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Rice Price Trends in Ghana (2006-2011)

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Per capita consumption of rice (*Oryza spp. L.*) in Ghana increased from 17.5 kg per annum between 1999 and 2001 to 22.6 kg per annum between 2002 and 2004. By 2011, it had reached 38 kg per annum and projected to reach 63 kg per annum by 2015.[2] This increase has transformed rice into Ghana's most important cereal food crop after maize. The evolution of rice prices, thus, has implications for national food security and income enhancement objectives. The purpose of this research is to evaluate the trends in rice prices and discuss their implication for policy. It used national monthly wholesale prices collected by the Statistical Research and Information Directorate (SRID) of the Ghana Ministry of Food and Agriculture.

Ghana's Rice Production Situation

Table 1 shows that while rice is grown in all ten regions of Ghana, production is very concentrated: the top-three regions (Northern, Upper East and Volta) accounted for nearly 80% of total national output and 73% of total production area in 2010. These three regions also fall in three of the country's six agro-ecological zones – Coastal savanna, Guinea savanna and Sahel savanna.   Average yield of 2.96 MT/Ha in these three regions exceeds the national average of 2.71 MT/Ha but is significantly lower than the average yield of 5.48 MT/Ha in the Greater Accra region, suggesting that the right technologies and policies could enhance yields and output. The opportunities are even higher when 2010 yields of 4.10 MT/Ha, 4.07 MT/Ha and 3.36 MT/Ha in neighboring countries of Senegal, Benin and Mali are considered.

Table 1: Distribution of Rice Production by Region and Agro-Ecological Zones (2006)

| Region	Agro-Ecological Zone	Output (MT)	Area (Ha)	Yield (MT/Ha)
Northern	Guinea Savanna	185,877	62,930	2.95
Upper East	Sahel Savanna	135,221	47,361	2.86
Volta	Coastal Savanna	67,229	21,860	3.08
Ashanti	Semi-Deciduous Rainforest	27,705	10,115	2.74
Western	Rainforest	23,022	17,130	1.34
Eastern	Semi-Deciduous Rainforest	20,703	6,630	3.12
Greater Accra	Coastal Savanna	12,741	2,323	5.48
Upper West	Sahel Savanna	7,291	4,570	1.60
Brong-Ahafo	Forest Savanna Transition	6,573	4,020	1.64
Central	Semi-Deciduous Rainforest	5,241	4,290	1.22
Total	National	491,603	181,229	2.71

Source: Statistical Research and Information Directorate (SRID), 2006.

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[2]   Information sources include Asare (2000), WARDA (2007) and Ghana Ministry of Food and Agriculture's National Rice Development Strategy (2011).

The table provides a snapshot of production situation across the country in a single year. Figure 1 shows the trend in paddy rice production and yield from 2000 to 2010.[3] The figure shows that both yield and production were essentially flat between 2000 and 2005 but have been rising since 2007. Indeed, domestic paddy price production in Ghana increased by 165% between 2007 and 2010 while yield increased by 59%, results that may be attributable to the focused attention that both the Government of Ghana and its development partners have brought to rice production in the last few years.[4]

Figure 1: Paddy Rice Production and Yield Trend for Ghana (2000-2010)
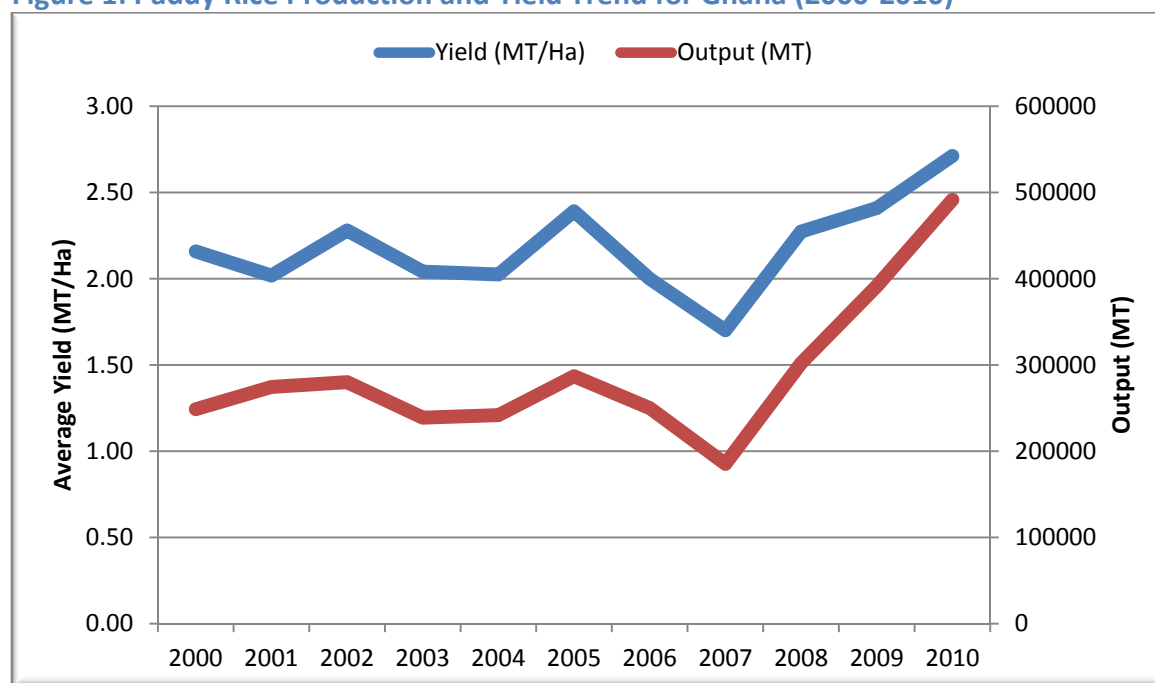
Source: FAO (http://www.faostat.org) and MOFA

