UNDER PEER REVIEW

Original Research Article

Effects of industrial paddy processing on local rice competitiveness in Benin

Abstract

Aims: This research aimed to assess the extent to which public investment in industrial paddy processing increases local rice competitiveness in Benin, and to discuss policy implications of the findings.

Study design: The study was conducted in the Glazoué district using the approach of comparing the outcome of a unique reference case (an industrial facility) with the average outcome of several cases of indigenous private mills.

Methodology: Based on interviews with 26 rice processing-and-trade women and 30 consumers, competitiveness of indigenous parboiled rice produced by the women via private mills, rice produced by state's paddy processing factory, and imported rice were compared. Competitive gains of the factory-processed rice over the indigenous one and vis-à-vis imported rice were assessed using quality index, market-gate cost price, and quality index/cost price ratio.

Results: Imported rice is more competitive than local rice. Nonetheless, the factory-processed rice is more competitive than the indigenous one. The factory reduces market-gate cost price of local rice by 19.1% and brings down its overall competiveness gap vis-à-vis imported rice from 49.72% to 13.13%, i.e. a more than 4-fold increase in competitiveness.

Conclusion: Therefore, more public investment in such factories should be promoted, provided adequate market linkages are established.

Key words: *competitiveness, imported rice, paddy-processing factory, private mills, local rice.*

UNDER PEER REVIEW

1. Introduction

1.1. Background, problem and objectives of the study

Accelerated agricultural development, food security and poverty reduction in Sub-Saharan Africa (SSA) cannot be achieved without genuine policy interventions to increase farmers' income and enable substantial gains in food value chains. One of the main causes of food insecurity is post-harvest losses that occur along the chains and result in higher prices and lost revenue which reduces real income for producers and consumers, especially the poor [1]. Therefore, improving post-harvest methods, especially processing techniques, to raise the competitiveness and to increase market access of locally-produced food is a critical challenge which countries in Sub-Sahara Africa, including Benin, must face [2]. Yet, progress achieved since independence days is little, regarding the impact of agricultural policies on livelihoods and food security of populations. An old debate is still evolving, as to whether governments should invest in large estates and industrial factories, or should they promote small-to-medium farms and enhance indigenous processing capacity through mechanical improvement with small equipment [3]. Various mixes of choices have been attempted, depending on the countries. In general very limited success is observed so far, although interesting policy shifts are being observed in countries such as Ghana, Nigeria, and Ethiopia [4, 5, 6, 7]. Today, existing rice production capacities in Africa are low and can meet only 10% of present demand and the continent therefore accounts for 1/3 of global rice imports and spends about US $1.5 billion annually on rice imports [8, 9].

The African rice sector paradox is pictured as follows: "It is ironic that in West Africa – the rice belt of sub-Saharan Africa (SSA) – although 20 million farmers are engaged in rice farming and about 100 million people depend on it directly for their livelihood, almost all the cities of the region are flooded with imported rice of various labels, everything except local rice… Why doesn't local rice find its way to the local markets? … Does the unavailability of

UNDER PEER REVIEW

local rice in the market mean that imported rice is cheaper and local rice cannot compete with it?" [9]. These two questions among many raised by these authors, are core to the issue of local rice competitiveness investigated in this paper, with a focus on paddy processing.

Local rice's consumption in Benin represents only 10-15% of imports [10]. In order to revert that trend, the government is striving to boost paddy production and to promote processing activities with the view to improving local rice competitiveness compared to imported rice. Domestic paddy production increased at the rate of 5.8% per year, from 16 498 metric tons (mt) in 1995 to 124 975 mt in 2010, as a result of average yield increase from 1.71 to 2.66 mt/ha [11]. Yet, that production is still below the needs. Between 2005 and 2007 about 60 000 mt were imported every year for domestic consumption [12].

Cost-effective paddy processing, rice quality and reliable market outlets are issues pending to be resolved in order to raise the competitiveness of locally-produced rice. That's why the rice sub-sector is one of the top priority food subsectors in Benin's strategic plan for boosting the agricultural sector (PSRSA), with the aim of accelerating poverty reduction and economic development. In that stream, the government installed in 2012 two modern paddy husking factories, one in Malanville in the upper north and one in Glazoué in the center of the country. This action is intended to provide an incentive to paddy farmers to produce more and sell the surplus at pre-negotiated prices, while enhancing quality and affordability of local rice for consumers in the domestic market and the sub-region. Presently paddy production in Glazoué is enough to supply the factory to its full running capacity. Yet the following question comes up: Does this policy intervention of public investment in industrial paddy processing increase local rice competitiveness in Benin?

This study addresses the issue of market access and competitiveness of local rice produced in Benin. It aims to assess the competitive gains of the modern paddy processing/husking factory installed in Glazoué compared to private mills that were already

UNDER PEER REVIEW

operating in the area before the government's action. For that purpose, the competitiveness gap of local rice vis-à-vis imported rice is assessed for each type of processing facility. This means imported rice is taken as the reference[i], and the study investigates whether the factory – which produces dry polished rice – enables a significant competitive gain over the indigenous system (women and existing private mills) – which produces parboiled polished rice.

