PN-ACU-344

Competitiveness of Rice Production in Northern Ghana: An Analysis of Nominal and Effective Protection

Work Shop Held at Sigma One Corporation Accra

February 11, 2002

February 2002

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February 11, 2002

Submitted to:

U.S. Agency for International Development
Mission to Ghana

for:

Trade and Investment Reform Program (TIRP)
Improved Policy Reform and Financial Intermediation
USAID Contract Number: 641-C-00-98-00229

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In fulfillment of the following milestones:

6.2 (Y4) **Hold Workshops/Seminars with Participatory Policy Working Group**

February 2002 **Sigma One Corporation**

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1.0 Background:

The present Government of Ghana proposes to increase rice production in Ghana, thus reducing Ghana's reliance on imported rice. The focus of these production efforts will be the major rice producing areas of Northern Ghana, This analysis reviews the current rice production and consumption trends in Ghana and compares the cost of transporting rice from Northern Ghana to the Accra market with the cost of imported rice. This data is then used to examine the competitiveness of rice production in Northern Ghana employing quantifiable coefficients such as the Nominal Rate of Protection (NPR) and the Effective Rate of Protective (EPR). These coefficients allow a comparison of domestic prices to foreign prices with the view to assessing the competitiveness of producing rice locally as against importing. By calculating the various coefficients, one is in the position to determine both the implied structure of taxation and subsidisation and the divergence between incentives that are generated by policy and incentives that opportunities for free trade would have provided.

2.0 Rice Production and Consumption in Ghana

Rice has become an important staple food for Ghanaian urban dwellers (especially in Southern Ghana) and to some extent for those in the rural areas. Much of the increased urban demand for rice has come from imports. Given that rice is also produced in Ghana, the issue has been raised as to why should Ghana import rice. Can't domestic demand be met by increased domestic production? This report examines the rice market in Ghana, the competitiveness of national rice production and the measures that might be required to make domestic production more competitive.

One difficulty with analysing the rice market in Ghana is the poor statistical base. The available statistics do not provide a clear indication of either consumption or production trends in the 1990's. The extent to which rice consumption has increased and the extent it is being met from domestic production or imports is dependent on what statistical source one chooses. A food needs assessment survey undertaken by CEPA in 2000, indicated a situation of declining net production of rice and fluctuating consumption levels in Ghana over the period 1995-1999 (Table 1). However, these production estimates seem inconsistent with Ministry of Food and Agriculture (MOFA), statistics presented below.

Table 1. **Rice Food Balance ('000Mt)**

	1995	1996	1997	1998	1999	Average	Ave. Annual1 Growth Rate
Net Production	104.45	101.81	93.08	59.38	64.38	84.62	-9.7%
Commercial Imports	104.264	75.71	76.03	77.25	227.78	83.06	42.4%
Food Aid Imports	37.98	5.37	5.56	6.03	2.85	11.562	-31.7%
Exports	0.00	1.79	0.22	0.14	0.70	0.57	92.0%
Total Domestic Supply	246.69	181.10	174.40	142.65	294.309	207.83	14.5%

Source: Food Needs Assessment and Analysis of Potential Disincentive Effects of Food Aid in Ghana (Draft Report by CEPA 2000).

The MOFA statistics on area, yield and production, over the period 1970-1999, show a significant increase in domestic rice output as a result of increased area and yields (Table 2). In fact the figures from Table 2 indicate that rice production has increased at an annual

Table 2. Output, Area Cultivated and Yield Per Hectare of Rice, 1970-1999 (5-Year Average)

	1970/74	1975/79	1980/84	1985/89	1990/94	1995/99	Annual Growth Rate in 1990's
Output	62	69	50	81	125	225	8.0
Area Cultivated (000 Hectares)	63	67	53	85	84	112	3.3
Yield per hectare (mt)	0.98	1.03	0.94	0.95	1.45	2.01	3.9

Source: The Agricultural and Food Sector, A workshop-paper presented by V.K. Nyanteng on 3rd May 2001

average growth rate of 8% in the 1990's, due to increases in area cultivated and yields. Indeed, Table 2 suggests that Ghana's rice industry is performing quite well.