Despite the observed growth in production, Ghana has been importing significantly larger quantities of rice to address quality and quantity differences between local production and demand. Figure 2 shows that the volume of total imported rice reached 442,469 MT by 2009, rising by 267% from 2000. The figure shows that imported rice comprises essentially broken rice and milled rice, with the former dominating in all years considered except 2004. Broken rice's share of imports peaked in 2006 at 91% of total volume of imports of 354,455 MT and ended the series in 2009 at 63% of total volume of imports of nearly 280,000 MT. The *preference* for broken imported rice may be due essentially to price as seen in the value distribution of rice imports, presented in Figure 3. The figure shows that the total (nominal) value of Ghana's rice imports was about $262.8 million in 2009 compared to $51.8 million in 2000. Broken rice's share of import value was about 52% in 2009 and 63% in 2008 compared to

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[3]   Paddy rice is whole or unbroken unhulled kernels of rice, milled rice is rice from which the hull and bran have been removed and broken rice is when the rice grains are less than three-fourths the size of whole kernels (USDA, 2009).

[4]   The development partners include U.S. Agency for International Development (USAID), the Food and Agriculture Organization (FAO), Japan International Cooperation Agency (JICA), the Canadian International Development Agency, and the French Development Agency (AFD).
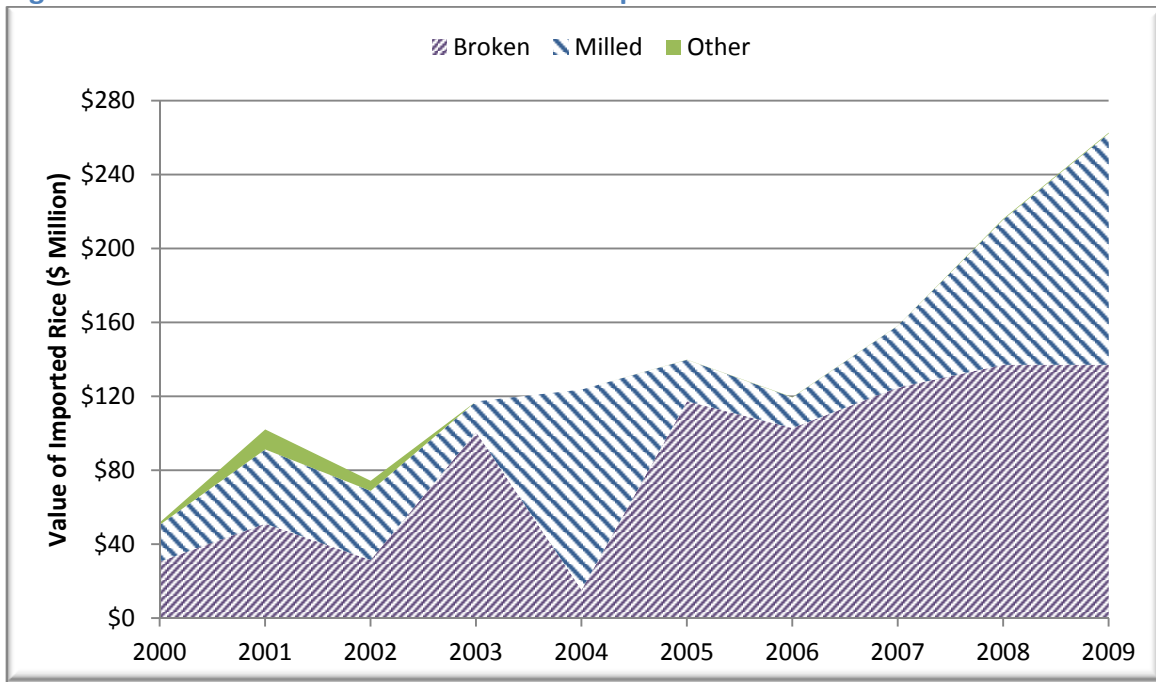
its volume share of 63% and 70%. Ghana has virtually stopped importing paddy rice and rice flour (which are the "other" in the graph) since the early 2000s.