The underlying development issue is to know if the Government has made a right decision by investing in the modern factory rather than promoting the multiplication of private mills[ii] through technical and financial assistance to rural paddy processing cooperatives and entrepreneurs. Indeed, producing rice for local consumption or high quality rice for export may not always have the same relevance for rural communities, although both options would contribute to poverty reduction. The first option aims primarily to enhance food security whereas the second targets a substantial increase in farmers' income. The coexistence of both types of processing facilities may be justified if there is enough evidence that resources are economically used in either case. As far as competitiveness of local rice is concerned, which perspective and which indicators would be more relevant?

Development issues such as the effects of modern factory operations (paddy purchasing at guaranteed prices, application of quality grades and other contract specifications and market arrangements) on farmers' and private mill owners incomes, and the overall rural transformation (labor dynamics, competition outlays) in local rice value chains will not be addressed in this paper. Indeed, the above development issue – promoting modern factories vs. artisanal private mills – would involve more impact assessment variables (farmers' incomes, total added value and its distribution in the local rice value chain, community-level food security, etc.) than product competitiveness indicators. Considering that market is the driver of production and economic growth [13], the paper

UNDER PEER REVIEW

analyzes competitiveness of local rice rather from the angle of sustained access to domestic market where competition by various sorts of imported rice has become very tough [14]. Market-gate cost prices (i.e. production and marketing costs) and quality attributes are used to derive simple competitiveness indicators, and compare local rice produced by each type of processing facility to imported rice.

1.2. Literature review

The theoretical background of the study includes the relationships between trade, industrialization, economic development and poverty reduction on the one hand, and the implications of competitiveness for agricultural trade in Africa on the other hand. These concepts and relationships are briefly reviewed in order to indicate how the study will contribute to enhancing their understanding through empirical application.

Trade, industrialization, economic development and poverty reduction

Most countries in Sub-Saharan Africa (including Benin) are characterized by weak economies and a growing poverty, in spite of their natural resource endowment. That situation is due to low wealth creation capacities, including weak production, processing and trade capacities. In particular agricultural trade, which is due to be a source of wealth and autonomous growth for poverty alleviation [13], is still at its infancy and deals with raw or crude farm products. Openness to trade is key to economic development, as it improves people's living conditions [15, 16]. Trade enables developing countries to get access to technologies that will help them to increase productivity, competitiveness and employment opportunities, especially for the poor [13]. It is believed that the 6% annual growth in the agricultural sector by 2015, recommended by the African Union (AU) to achieve the first millennium development goal, will not be possible without accelerated industrialization, especially modern processing of locally-produced crude farm products, and trade mechanisms that promote quality standards to attract foreign exchange[iii]. Trade will revert

UNDER PEER REVIEW

wealth losses that occur through massive imports of basic goods that can be produced locally. As illustrated in figure 1, a dedicated support of the industrial sector is required in developing countries to improve trade and payment balances and boost economic growth [13]. Industrialization will contribute to reducing consumer prices of such goods and raise market accessibility for the poor [17] (Grain de Sel, 2012). In Benin, the Agenda for Economic Emergence called Benin Alafia 2025 put emphasis on the industrial push that is needed to boost agricultural productivities and farmers' incomes.

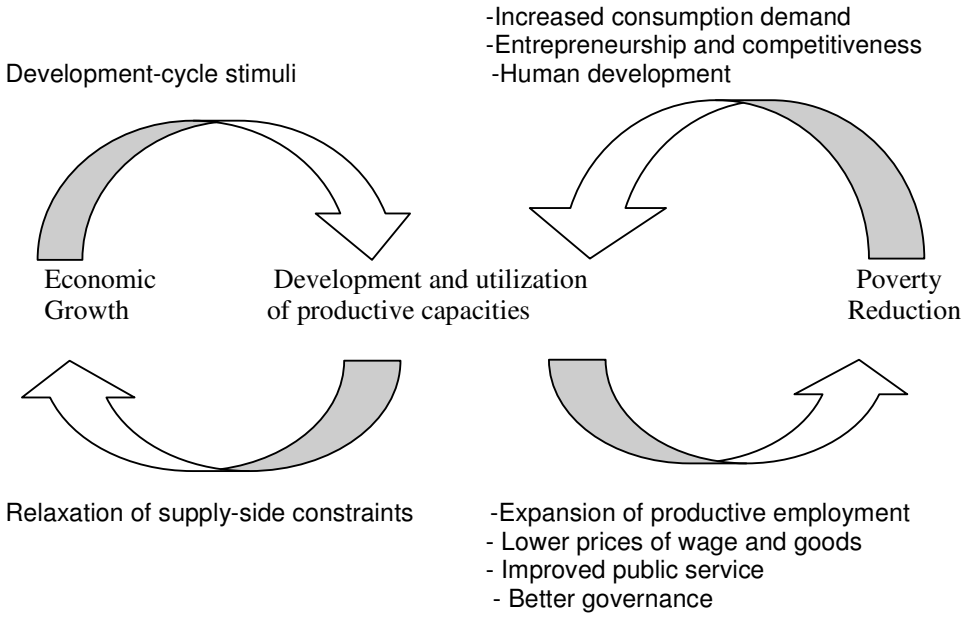


Figure 1: Relationships between economic growth, productive capacities and poverty reduction

Source: Hayashikawa (2008), reporting UNCTAD.