One of the priority issues that Government must resolve, as it deliberates on its rice policy, is this apparent contradiction in what is occurring with respect to production, within the rice sector. In addition to the obvious explanation that the statistical reports need to be reviewed for consistency, other explanations need to be considered. One possible explanation for the discrepancy in production estimates may be that the production estimates cited by CEPA represent marketed surplus, and do not include on-farm consumption of rice. A problem with

1 Although Table 2 is a five year average, the force of the argument that production estimates seem inconsistent is not lost; the reconstructed five year average for the CEPA data shows a negative average growth rate for Net Production.

this explanation is, while increased on-farm rice consumption might have increased over the last decade, increased on-farm consumption could not be expected to absorb the increased production in the 1990's implied by Table 2. Thus, if the rice was produced and not consumed on the farm, it must have entered the marketing channel. The volume of production increase implied by the MOFA statistics, should have put downward pressure on rice prices in Ghana. As will be seen below, while domestically produced rice prices did trend downward over the 1994-1999 period, there was no strong downward pressure on prices.

One method of estimation of the magnitude of on-farm consumption and marketed surplus is to use the GLSS 4 data published in October 2000. The GLSS 4 reports that an estimated 42.3% of the rice harvested in Ghana, in the 1998/99 period was sold (the number was 46.5% for the entire savannah). Using the 42.3% figure as marketed surplus, then only about 95,200 MT of the rice production reported by MOFA in the 1995/99 period would have entered the marketing channel. This estimate is much closer to the average net production of 86,000 MT reported by CEPA in Table 1. However, it still leaves the issue of how to explain a declining net production trend with a rising gross production trend. Official and/or unofficial exports may be part of the explanation.

It is not only the production numbers that generate questions. Commercial import statistics (as reported by the MOTI) have fluctuated considerably. The104,264 MT of imports in 1995, is in contrast with stable imports averaging 75,000-77,000 MT per year over the 1996-1998 period, and then the large increase to 227,780 MT in 1999 (although the Ghana Statistical Service reported 1999 imports to be 70,000 MT). The import numbers need to be examined more closely. The Ghana Statistical Service estimate of 70,000 MT in 1999 seems more consistent with the 1996-1999 import figures. The 227,780 MT of imports reported by the MOTI represents almost a 300% increase in imports relative to the previous three years.

This issue of data inconsistency from various organisations and sources must be of concern to policy makers and those trying to undertake analysis and develop realistic policy recommendations. Further work is needed to clarify what has actually occurred. However, the questions regarding levels of production and importation data are no reason not to examine the issue of the competitiveness of the rice industry. Can the rice industry in Northern Ghana compete with imports or should Ghana rely on imports to meet rice consumption needs? To address these questions one needs to examine the rice marketing and production systems in Ghana.

2.1 *Rice Marketing Costs And Margins*

In Ghana there are two marketing channels for rice, one for domestic rice and the other for imported rice. For the imported rice, its domestic price is determined by the CIF price in dollars converted into the domestic currency by using a relevant exchange rate (either nominal or real). Adjustments are made to this price by adding import duty, sales tax (VAT), handling changes and transportation cost from the port to the marketing centre. The final price of the imported rice is arrived at after taking into account marketing cost and margins within the domestic market.

Ghana imports rice mainly from USA, Vietnam, China, Thailand, India and Pakistan. Rice from these countries is of varied quality and prices. We report below the derived average dollar prices of imported rice for the period 1990-1998 (Table 3). The average price of

Table 3. Average Import Price of Rice Per MT

Year	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
$US	313	318	266	207	195	240	355	296	267	344
CEDI	102141	116970	116266	134355	186558	288103	581217	606850	617878	942045

Source: FAO Statistics on Trade and Commerce and MOTI.

Price of imported rice fluctuated considerably over the 1990's, from a low of US$195 in 1994 to US$355 in 1996, in response to world market conditions. However, over the decade, the ending price of US$344 was not that different from the 1990 price of US$313 per MT. While world market prices did not increase dramatically during the 1990's due to the continued devaluation of the Cedi over the period, the nominal Cedi price of rice increased dramatically: from 102,141 Cedis in 1990 to 942,045 Cedis in 1999, an increase of over nine folds. The prices in Table 3 represent the price of imported rice at the port, not the consumer price. To arrive at an estimated consumer price taxes, handling and transport charges plus marketing costs must be included.

Table 4. Estimated Cost Structure of Imported Rice Per MT in Cedis

	1991	1992	1993	1994	1995	1996	1997	1998	1999
CIF Price	116970	116266	134355	186558	288103	581217	606850	617878	942045
Import Duty	29242	29066	33589	46640	72026	145304	151713	154470	235511
Sales Tax/Vat	17545	17440	20153	27984	43215	87182	91028	92682	94205
Handling Charges	8539	8487	9808	13619	21032	42429	44300	45105	68769
Transportation	784	779	900	1250	1930	3894	4066	4140	6312
Wholesale Prices	251252	245913	283735	463243	795183	1213667	1414200	1664580	1666867
Gross Margins2	78172	73874	84929	187193	368877	353640	516244	750306	320025

Source: FAO statistics on Trade and Commerce, MoTI and MoFA.