Figure 2: Quantity of Imported Rice by Type (2000-2009)


Source: FAO (http://www.faostat.org)
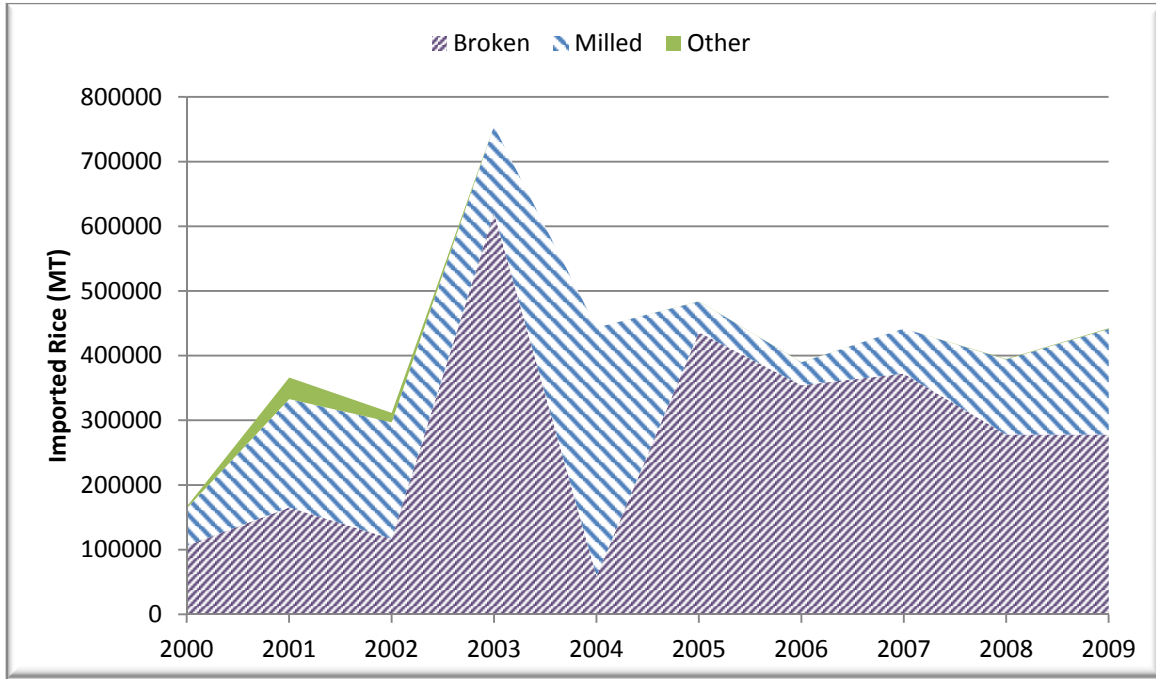
Figure 3: Distribution of Total Value of Rice Imports

Source: FAO (http://www.faostat.org)

Figure 4 shows the trend in the rice import penetration ratio in Ghana based on an assumption of 65% milling yield rate for paddy rice.[5] The figure shows that while the import penetration ratio increased between 2000 and 2003, peaking at about 486% – implying that the country imported almost 5 kg for each kilogram of rice it produced – it has been declining since the mid-2000s, reaching 174% in 2009. Although the declining trend is illustrative of the increasing domestic rice production in since 2007 (as seen in Figure 1), some consider the current import penetration ratio as still high. This has prompted debates about the appropriate policies to implement to address the high rice importation levels.

Figure 4: Rice Import Penetration Ratio in Ghana (2000-2009)