Competitiveness

Lachaal [18] provides a comprehensive economic literature review on competitiveness, covering concepts, definitions and application. Competitiveness is the capacity to provide goods and services at the time and place and in the form desired by national and foreign buyers, and at prices equivalent to, or better than those of other

UNDER PEER REVIEW

providers, while recovering at least the opportunity costs of resources used [19]. An industry is competitive when it has the capacity to make profit and keep a certain share in the domestic and/or international market [20]. Therefore, farmers and domestic firms will need to raise their competitiveness to meet the demand of mass consumption goods such as rice. However, competitiveness (of a nation, a sector or a firm) is dynamic and closely related to its economic conditions as well as to international market conditions. An entity will remain competitive as long as it can continuously adjust in response to forces and factors that determine its position or competitive advantage in a liberalized market [18]. Most of previous assessments of competitiveness addressed static cases and they vary largely in their level of analysis (international, national, sector/sub-sector, and firm level). At the international level, the main determinants of competiveness include exchange rate, international market conditions, fares of international freight, and preferential arrangements between countries. At the national level, the determinants include resource endowments (human and natural resources), technology, product attributes or quality grades, economies of scale, trade policies and regulations [21, 18]. At that level, balance deficits and factors' productivity growth are used to assess competitiveness [22, 18].

At sector or industry level, production costs, factors' productivities, trade patterns are used for the same purpose, whereas market share and profit are the indicators frequently used at firm or micro-economic level [18].

A few previous studies assessed the competitiveness of locally-produced rice in Benin. A one-season paddy production and low market supply [23], weak mechanization of paddy production and processing with negative impacts on rice quality [24], and non-attractive quality/price ratio are the main factors that limit the competitiveness of local rice. Adégbola and Singbo [10] found that local rice will not be competitive until paddy yields are increased, post-harvest operations are improved and marketing strategies are developed.

UNDER PEER REVIEW

Indeed, food prices are made 78% of post-harvest operations costs and only 12% of production costs [25]. At a same quality grade, local rice in Benin is sold at prices 10-20% higher than those of imported rice [23]. However, trade margins should have been removed from those prices, in order to righteously compare market-gate cost prices of local rice with import parity prices of imported rice. The market-gate cost price of a locally-produced good includes its production and distribution costs at the specified market point/location. The import parity price of a good purchased in a foreign country is its unit value at a given location in the importing country if it would equally compete with the same good locally-produced [26].

Previous competitiveness studies in Benin rarely used import parity prices in their assessment. This paper attempted to fill that gap to enable a valid comparison between imported rice and local rice. It also paid attention to several quality attributes that are relevant to consumers in order to calculate quality grade values that would permit a valid comparison of the two types of rice using the quality/price ratio, which is a key empirical indicator of competitiveness.

2. Materials and methods

Assessment of the competitiveness of both types of local rice and of imported rice is done using two main indicators: the market-gate cost price and the quality/cost price ratio. In so doing, the study anticipates a broader research that would apprehend whether public investment in the modern paddy husking factories was a right decision or not, especially in Glazoué where an indigenous paddy-processing industry (women and private mills) existed before.

2.1. Sampling and data collection methods

A survey was done using structured questionnaires to conduct interviews with a sample of 56 local rice value-chain actors, including 26 “indigenous paddy processors” in

UNDER PEER REVIEW

Glazoué (center of the country) and 30 rice consumers in Glazoué (15) and Cotonou (15). The women process paddy using the indigenous parboiling technique, and sell parboiled rice after paddy is husked by private mills operators and cleaned.

The 26 women paddy processors-and-traders were randomly chosen in 6 sub-districts, which were randomly selected from the 10 sub-districts that compose the district of Glazoué. They were selected on the basis of household random pointing or random draw from a list of household where paddy processors are known to extension agents as residents. The 30 consumers were met and selected using a kind of "boule-de-neige" or snowball sampling method[iv]. They were selected based on their knowledge of the three types of rice: local parboiled rice, factory-made local rice, and imported rice. A "yes" answer for the three types of rice, in terms of having heard about, qualifies a consumer for the survey. Then on the same basis a next consumer is selected and interviewed on the spot (or after an appointment), until the required number of interviewees is obtained and surveyed using the appropriate questionnaire. Consumers in Cotonou were included in the sample in order to capture the real influence of various sorts of rice available in the metropolitan city on their preferences for rice quality attributes.

Data used for calculating the market gate cost price were collected from interviews with the women/indigenous processors. They include: paddy purchasing price and costs of transportation, parboiling (and related works), taxes, etc. The factory also faces these costs, except those related to parboiling. On the other hand, the indigenous processors do not pay for packaging which are diffused in family labor whereas hired labor is paid by the factory to cater for that. Otherwise, indigenous parboiled rice is sold in bulk to city wholesalers who handle packaging themselves. Regarding the import parity price, data used include CIF price[v] of imported rice, handling costs, taxes and port fees, and local transportation costs from port to the domestic selling point or market. They were collected from rice importing companies,

UNDER PEER REVIEW

and trade facilitation organizations such as the national handling company (SOBEMAP) and the Customs Directorate in the Port. The import parity price was calculated for imported rice delivered in Glazoué market.

