price as the latter. Frequently, the unexplained discount on local rice is 10–20%. The reasons for this are not well understood and need to be investigated.
- In addition to taxes on imports, the government provides substantial subsidies on production by paying for irrigation infrastructure and subsidizing the transportation of fertilizer. These subsidies amount to close to 30% of total on-farm production costs. Rice production is financially profitable everywhere, partly because of the subsidies involved. It is economically profitable in most, though not all, locations in competition with rice imports.
- Data on the range of small to medium-sized modern mills (0.2–3.5 t/hour) that are operating in Rwanda suggests that most of those mills are profitable and would continue to be profitable even if they paid the market price for paddy. There is a wide range of mills of different sizes on the international market that are able to process and grade rice of good quality, with a low percentage of broken grains, uniform appearance and few impurities.

### ***Recommendations to improve competitiveness***

The Government of Rwanda has two major objectives regarding the rice sector. The first is to increase supplies of domestic rice to reduce dependence on rice imports. The second is part of the overall objective of assuring food security for the majority of the population. It is clear that the current system for processing most rice in small hullers is not contributing to the first objective because of the poor quality of the hulled rice, as indicated by the substantial discount this rice receives — up to 30% of the price of imported rice. However, it can contribute to food security.

There are some important advantages to having a modest-sized market for this hulled rice. First, the quality is not so bad that no one will eat it. With a little cleaning, it can be quite satisfying, especially for the poor and those living in rural areas. Second, the by-product of such rice is usually a mixture of husks, bran and some broken grains. This is a relatively good animal feed, especially for ruminants, and can contribute to food security via the livestock sector. Third, the small scale of these hullers allows them to be owned and operated by a number of small entrepreneurs, creating income and employment, and — though this — improved food security. Finally, availability of a large number of small rice-processing units creates an environment in which competition flourishes, ensuring that costs to consumers are minimized.<sup>5</sup>

Nevertheless, the poor quality of rice processed in the small hullers does limit its ability to compete with imports. In the longer term, as incomes increase, the consumption of this rice will decline in importance as

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<sup>5</sup> West Africa is filled with examples of how the introduction of small rice hullers contributed to higher prices for producers, lower prices for consumers, and greater market efficiency. For example, in the Office du Niger in Mali, small-scale hullers competed very well with large, inefficient and costly rice mills owned by the state. This led to liberalization of rice marketing and expansion of rice production and processing.

consumers become more discriminating. It is important, therefore, that a modern milling sector develop alongside the small-scale, poor-quality sector. The analysis of costs and returns in Rwanda suggests that this can be done without the ban on small hullers. There is a ready market for good-quality local rice as a substitute for imported rice, especially if this rice enters the market chain at the same point as the imported rice. Substantial profits can be made all along the value chain even if the larger mills compete freely in the market for paddy.

This does not mean that all rice should be milled in a few larger mills. There are ample markets for and ready sources of supply of modern mills of different sizes — ranging from 250 kg/hour to 5 t/hour. These mills are capable of cleaning, dehulling, whitening, polishing and grading rice to the specifications that will meet international standards. Small mills are particularly appropriate where rice production occurs in relatively isolated regions. They give to the co-operatives and individual owners the sense that they are able to make productive investments that capture some of the value added in the commodity chain. Furthermore, the existence of a number of mills in this size range, in addition to a few larger mills at strategic locations, helps to spur competition. Such a diversified range of milling activities should therefore be promoted.

There is one caveat. Even when the appearance of imported and local rice is the same, there appears to be a consumer bias toward imported rice, which results in a price discount of 10–20% of the price of imported rice. It is not evident why this is so. There may be characteristics that are not always clearly visible in the market, such as better taste, faster cooking time, more swelling in cooking, greater assurance of availability, and attachment to brand names. These characteristics need to be identified through consumer surveys, blind tastings, and physical testing. Once the sources of bias are understood, efforts should be made to overcome these perceived differences through investment in storage, parboiling and other measures. Finally, to the extent that differences in preferences persist that are unexplained, this should be publicized in order for consumers to learn that their preferences are not based on real differences and that they can gain by buying cheaper local rice.

### Conclusions and implications

The qualitative competitiveness of local rice production and processing in SSA is increasingly being recognized as a major constraint to increased self-sufficiency and reduced dependence on rice imports. The duality of the market for rice is a major factor. On one hand, the market for imported rice is heavily concentrated in urban areas and demands a relatively high standard of quality in terms of lack of impurities and relatively uniform appearance. On the other hand, rice in rural areas is more likely to come from local sources, to have more impurities and to be less uniform with respect to grain size and color, though it may have certain taste characteristics that are appreciated by local consumers.

One result is that the price of local rice on the domestic market is generally less than that of imported rice. It is not totally evident whether this is because the local rice is of lower quality. Some local rice, processed in modern mills and flowing into similar market channels, would seem to compete very well with imported rice. However, in Rwanda at least, local rice of very similar appearance in terms of lack of impurities, percentage of broken grains, uniformity of grain size and color, etc., sells at a substantial discount over imported rice. Whether this is because of other characteristics that cannot so easily be observed or results from prejudice in favor of imported rice is not known.

This is an important area for research. The effect of the price discount is substantial in terms of foregone profits. Furthermore, lack of substitutability between imported and local rice means that all of the efforts being undertaken to promote local production as a substitute for imports may simply drive down the price of local rice, discouraging investment in expanded production.