Source: FAO (http://www.faostat.org)
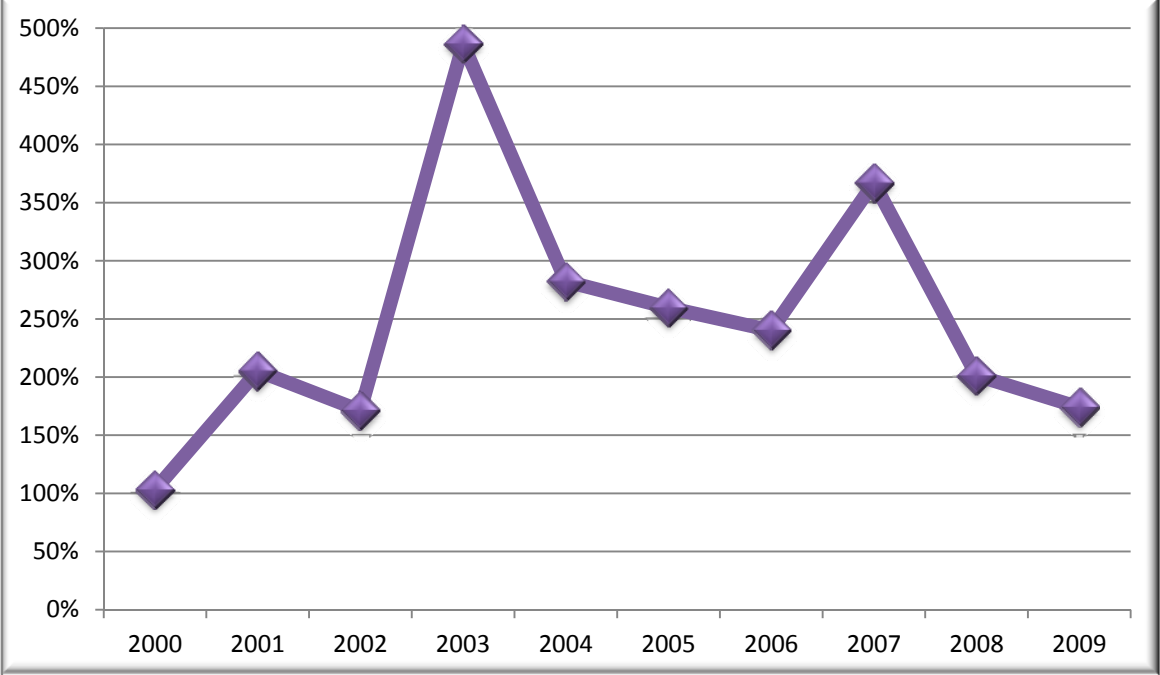
It is argued that the foregoing high import penetration ratio presents opportunities for improving the operations and capacity of participants in Ghana's rice industry to enhance their global competitiveness. It challenges the industry's stakeholders, public policymakers and their development partners to assess the expanded opportunities presented by prevailing market conditions and develop solutions that are sustainable and present the least cost to consumers, taxpayers and industry stakeholders.

Rice Price Trends

The production and trade data presented above show that about 70% of rice consumed in Ghana is imported. This reveals the existence of essentially two rice markets – local and imported rice markets. Various studies show that Ghanaian consumers have a higher preference for imported rice because of its perceived higher cooking and sensory characteristics and quality (Diako et al., 2011; Tomlins et al., 2005). The study by Tomlins and

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[5]   This milling rate applied in the literature and is also used by the National Rice Development Strategy.

his colleagues found the local rice was only appealing to a "niche segment" comprising 14% of their sample while the remaining 86% preferred imported rice which was influenced by the consumer's gender and location. Although the study by Diako et al. found local rice to present higher mineral levels, these *unobserved* nutritional qualities were not enough to persuade consumers whose consumption decisions seem to be influenced by convenience and visual characteristics. The revealed preferences of consumers directly influence the price differences between local and imported rice in the Ghanaian market and must be recognized in the development of policies to achieve stated objectives.

Table 2 shows the summary statistics of the monthly nominal wholesale prices of local and imported rice between January 2006 and December 2011. The table shows that the mean price for both types of rice has been trending upwards over time. For example, the mean price of local rice more than doubled from GH 55 in 2006 to about GH 120 by 2011 while that of imported price nearly tripled from about GH 63 to nearly GH 169. The table also shows that the price range and variability were highest in 2008, driven essentially by the global commodity crisis that peaked in that year. This would suggest Ghana's local rice market is not independent of the global market, a subject that is explored more extensively in the ensuing pages.

Table 2: Summary Statistics of Nominal Monthly Wholesale Rice Prices (GH /100kg Bag) in Ghana by Local and Imported Types of Rice (2006-2011)

Variable	N (Months)	Mean	Std. Dev.	Min	Max	Range	Coefficient of Variation
Local Prices							
2006	12	55.02	2.31	51.47	57.77	6.30	4.2%
2007	12	58.21	3.05	54.06	62.04	7.98	5.2%
2008	12	86.89	15.71	62.00	101.64	39.64	18.1%
2009	12	104.35	4.17	95.13	110.80	15.67	4.0%
2010	12	107.53	4.42	100.54	114.63	14.09	4.1%
2011	12	119.81	10.95	105.66	135.61	29.95	9.1%
Imported Prices							
2006	12	63.27	1.48	61.60	66.54	4.94	2.3%
2007	12	72.96	5.40	63.38	81.82	18.44	7.4%
2008	12	114.66	17.95	82.92	129.36	46.44	15.7%
2009	12	133.60	3.71	127.78	138.44	10.66	2.8%
2010	12	144.89	2.61	140.64	149.68	9.04	1.8%
2011	12	168.71	13.94	152.94	197.26	44.32	8.3%

Source: Statistical Research and Information Directorate (SRID), MoFA – Ghana.

Figure 5 shows the trends in the nominal monthly wholesale price of local and imported rice from January 2006 to December 2011. It shows that the commodity crisis of 2008 shifted rice prices to a new level, for until March 2008, there had never been more GH 9.00/100kg change in price from one month to the next in either rice markets. The peak month-to-month difference of GH 11.67 for local rice and GH 18.78 for imported rice occurred between June and July 2008 and between April and May 2008. This single massive shift put prices in both rice markets at higher levels from which they have not descended. The figure also shows that prices

of imported rice accelerated in the last half of 2011, increasing by GH 17.58/100kg between June and July and by GH 16.16 between November and December. For local rice, a price spike of GH 12.13 was observed between May and June of 2011.