Data collected from consumers concern mainly their evaluation of the quality attributes of each type of rice, including physical and organoleptic characteristics of crude or cooked rice based on their tastes and preferences. There were 7 distinct attributes, including: cleanness, rate of broken rice, degree of whiteness, cooking speed[vi], boldness after cooking or water absorption ability at cooking[vii], taste/palatability, cohesion/grains' gluing or texture of cooked rice.

2.2. Method of data analysis

Cost-wise competitiveness is evaluated first, using service costs and product price data. A comparison is made between market-gate cost prices of rice locally-produced by each type of processing facility, and the import parity price of imported rice. The import parity price is also the cost price of the imported good delivered at the market point where the local one is sold. However, cost-wise competitiveness assessment is not enough. Indeed, one should consider at least the 'quality/price' ratio commonly used in marketing and public discourses for a more meaningful assessment of competitiveness[viii]. Here, an empirical application is made of the concept of 'quality/price' ratio, using the 'quality index/cost price' ratio. Full price of final product (including production and distribution costs, and profits along the value chain) is not used because declared profits data are usually unreliable and would not be comparable between local actors operating informally and importers who are registered traders and are exposed to domestic taxes and uncertain foreign business environments.

Therefore, the following variables were calculated for the different types of rice: quality average scores and quality indexes for each type of rice; market-gate cost prices and

UNDER PEER REVIEW

'quality index/market gate cost price' ratio for locally-produced rice; import parity price at Glazoué market and 'quality index/import parity price' for imported rice. Primary survey data were codified and entered with Epi data 3.1 and processed with Excel and PASW statistics (SPSS 18.0).

The quality index was computed with the view to compare the three different types of rice over the above-mentioned 7 quality attributes and a range of quality grades. Therefore, consumers were requested to give points to each attribute using the scale 1 – 3. For example, the attribute 'cleanness' was assessed as follows: 1=not clean, 2=moderately clean, 3=very clean). A total score was then calculated for all the 7 attributes, paying well attention to reverse gradient attributes such as 'rate of broken rice' or 'cohesion' (too much gluing is not accepted). The quality average score (AS) is the weighted average of percentage of respondents ($\boldsymbol{P}_i$), the weights being the declared quality grades ($\boldsymbol{G}_i$). The quality index is the ratio: 'average score (AS)/maximum score', the maximum score being 50 (Table 1). This method of index calculation derives from the formula: Index = (Observed score – Minimum score)/(Maximum score – Minimum score) [27, 28]. In this research, the observed score is the calculated average score, and the minimum score is zero.

Table 1: Method of quality index (%) calculation for a given quality attribute Y of rice type X [1/]

Quality grade (Gi)	**% of respondents (Pi)**	**Observed scores (PiGi)**
Not good		
Moderately good		
Very good		
Total observed score (∑PiGi)		
Average score (AS)	**AS =** $\frac{\sum_{i=1}^{3} P_i G_i}{\sum_{i=1}^{3} G_i}$	
Quality index (%) =	**100*AS/50 = 2AS**	

UNDER PEER REVIEW

100*Average score/Maximum score [2/]	

1/ X = private mill-processed indigenous parboiled rice, factory-processed white rice, imported rice; Y = any of the following attribute : cleanness, rate of broken rice, degree of whiteness, cooking speed, boldness after cooking or water absorption ability at cooking, taste/palatability, cohesion/grains' gluing or texture of cooked rice. Blank cells are data filling zones.

2/ Maximum score is: (maximum percentage of respondents*maximum quality grade)/sum of grades = 100*3/6 = 50.

3. Results and discussion

3.1. Quality-wise competitiveness

The quality assessment survey revealed that rice consumers usually prefer clean and white color rice, with low rate of broken rice. They would also like to eat delicious rice i.e. with very good taste/palatability, and with high water absorption ability at cooking or boldness after cooking. A short cooking time is also desired, as it allows time and energy saving. Figure 2 summarizes the findings in terms of quality index comparison between rice types by quality attribute.

UNDER PEER REVIEW

Figure 2: Comparison of the three types of rice for quality index by quality attributes

It appears that the factory-processed rice (SONAPRA rice) overtakes the private mill-processed indigenous parboiled rice regarding whiteness and cleanness which are highly valued by consumers for the choice of crude/non-cooked rice. Likewise, the SONAPRA rice overtakes the indigenous parboiled rice for taste/palatability and texture of cooked rice which are key for the choice of cooked rice by consumers. On the contrary, the indigenous parboiled rice is better than the SONAPRA rice regarding the 'broken rice ratio' attribute. Finally over the 7 quality attributes, the average quality index was 74.2%, 53.2%, and 79.6% respectively for SONAPRA white rice, indigenous parboiled rice and imported rice (Table 2).