For the period between 1990-1998, rice imported into the country attracted an import duty of 25% and a sales tax of 15%, with a VAT rate of 10% replaced the sales tax in 1999. Before the imported rice enters the stores of the wholesalers the following additional cost are incurred; stevedoring, shipping agent's fee, Ghapoha charges, plant quarantine and local handling charges and transportation cost. A time series data on these fees are not available therefore we used information provided by a cost structure presented in the CEPA report (2000). According to the cost structure transportation cost from the port to store was 0.67% of CIF and the rest of the charges formed 7.3% of CIF. We therefore assumed that the same rates prevailed in the period 1990-1999 in calculating these costs each year. In addition to these

2 Gross margins can be considered as gross profit, though at the wholesale level

mark-ups before the commodity reaches the final consumer, the wholesaler and the retailer must have added their respective marketing costs and margins. Table 4 presents the estimated mark-ups to the wholesale price level. Data on prices of imported rice at the retail level were not available therefore we could not derive prices paid by consumers at the retail level.

The gross margins presented in Table 4 reflect the difference between the domestic wholesale price of imported rice as derived from MoFA source and the total costs of imported rice up to the wholesale level. The gross margins in nominal terms increased significantly from 78172 Cedis in 1991 to 750306 Cedis in 1998. This may be attributed to the significant nominal depreciation of the Cedi over the period. This also suggests how profitable it is to engage in marketing imported rice. Thus in spite of the inconsistencies in data on imported rice as alluded to above it is not surprising that the volume of imports increased over the period 1996-1999 (Table 1).

In terms of local production, the bulk of local rice in the domestic market comes from the northern part of Ghana and must be transported to the major urban markets in the south. The structure of domestic rice trade comprises largely itinerant traders who journey to a designation market centre (say Tamale) on a market day where most of the producers converge to sell their produce. Thus the average price of rice at this market centre can fairly reflect the farm gate price. In terms of prices of local rice, Table 5 presents the average wholesale price for local rice in the major northern and southern markets and the marketing margin, over the 1990-1999 period.

Table 5. Average Wholesale Prices of Local Rice (Per MT) in Cedis

Year	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Accra	192690	175430	204480	272500	401180	526400	753250	904670	1094600	1177000
Tamale	128310	142420	173370	240030	287360	450520	635500	812500	984110	870000
Gross Margin	64380	33010	31110	32470	113820	75880	117750	92170	110490	307000

Source: PPMED of Ministry of Food and Agriculture.

Over the decade of the 1990's the price of domestically produced rice in the Accra market increased less than that of imported rice. Domestically produced rice only increased five fold over the decade (although prices in the Tamale market increased eight fold). While domestically produced rice increased in nominal terms over the decade the year to year differences varied with resulting variations in the gross margins between the production and consumption centre. Figure 1, shows the variation in the gross margins between Tamale and Accra for locally produced rice. Annual gross margins varied from 10-33 percent over the decade. The variation in the gross margins should reflect the supply and demand situation in the Ghanaian rice market. The present statistics do not support this assumption, with relative gross margins falling over 1997-1998 even as supplies were decreasing (Table1).

To trace the domestic price of the local rice in Accra, marketing costs and marketing margins must be added to the farm gate price in the North. Estimates of these cost components are given in Table 6.

Table 6. Marketing Costs and Marketing Margins (MM) Per MT of Local rice from Tamale to Accra in Cedis

Year	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Mkt. Costs	11730	10300	10240	12680	23220	26420	48640	60000	71880	110700
Ldg. & unldg3	6980	3580	3380	3520	12350	8230	12780	10000	11990	33310
TC	4750	6720	6860	9160	10870	18190	35860	50000	59890	77390
MM	52640	22710	20870	19790	90610	49460	69120	32170	38610	196300

Source: PPMED of MOFA and Author's calculations.