Figure 5: Trend in Nominal Monthly Wholesale Rice Prices (2006-2011)
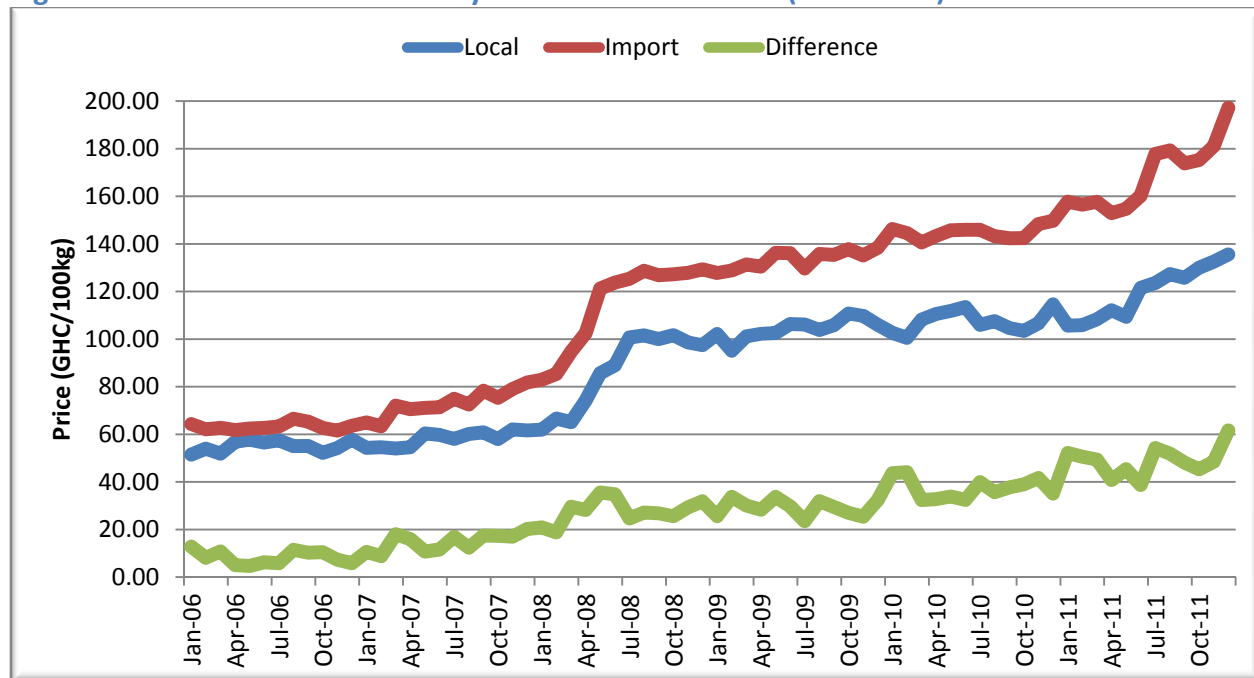
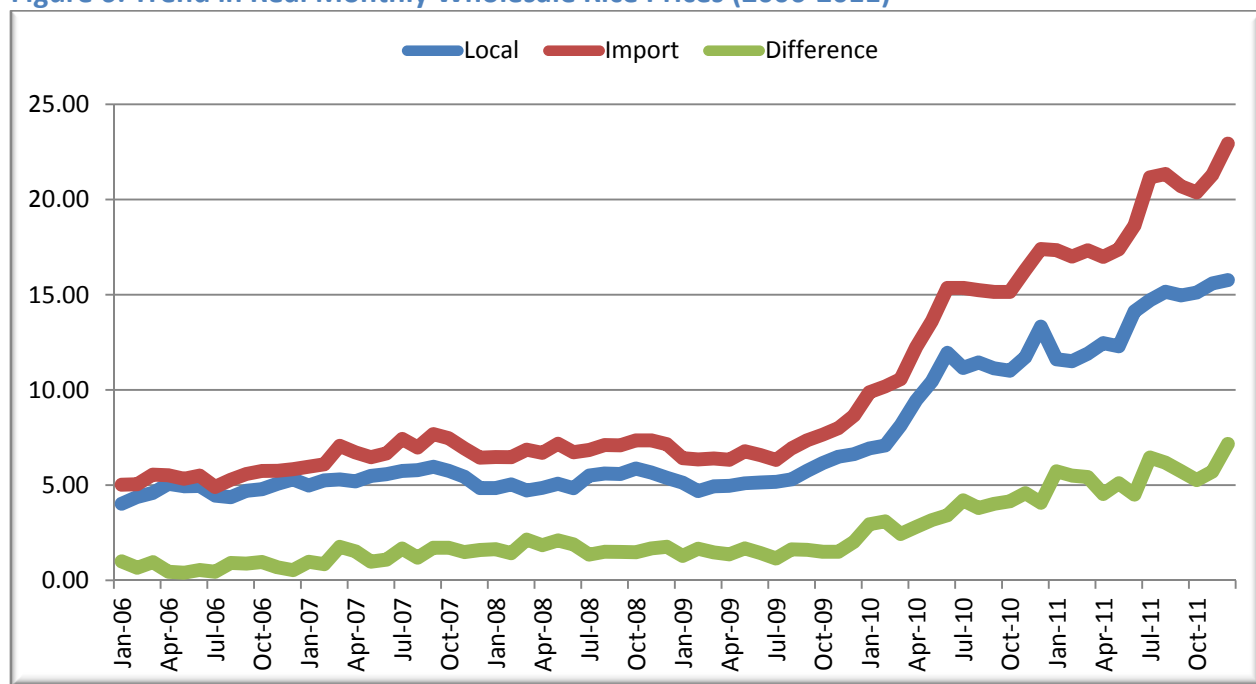Source: Statistical Research and Information Directorate (SRID), MoFA – Ghana.