Table 2: Quality index (%) of the three types of rice by quality attributes

Quality attributes	**Indigenous parboiled rice (mill- processed)**	**SONAPRA rice (factory-processed)**	**Imported rice**
Whiteness	35	90.2	87.2
Cleanness	38	76.2	90.2
Cooking time	62.6	72.4	78.2
Rate of broken rice	60	46.6	95
Boldness after cooking	83.4	81.4	44.4
Texture of cooked rice	48	66.6	92.6
Taste/palatability	46.6	86.6	70
Average	**53.2**	**74.2**	**79.6**

Therefore, the SONAPRA rice is quality-wise more competitive than the indigenous parboiled rice. The factory-processed rice largely reduces the quality-wise competitiveness

UNDER PEER REVIEW

gap of local rice vis-à-vis imported rice (Figure 3). Indeed, it corrects the indigenous rice's weaknesses previously revealed by VECO West Africa [25] and Adégbola and Singbo [10]. However, these authors did not make any quantitative quality assessment. In addition to the high quality of imported rice, other competitive advantages which local rice producers ought to strive for would include regular presence of the product on all periodic markets, variety of rice types, and good linkages with traders.

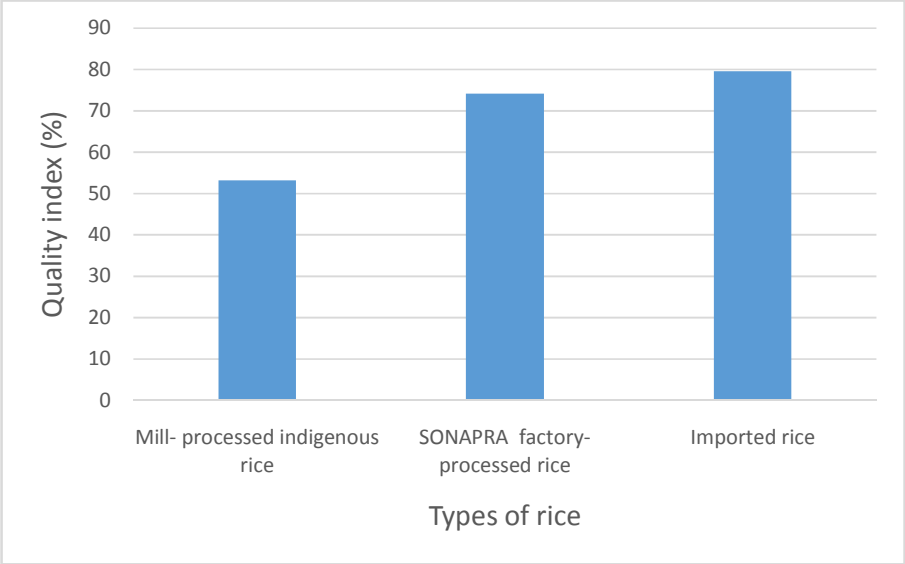


Figure 3: Quality index of local rice and imported rice

3.2. Cost-wise competitiveness

3.2.1. Cost prices of the two types of locally-processed rice

In 2012-2013, indigenous paddy-processing women buy paddy in their villages and neighborhoods at prices ranging from 120-240.6 FCFA/kg, with an average of 192.92 FCFA/kg. On the contrary, the SONAPRA industrial factory buys paddy at assembly points in Glazoué district and other districts in the 'Collines' sub-region at a fixed price of 150 FCFA/kg. At mill gate, paddy price may go higher than at factory gate because some women collect paddy from numerous scattered farms and bear high procurement costs. On the

UNDER PEER REVIEW

contrary, average paddy processing/husking cost at private mills (17.92 FCFA/kg of paddy) is lower than that of the factory (30 FCFA/kg) because the latter supports high energy costs and pays salaries for permanent workers. However, several hand works (including artisanal parboiling and outsourced services) increase the mill-gate cost of indigenously-processed local rice (Table 3). On the contrary, the factory realizes economies of scale during paddy procurement and slightly reduces many hand works at processing stage, through internal integration via machines instead of outsourcing. Indeed, it does not produce parboiled rice which entails many hand works. Yet, it bears high packaging costs which paddy-processing women do not face or pay for. They sell their rice in bulk to wholesalers.

Table 3: Market-gate cost prices of mill-processed and factory-processed local rice

Cost items	**Indigenous parboiled rice (mill- processed)**	**SONAPRA rice (factory-processed)**
	FCFA/kg	
Processing yield from 1 kg of paddy [a]	0.64	*0.65*
Purchasing price of 1 kg of paddy	192.92	150
Collection and assembly of 1 kg of paddy [b]	3.27	--
Processing-related services for 1 kg of paddy (parboiling, drying, sorting, winnowing)	20.72	0
Husking	17.92	30
Sub-total for 1 kg of processed rice before packaging [c]	366.92	276.92
Packaging of 1 kg of processed rice		20

UNDER PEER REVIEW

Distribution	7.1	5,52
Market-gate cost price of 1 kg of processed rice [d]	**374.02 (n= 25, s= 45,33)**	**302,44 (n=1)**

a- Processing yield is the 'processed rice/paddy' weight ratio; thus FCFA/kg does not apply here.