It appears from the Rwanda case study and from some other experiences in Africa that it is quite possible to invest in modern mills of various sizes that are capable of profitably milling rice of good quality that should compete very well with imports. Even though the cost of this milling will be higher than using small hullers alone, the price increase resulting from the higher-quality product should be more than enough to offset the higher costs. This is certainly the case in Rwanda.

Given the cleaning, polishing and grading capabilities that these mills have, better milling should take care of the problems of impurities, lack of uniformity, and high percentage of broken grains. With complementary investment in storage, this should also ensure that adequate supplies of local rice are available year round. It will not necessarily solve problems of taste, storability, cooking time, water absorption and other characteristics that are not apparent to the eye. That will require further testing and consumer surveys, including the use of blind sensory tests. It will also require trials to see how improvements can be made. For example, there is some evidence that imports benefit from longer storage during transport, and this improves quality (Bleoussi *et al.*, 2011). Parboiling may be used to increase water absorption during cooking. All of this needs to be better understood and tested to see what works best in competition with imports.

To the extent that there do not appear to be any important differences between imported and local rice processed in modern mills — whether visible or not — there may simply be a prejudice in favor of imported rice because it is ‘foreign’. The fact that definable differences have not been found and yet imported rice is more

expensive than local rice needs to be publicized in order for consumers to learn that their preferences are not based on real differences and that they can gain by buying cheaper local rice.

A final issue to be considered is what happens to food security as progress is made in increasing food self-sufficiency. Here the answer is not so evident. Low prices of rice, even of mediocre quality, help ensure that the poor have adequate supplies of food. If all paddy is channeled toward the modern mills, what happens to this source of food?

The importance of this depends on what other alternatives are available. In Rwanda, there are numerous alternative sources of food upon which the population has traditionally depended. The opportunity to grow rice in the marshlands is an opportunity to make the best use of this scarce resource, which can be most profitably exploited by selling the rice as a cash crop. But this can most profitability occur only if the paddy is processed in modern mills in order to earn the best price in competition with imports.

In other countries, for example Liberia, rice is widely consumed as a staple food throughout the country. Here one wants to be much more careful in moving too rapidly toward the use of modern processing facilities, since this can put rice out of reach of the poor. This does not mean that improvements in processing should not be made, but simply that there are some advantages to the simple hulling of rice to produce a product that is widely consumed throughout the country, yields a by-product that is valued as an input into the livestock sector, and provides income and employment to the rural economy. Thus, a dual approach involving both types of processing might be best until there are reasonable assurances that food security has been attained.

### References

- Bleoussi R, Fofana M, Bokossa I and Futakuchi K. 2011. Effects of storage on grain quality characteristics in NERICA rice. p 3.3.1–3.3.7. *In: Innovation and Partnerships to Realize Africa's Rice Potential*. Proceedings of the Second Africa Rice Congress, Bamako, Mali, 22–26 March. Africa Rice Center, Cotonou.
- Campbell R, Schiff H, Snodgrass D, Neven D, Downing J and Sturza D. 2009. Global Food Security Response: West Africa Rice Value Chain Analysis. USAID microREPORT # 161. [Washington, DC]. 75 p.
- Diagana B, Akindès F, Savadogo K, Reardon T and Staatz J. 1999. Effects of the CFA franc devaluation on urban food consumption in west Africa: Overview and cross-country comparisons. *Food Policy* 24: 465–478.
- Diagne, A. 2010. Rice policy and impact research at AfricaRice. Presentation to CORAF/WECARD Meeting, 24 May, Cotonou.
- FIAS (Foreign Investment Advisory Service). 2007. *Moving Toward Competitiveness Analysis: A Value Chain Approach*. The World Bank, Washington, DC. 67 p.
- Lançon F and Benz HD. 2007. Rice imports in west Africa: Trade regimes and food policy formulation. Poster prepared for the 106th seminar of the European Association of Agricultural Economists, Montpellier, France, 25–27 October.
- Ministry of Agriculture and Animal Resources. 2005. National Program for the Production of Rice, Program 2006–2016. Ministry of Agriculture and Animal Resources, Kigale, Rwanda.
- Pearson S, Stryker JD and Humphreys CH. 1981. *Rice in West Africa: Policy and Economics*. Stanford University Press, Palo Alto, CA.
- Rizzotto AC and Demont M. 2010. Extending reach to strengthen value chains: Increasing consumer awareness of quality Senegal River rice. p 3.1.1–3.1.7. *In: Innovation and Partnerships to Realize Africa's Rice Potential*. Proceedings of the Second Africa Rice Congress, Bamako, Mali, 22–26 March. Africa Rice Center, Cotonou.
- Rutsaert P, Demont M, Ndour M, Verbeke W, Seck PA and Tollens E. 2010. Paying for quality: Private versus collective valuation of Senegal River Valley rice. p 000–000. *In: Innovation and Partnerships to Realize Africa's Rice Potential*. Proceedings of the Second Africa Rice Congress, Bamako, Mali, 22–26 March. Africa Rice Center, Cotonou.
- Stryker JD and Salinger BL. 2004. A guide to commodity-based export diversification and competitiveness strategies for African countries. Paper prepared for UNCTAD, 5 November.
- WARDA (Africa Rice Center). 2007. *Africa Rice Trends: 2007 Brief – Overview of recent developments in the sub-Saharan African rice sector*. WARDA, Cotonou.