Figure 6 shows the real (inflation-adjusted) monthly prices for local and imported rice as well as their difference between January 2006 and December 2011. Adjusting the trend for inflation provides a more vivid presentation of the shift discussed under the nominal trend in Source: Statistical Research and Information Directorate (SRID), MoFA – Ghana.

Figure 5 shows the trends in the nominal monthly wholesale price of local and imported rice from January 2006 to December 2011. It shows that the commodity crisis of 2008 shifted rice prices to a new level, for until March 2008, there had never been more GH₵9.00/100kg change in price from one month to the next in either rice markets. The peak month-to-month difference of GH₵11.67 for local rice and GH₵18.78 for imported rice occurred between June and July 2008 and between April and May 2008. This single massive shift put prices in both rice markets at higher levels from which they have not descended. The figure also shows that prices of imported rice accelerated in the last half of 2011, increasing by GH₵17.58/100kg between June and July and by GH₵16.16 between November and December. For local rice, a price spike of GH₵12.13 was observed between May and June of 2011.

Figure 5. It shows that the shift resulted in not only an increase in the level of prices but also in the average growth rate in the monthly price of both products. The average month-to-month growth rate in the pre-crisis real prices was 1.13% for local and 1.71% for imported rice compared to 2.94% and 3.13% in the post-crisis period.

Expanding domestic production without improvement in quality would not alter consumers' preference for imported rice. Therefore, policy focus needs to shift from *merely* expansions of rice production in Ghana to enhancing the quality of domestic rice with an objective of making it competitive on Ghanaian consumers' preference scale. Although there are suggestions to increase import tariffs (as an import substitution strategy), focusing on enhancing the quality of local rice will be a more sustainable solution. Import substitution policies are not effective – and may indeed lead to adverse outcomes such as smuggling and price inflation – if supporting infrastructure – production technologies, human capacity, distribution and marketing infrastructure, etc. – are absent (Huchet-Bourdon and Pishbahar, 2009).

Figure 6: Trend in Real Monthly Wholesale Rice Prices (2006-2011)

Source: Statistical Research and Information Directorate (SRID), MoFA–Ghana and Bank of Ghana.

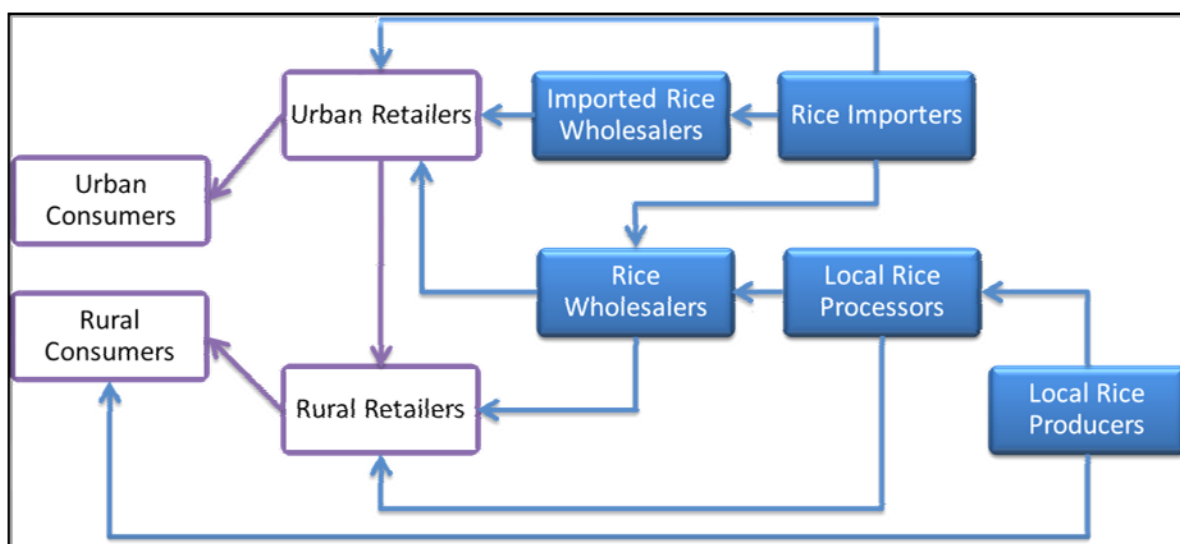## Ghana's Rice Supply Chain, Price Relations and Policy Action