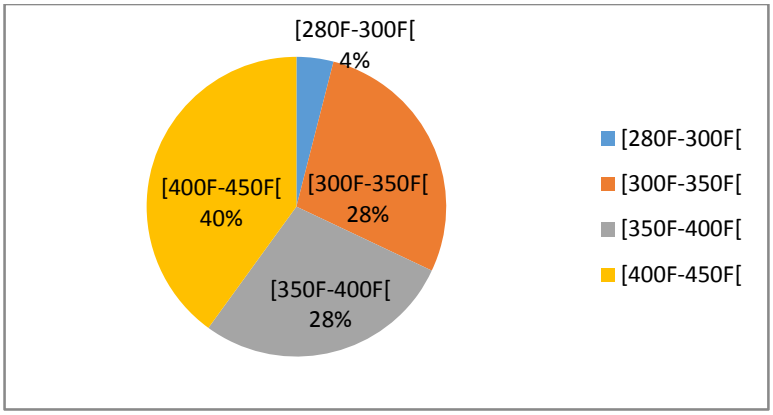
b- Not applicable. This costs are integrated in the husking cost, as declared by the factory officials.

c- This sub-total is equal to the sum of above values divided by the processing yield.

d- Cost price means the processing firm's profit is not included. Here it is average value calculated from the sample: n = 25 women, based on declared minimum and maximum values of cost items; s is the standard deviation. n=1 means there was only one industrial factory investigated. It is the only one that exist in the region.

--: not available.

Overall, average market-gate cost price of mill-processed indigenous rice is 374.02 FCFA/kg, and 302.43 FCFA/kg for the SONAPRA factory-processed rice. Figure 4 shows that 28% of women produce the mill-processed rice at high cost price (350-400 FCFA/kg) and 40% at very high cost (400-450 FCFA/kg), in comparison with the average cost. Therefore, the SONAPRA factory-processed rice is less expensive than the mill-processed indigenous parboiled rice. The industrial factory thus brings down processing costs and enables a 19.1% reduction in market-gate cost price of locally-produced rice.



UNDER PEER REVIEW

Figure 4: Proportion of women in various cost price ranges of mill-processed indigenous rice

Note: Values in square brackets are cost price values.

Source: Survey data, 2012

3.2.2. Import parity price of imported rice, compared to local rice cost prices

Table 4 presents the breakdown of the import parity price of imported rice, delivered at Glazoué market-gate. The average import parity price (281.30 FCFA/kg) is lower than the cost price of each type of locally-produced rice (374.02 FCFA/kg for the private mill-processed rice and 302.44 FCFA/kg for the SONAPRA factory-processed white rice). The Student T test indicates that the differences between these average cost prices is statistically significant at 5% level. This means the two types of locally-produced rice are more expensive and thus less competitive cost-wise than the imported one. This result confirms previous research findings [23, 10]. It also shows that the cost competiveness gap is about 33% for the private mill-processed rice and only 7.5% for the factory-processed rice. Therefore, the modern factory provides a significant cost-wise competitive gain of 25.5 percentage points over the indigenous paddy processing facilities (indigenous parboiling, private milling, and several other hand works).

Table 4: Import parity price of imported rice, delivered at Glazoué market

Cost items	**Cost (FCFA/kg)**
CIF price (international import price)	*183.30*
Port and customs fees	*70.00*
Port and insurance fees	3.64
Custom fees 35,5%	66.36
Local transport and handling charges	*28.00*
Transport within Cotonou (importer, wholesaler, semi-wholesaler)	7.50

UNDER PEER REVIEW

Transport Cotonou-Glazoué	20.50
Import parity price of 1 kg of imported rice at Glazoué market	**281.30**

3.3. The 'quality index/cost price' competitiveness assessment

Based on the results in sections 3.1 and 3.2, 'quality index/cost price' ratio is calculated for local rice, and the 'quality index/import parity price' ratio for imported rice. Let's recall that the import parity price is also a cost price of the imported good delivered at the gate of a specific market in the importing country. From the results in Table 5, it appears that the 'quality/cost price' ratio decreases from 0.28 for imported rice to 0.25 for SONAPRA factory-processed rice and drastically to 0.14 for the mill-processed indigenous parboiled rice.

Table 5: Differential competitiveness gaps of local rice vis-à-vis imported rice

	Indigenous parboiled rice (mill- processed)	**SONAPRA rice (factory-processed)**	**Imported rice**
Quality index (%)	53.2	74.2	79.6
Cost price (FCFA/kg)	373.95	302.43	-
Import parity price (FCFA/kg)	-	-	281.3
Quality index/cost price ratio (A)	0.14	0.25	-
Quality index/import parity price ratio (B)	-	-	0.28
Competitiveness gap vis-à-vis	**49.72**	**13.13**	-

UNDER PEER REVIEW

imported rice (%) = 100*(B-A)/B			

- : not applicable

This means the indigenously-processed rice is not competitive compared to the imported rice, and it is less competitive than the SONAPRA rice. The core result of this research is that the industrial paddy processing brings down the competiveness gap of local rice vis-à-vis imported rice from 49.72% (indigenous parboiled rice) to 13.13%, i.e. a more than 4-fold increase in competitiveness (figure 5).