The marketing costs are made up of loading and unloading charges and transportation costs (TC). Again, because of the absence of reliable data over the period, the costs in Table 6 were derived by using the following assumptions. Data on loading and unloading charges was only available for 1997, which was 10000 Cedis per Mt. This actual figure was used to calculate this item as a percentage of the gross margin for 1997 and the same percentage rate was assumed to apply for the other years. Similarly the actual transportation costs in 1997 of 50000 Cedis per Mt from Tamale to Accra were adjusted annually by the transport and communication component of the CPI to generate the costs for the other periods. The market margins are the residuals after deducting the marketing and transportation costs from the gross margins. The gross margin reflects the difference between the local price of rice in Accra and Tamale.

Figure 1

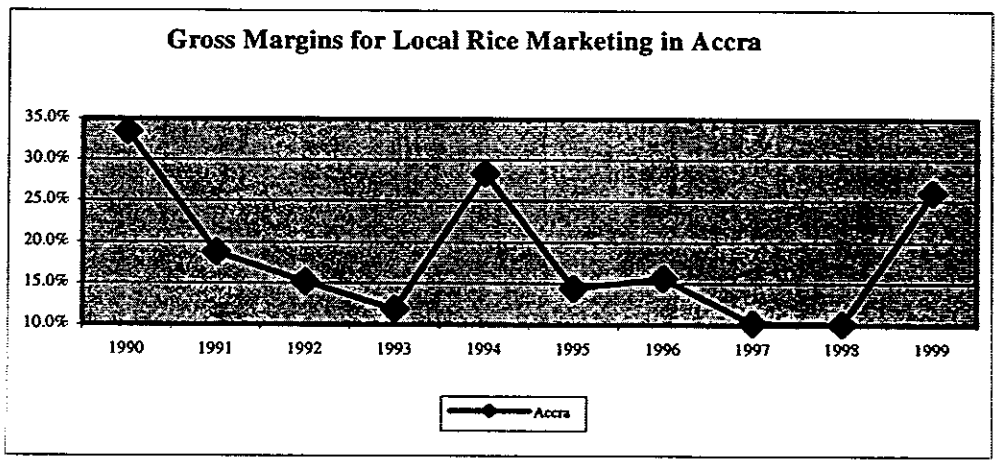
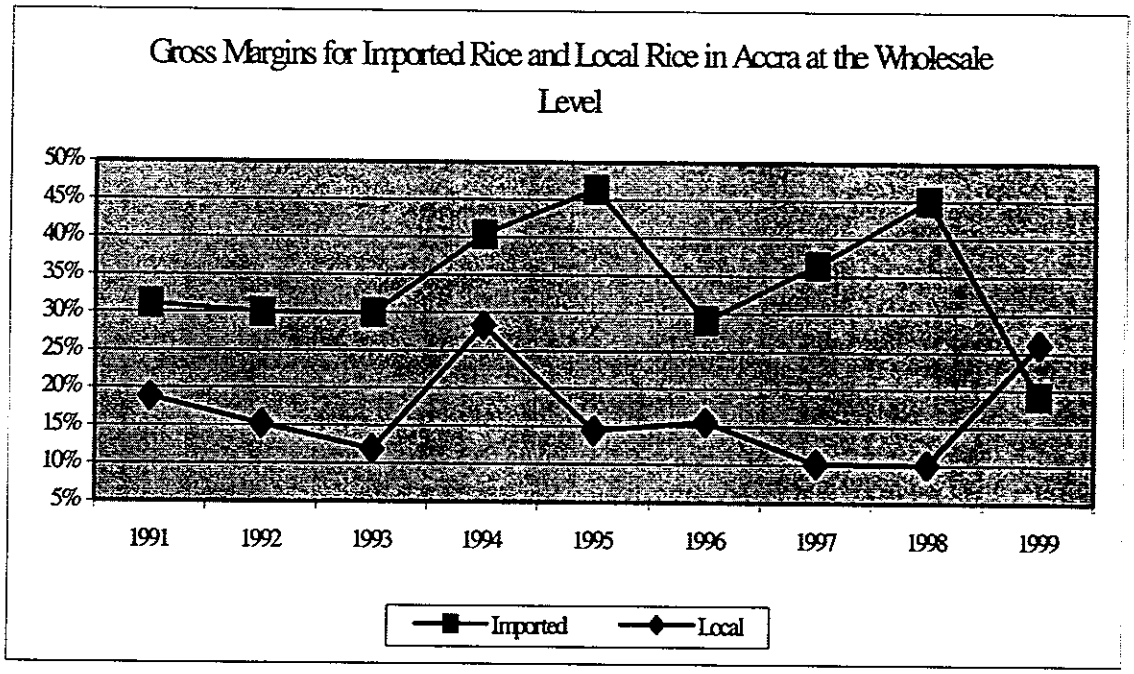


Figure 1 above presents the gross margins of local rice marketing from 1990 to 1999. The gross margins fluctuated between 10% in 1998 and 33.4% in 1990. Such an unstable trend of gross margins may suggest high risk as well as unstable income for those who engage in such an activity. The average gross margin for the period was 16.7%. This can be compared with estimated gross margins for selling imported rice at the wholesale level of 34.2% (Figure 2).