Figure 7 provides a schema of the flow of local and imported rice to the two Ghanaian rice markets. The leading rice exporting countries to Ghana are the U.S., Thailand, Viet Nam, China, Pakistan, India and Korea. Equation (1) describes imported rice price (P_F) as technically determined by purchase price plus freight and insurance to transport it to a Ghanaian port (P_C), excise, custom and other government-mandated fees (T_E), internal transportation and distribution (F) and other transaction costs (T_I) and importers' margin (π), i.e.:[6]

$$P_F = P_C + T_E + F + T_I + \pi \tag{1}$$

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[6] In addition to the 20% duty, there is a 12.5% Value-Added Tax, 2.5% National Health Insurance levy, 1% inspection fee, 0.5% Economic Development Fund levy, 0.5% ECOWAS levy and 0.4% Ghana Customs' Network fee. This brings Ghana's total government-related cost to about 37.4%.

Imported price differences are, thus, defined by differences in P_C (which will reflect quality differences) and the expected margin if all other costs are assumed equal. Thai rice, for example, is priced between GH 240 and GH 300 per 100kg bag compared to GH 60 and GH 70 for Chinese rice. Importers may distribute their products through wholesalers who sell to urban and rural retailers or distribute directly to retailers themselves, depending on the size of the retailer. Unlike importers who handle only imported rice, wholesalers may handle only imported rice or both local and imported rice. The wholesalers who handle only imported rice tend to be large and generally serve large urban retailers, who not only service urban consumers but may also supply smaller urban and rural retailers with their imported rice needs.

Figure 7: Rice Distribution Network in Ghana

Urban Retailers — Imported Rice Wholesalers — Rice Importers — Urban Consumers — Rice Wholesalers — Local Rice Processors — Rural Consumers — Rural Retailers — Local Rice Producers

Local rice producers tend to be small scale, although some *medium* and *large* scale producers are emerging in the Ghana rice industry. These producers will generally use a processing plant or mill to process their rice while the small producers typically use traditional threshing and winnowing techniques and sun drying on mats and concrete floors to process their rice.[7] These small local rice producers distribute their marketed products directly to rural consumers, rural retailers or small wholesalers/retailers (essentially "*middlemen*" who would often travel to rice-producing areas to assemble production from numerous small producers).

The fragmented structure of the rice markets (as many other commodity markets in Ghana) concentrates a lot of market power at the wholesale level. As such, wholesale price has significant influence on both consumer and producer prices. Wholesalers determine how much they are willing to pay producers based on their expectations about the retail market prices. Poor market information makes it difficult for small retailers and small producers to exercise much power in their transactions with wholesalers. Importers' relative size, capital position and access to relevant and timely information generally provide them with a power advantage in this market. Indeed, most importers also provide wholesale services.

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[7] These infrastructural constraints in the post-harvest environment may explain a large part of the relatively low quality of the local rice in comparison to the imported rice in Ghana.

Figure 7 shows the two distinct but related rice markets in Ghana – the local and the imported rice markets – and the clear segmentation of the rural and urban consumer segments. Ghana Ministry of Food and Agriculture reports that while 80% of local rice is consumed in rural communities, imported rice is ubiquitous in both urban and rural communities. This extensive presence of imported rice across country would suggest that its price determines that of local rice. The price trends in Source: Statistical Research and Information Directorate (SRID), MoFA – Ghana.

Figure 5 shows the trends in the nominal monthly wholesale price of local and imported rice from January 2006 to December 2011. It shows that the commodity crisis of 2008 shifted rice prices to a new level, for until March 2008, there had never been more GH₵9.00/100kg change in price from one month to the next in either rice markets. The peak month-to-month difference of GH₵11.67 for local rice and GH₵18.78 for imported rice occurred between June and July 2008 and between April and May 2008. This single massive shift put prices in both rice markets at higher levels from which they have not descended. The figure also shows that prices of imported rice accelerated in the last half of 2011, increasing by GH₵17.58/100kg between June and July and by GH₵16.16 between November and December. For local rice, a price spike of GH₵12.13 was observed between May and June of 2011.

Figure 5 and Figure 6 show strong positive correlation (0.98) between the two prices (both nominal and real), significant at the 1% level between January 2006 and December 2011.