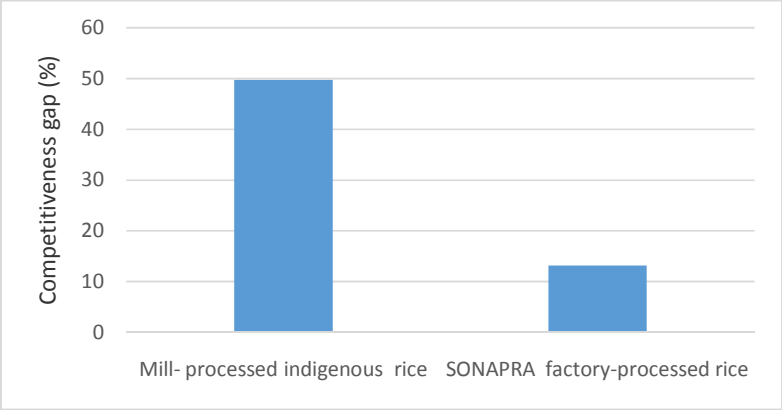


Figure 5: Differential competitiveness gaps of local rice vis-à-vis imported rice

However the SONAPRA rice faces serious market linkage problems. Indeed, that rice is presently sold only by ONASA (the national food security agency) through government pilot shops where access is restricted to the poor, and huge stocks are left unsold. Some consumers reported that those stocks are finally sold at low 'rescue' prices. They may then be captured by illegal traders who practice foreign rice label substitution, and thereby cheat largely on consumers.

4. Conclusion and policy implications

UNDER PEER REVIEW

This research investigated if public investment in industrial paddy processing increases local rice competitiveness in Benin. It assessed the competitive gains of the modern paddy husking/processing factory installed in Glazoué compared to private mills that were already operating in the area. Competitiveness of locally-produced rice vis-à-vis imported rice was evaluated, with particular attention to the type of processing facility used.

Quality index, market-gate cost price, and quality index/price ratio were used as competitiveness indicators. The results reveal that average quality index was 53.2%, 74.2%, and 79.6% respectively for the mill-processed indigenous parboiled rice, the SONAPRA factory-processed rice, and the imported rice. Therefore, the indigenously-produced rice is not competitive compared to the imported rice, and it is less competitive than the SONAPRA factory-produced rice. The latter is both quality-wise and cost-wise more competitive than the indigenous one. Indeed, the factory brings down processing costs and enables a 19.1% reduction in market-gate cost price of locally-produced rice. However, the indigenous parboiled rice fit to tastes and preferences of consumers in the centre and the north of the country, and in Nigeria, whereas SONAPRA rice seems to meet only the preferences of Cotonou city consumers. Yet, this later observation is not very obvious.

The most striking result of this research is that industrial paddy processing with the SONAPRA factory brings down competiveness gap of local rice vis-à-vis imported rice from 49.72% (indigenous parboiled rice) to 13.13% (SONAPRA rice), i.e. a more than 4-fold increase in competitiveness. Therefore, more public investment in such factories should be promoted if rice produced in Benin is to gain large shares in the domestic and regional markets. However, market linkage issues remain to be addressed by the SONAPRA management in order to ensure greater access of consumers to its rice, the quality of which competes quite well with the imported rice. On the other side, processing and marketing capacities of women and private millers need to be enhanced, provided that the parboiled rice

UNDER PEER REVIEW

has a growing market. The specific market outlets of each type of local rice should be developed. Finally, for equity concerns, further research is needed to assess the impact of the modern factory on incomes of rice farmers, women rice processors-traders, and private millers, and on overall well-being of rural households.

References

[1] FAO. FAO/World Bank workshop on reducing post-harvest losses in grain supply chains in Africa. Lessons learned and practical guidelines. FAO Headquarters, Rome, Italy, 18–19 March 2010.

[2] Honfoga BG, Akissoe NH, Guedenon A, Sossa-Vihotogbé, CN. Post-Harvest Management Policies, Programs and Strategies in Benin and Sub-Saharan Africa. *Food, Agriculture and Natural Resources Policy Analysis Network (FANRPAN)*, 2014. French.

[3] Wiggins S. Can the smallholder model deliver poverty reduction and food security for a rapidly growing population in Africa? FAC Working Paper 8, July 2009, IDS, Brighton.

[4] Mhlanga N. *Private Sector Agribusiness Investment in Sub-Saharan Africa Agricultural Management.* Marketing and Finance Working Document 27. Rome: FAO; 2010.

[5] Negassa A, Rashid S, Gebremedhin B, Kennedy A. "Livestock Production and Marketing." In Dorosh P, Rashid S (editors). *Food and Agriculture in Ethiopia: Progress and Policy Challenges,* International Food Policy Research Institute, 2012.

[6] Brautigam D, Tang X. *An Overview of Chinese Agricultural and Rural Engagement in Ethiopia.* IFPRI Discussion Paper 01185. International Food Policy Research Institute, 2012.

[7] Diao X. Evidence on Key Policies for African Agricultural Growth. International Food Policy Research Institute, Discussion Paper 01242; 2013.

UNDER PEER REVIEW

[8] Alliance Sud. The rice in the world; 2010. Available at: http://www.alliancesud.ch/fr/infodoc/dossiers/riz/le-riz-dans-le-monde

[9] Nwanze KF, Mohapatra S, Kormawa P, Keya S, Bruce-Oliver S. Perspective for rice development in sub-Saharan Africa. *J Sci Food Agric* , 2006(**86**):675–677. DOI: 10.1002/jsfa.2415.