3 . Ldg & unldg are equal to loading and unloading charges respectively

Figure 2



Given that the average gross margins for imported rice for the period 1991-1999 was 34.2% as against 16.7% for local rice for the same period, and with the continued high domestic demand for imported rice, the two products seem to serve different markets. (From the graph it appears gross margins for local rice exceeded that of imported rice in 1999. This must be viewed against the background that all the figures are annual averages but in 1999 data was available for only the first three months for the domestic wholesale price of imported rice).

To throw more light on the relative profitability of marketing in imported rice vis-à-vis locally produced rice Figure 3 compares their relative prices in real terms over the decade beginning 1991.

Figure 3

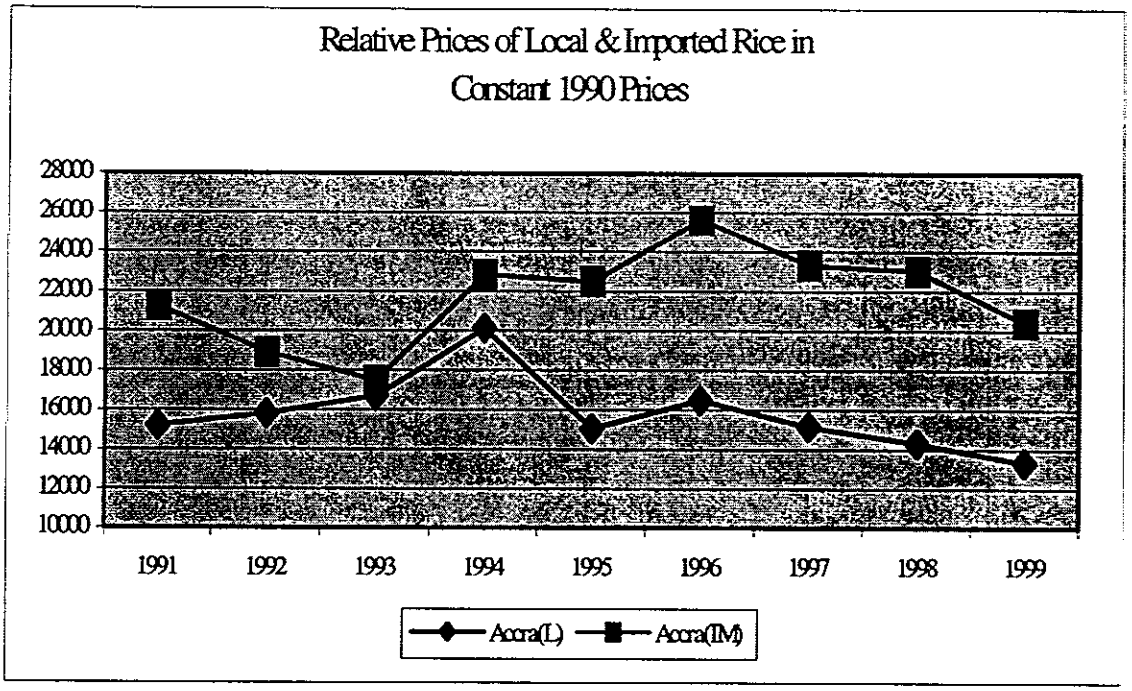
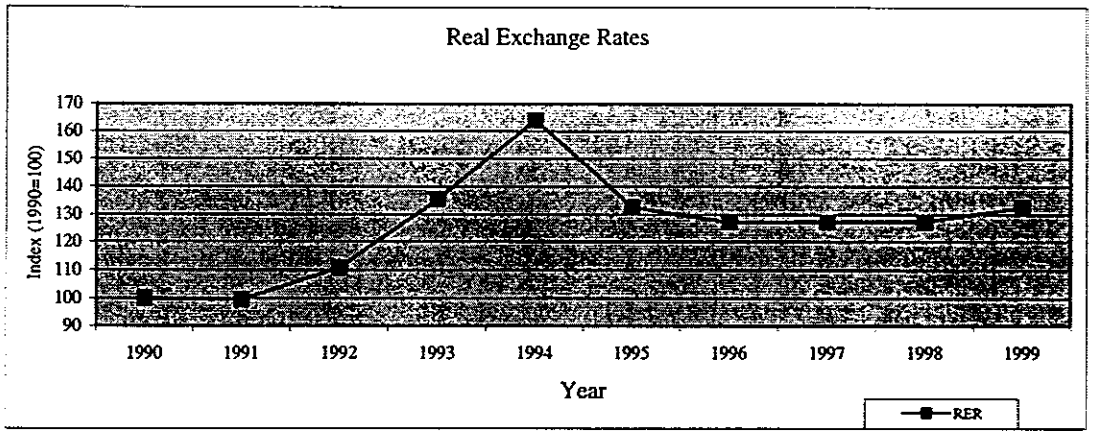