Figure 4 showed that between 2000 and 2009, approximately 2.5MT of rice were imported for each tonne of rice produced in the country. Given the dominance of imported rice and consumer preference for imported rice in Ghana, it is very plausible that local rice price is determined by imported rice price. To what extent does import price determine the local price? This question is relevant because of the ongoing policy debate about how to address the high import penetration ratio of rice in Ghana. From a food security perspective, increasing imported rice price (through tariffs, for example) could, keeping all other things unchanged, directly increase domestic rice price if this relationship is confirmed, and, result in rice becoming inaccessible to income-constrained consumers. Such a policy, then, neither achieves its income enhancement nor its food security objectives.

To answer the question about the extent to which the imported rice price determines the local price, a simple linear regression model is estimated using real local rice price (P_L) as the dependent variable and real imported rice price (P_F) and tariffs (T) as the independent variables. The model is presented as follows:

$$P_L = a + bP_F + cT + D + \varepsilon \qquad (2)$$

The variable, ε, is the random error term and D is the interaction between P_F and T. Tariff is a dummy variable, where T = 1 for the period May 2008 to December 2009 when the 20% tariff on rice imports was removed and T = 0 for the period when the tariff was reinstated at the beginning of 2010.[8] The coefficient on P_F is expected to be positive and statistically significant if

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[8]   The original intent for removing the tariff was to reduce the price of imported rice for consumers and the rationale for reinstating it is to protect local rice producers.

imported rice price actually influenced the level of local prices. Contrarily, the coefficient of *T* is expected to be negative if the removal of a tariff on imported rice decreased local rice price.

A Prais-Winsten regression was ran in Stata 12® using the robust option for the estimation of the variance-covariance matrix and a Cochrane-Orcutt transformation to address any potential autocorrelation in the model. The duration of the data used was January 2009 through December 2011. The results, presented in Table 3, show that the model specified in Equation (2) is significant (F-value = 870.73; Prob > F = 0.00; R-square = 0.98) and has no autocorrelation problem (Transformed Durbin-Watson = 2.01). The results indicated that for each cedi increase in the price of 100kg bag of imported rice, local rice price increased by about GH 0.68, significant at the 1% level. Although the coefficient on *T* exhibited the right sign, suggesting that removing the tariff contributed to reducing local rice prices, it was not statistically significant. Similarly, the coefficient of *D* (the interaction variable) and the intercept were both not statistically significant. Thus, the model confirms that the principal variable determining local rice price is imported rice price.[9]

Table 3: Regression Results for Effect of Import Rice Price and Tariffs on Local Rice Price

Exogenous Variables	Regression Coefficient	Semi-Robust Standard Error	T-Value	P>t	[95% Confidence Interval]	
Import Price	0.680	0.032	21.360	0.000	0.615	0.744
Tariff	-0.871	0.812	-1.070	0.291	-2.524	0.782
Tariff-Import Interaction	0.120	0.094	1.280	0.211	-0.071	0.312
Constant	0.735	0.527	1.400	0.172	-0.337	1.807
Number of Observation		37	**Rho**			0.165
F(2,35)		870.73	**R-Square**			0.984
Prob > F		0.000	**Root Mean Square**			0.425

The strength of the effect of imported rice price on local rice price is investigated through estimation of the response elasticity of local rice price to import rice price. The results show that a 10% change in the wholesale price of imported rice yields about 9.13% change in the wholesale price of local rice. This inelastic relationship implies that policies that increase imported rice prices *actually* benefit rice importers more than they benefit local rice sellers (and hence producers). Due the positive price transmission relationships between the wholesale and retail levels, it can also be noted that such policies create hardships for consumers in a market where local rice is not a "good" substitute for imported rice.

Conclusion

The purpose of this paper was to assess national wholesale price trends in Ghana's rice markets and contribute to the debate about policy options. The research confirmed the significant

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[9]   Stata's Linktest routine was used to test for specification error. It involves regressing the local rice price on its predicted value and the square of the predicted value. If there is no specification error, the predicted value's coefficient would be the only statistically significant estimate in the model. In this case, the coefficient was indeed the only significant estimate (t-value = 7.62; p > t = 0.00).

dominance of imported rice in the country, which contributed to the absence of price cycles normally observed in commodities with poor storage and distribution infrastructures. The research also indicated that local rice price is determined by imported rice price, with a less than unit elasticity. This result is very important in informing policy to avoid policies that increase the price of imported rice because they would lead to increases in local rice price, increasing the risk of an adverse effect on the demand for local rice and unintentionally increasing food insecurity.

The search for effective policies to enhance the competitiveness of Ghana's local rice industry needs to be explored from a market and not from an import substitution perspective. The focus must include the development of the niche markets that *appreciate* the higher nutritional characteristics of Ghana's local rice and drive production and sale in those markets, be they local or foreign. This market-driven approach presents a different perspective on the role of rice in economic development, shaping the possibility of rice production and marketing as a capital formation process that supports the development of the necessary infrastructure to support the competitiveness of local producers and their supply chain without encumbering the imported rice supply chain.

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