[10] Adegbola PY, Singbo AG. Impact of imports of rice on the competitiveness and profitability of domestic production in Benin. In: WARDA (editor). Proceedings of the Regional Workshop on "Policy and strategies to promote rice production and food security in sub-Saharan Africa", Cotonou, Benin; 2005. French

[11] APRM. DPP database. APR / DPP, Cotonou, Benin; 2014 French.

[12] APRM. Statistical Yearbook. APR / DPP, Cotonou, Benin; 2011. French.

[13] Hayashikawa Mr. Overcoming poverty through trade: What Role for Aid for Trade? In OECD (editor). Conference on "Dialogue on aid for trade", OECD, Paris; 2008. French.

[14] Agbaka A, Ahouandjinou I Ahounou MD, Bio Bagou JB, Dossouhoui FV, L Glin, Kinha C. Diagnostic Analysis and Outlook of the rice sector in the valley of Ouémé - Benin. Working Paper Series No. 130. APRM, 2007. French.

[15] Rodriguez F, Rodrik, D. Trade policy and economic growth: A sceptic's guide to the cross-national evidence. *NBER working Paper* 7081, National Bureau of economic Research, Massachusetts; 1999.

[16] Winter LA. Trade Liberation and Economic Performance: An overview. *The Economic Journal*, 2004(**114**)F4-F21.

UNDER PEER REVIEW

[17] Grain of salt. Development of local products: face challenges, a variety of solutions; 2014. Available at: http://www.inter-reseaux.org/publications/revue-grain-de-sel/58-valorisation-des-produits.

[18 Lachaal L. Competitiveness: Concepts, definitions and enforcement. In: Laajimi A & L Arfa (editor). The future of agri-food trade in the Mediterranean basin: The challenges of globalization and the challenges of competitiveness. Zaragoza: chimea. Notebook Options Mediterranean, 2001 (57): 29-36. French.

[19] Sharples J, Milham N. *Long run competitiveness of Australian agriculture*. In: USDA Economic Research Services. Foreign Agricultural Economics Report 243; 1990.

[20] Agriculture Canada. *Task Force on Competitiveness in the Agri-Food Industry, Growing Together*. Report to Ministers of Agriculture. Agriculture Canada, Ottawa, 1991.

[21] Brinkman GL. The competitive position of Canadian agriculture. *Canadian Journal of Agricultural Economics*, 1987(35):263-288.

[22] McCorriston J, Sheldon M. International competitiveness: Implications of new international economics. In: Bredahl, ME, Abbott PC, Reed MR (eds). Competitiveness in International food Markets, Westview Press, Boulder, 1994.

[23] JRC. Transformation Initiative and marketing of rice in southern Benin. In: Inter-Network / CTA and PPAB. Forum report "market access of agricultural products", Cotonou, Benin, 2004. French.

[24] VECO West Africa. Rice sector in Benin: Analysis of livelihoods and value chain analysis; event Rice Farmers department Collines, 2008. French.

UNDER PEER REVIEW

[25] Goletti F, Wolff C. *The impact of postharvest research* (MSS Discussion Paper No. 29). In: IFPRI: Proceedings of the meeting on Postharvest Research, International Centers Week, Washington, 1999.

[26] USAID. Analysis of parity prices for import and export. FEWS NET Markets Guidance No. 1. May 2008. French.

[27] United Nations Development Program (UNDP). Human Development Report, 1997.

[28] Lonergan S, Gustavson K, Carter B. The Index of Human Security. Prepared for the Global Environmental Change and Human Security (GECHS) project. In Aviso – An information bulletin on global environmental change and human security, 2000, Issue No. 6.

End notes

[i] Although certified quality grades established through laboratory calibration of quality attributes are not available, everybody knows that Beninese people have a very high preference for imported rice coming from various countries (Thailand, Vietnam, Malaysia, Pakistan, USA, etc.).

[ii] This question has a larger dimension connected with the impact of industrial factories on local paddy production, on jobs initially created by women and private mills, on incomes of rice value chain actors and on rice consumption. The present study does not deal with that perspective.

[iii] See FAO Corporate Document Repository: Comprehensive Africa Agriculture Development Programme, Chapter 1: Underpinning Investments in African Agriculture and trade-related Capacities for improved Market Access: A Continental Vision.

[iv] Snowball sampling is a non-probability sampling scheme through which one begins by (purposively) sampling one person and then –through this person– obtains a list of persons who have the same characteristics as the initial persons selected and so on. In our case, the next person interviewed is not always designated by the previous one. A 'meet on the spot' approach was rather used.

[v] CIF = Cost, insurance and freight.

[vi] Slow or long duration of cooking increases energy costs.

[vii] According to interviewees, rice with high water absorption capacity is perceived as economical as the quantity of crude rice needed to feed one person is reduced.

UNDER PEER REVIEW

[viii] Here we are discussing only product competitiveness and not firm competitiveness. In addition to the former, the latter would also include the firm's market penetration (trends in sale volume, market share, etc.), frequency of market supply, leadership's smartness in market negotiations, and many other business attributes.