Figure 3 shows that with the exception of 1993, real prices of imported rice have been consistently higher than locally produced rice. Though in real terms prices of both imported and local rice seem to be declining from 1996-1999, yet the prices of imported rice remained higher within this period. This reinforces the fact established earlier that it is more profitable to trade in imported rice than the locally produced rice. No wonder then that imports of rice as percentage of total supply of rice in Ghana rose from 57.7% in 1995 to 78.2% in 1999 though figures for 1996, 1997, and 1998 were 44.3%, 46.7% and 58.4% respectively. The ability of imported rice to be sold at higher prices and margins reflect the willingness of consumers in Accra to pay higher prices for what they consider to be a superior product. The imported rice is of a more uniform quality and is absence of small stones. At present it appears that the market for imported and domestically produced rice are separate, with imported rice for the higher end of the market and domestically produced rice for low-income consumers.

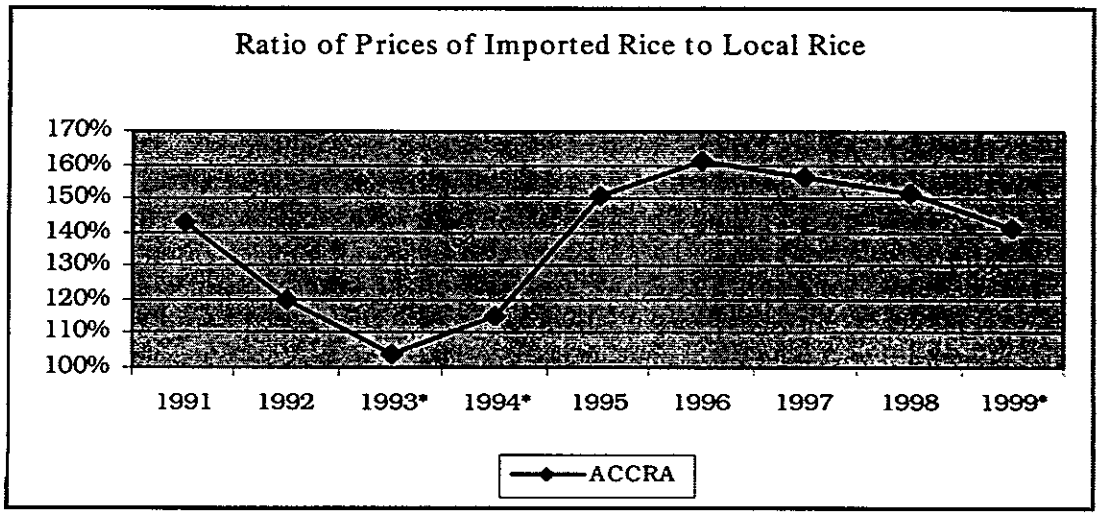
In addition to quality driven consumer differences, another factor that could have impacted the demand for imported rice was the real appreciation of the Cedi in the 1995-1999 period. It is on record that between the period 1994 to the middle of 1999, Ghana experienced real appreciation of its exchange rate. This real appreciation resulted in an implicit subsidy being enjoyed by importers of rice. This implicit subsidy served as an implicit tax on import substitutes such as locally produced rice thus resulting in a reduction in its competitiveness. Figure 4 below shows the trend of real exchange rate for the period 1990 to 1999.

Figure 4



As indicated by the graph above the Cedi was severely overvalued. The appreciation of the real exchange rate during these periods was a source of motivation for engaging in import activities, in rice as well as other goods.

Figure 5



From Figure 5 above, on the average, price of imported rice was higher than locally produced rice by 39%. This suggests that consumers of imported rice were willing to pay that much difference or even more just to consume the imported rice. Thus with a high domestic demand for imported rice and the profitability of its marketing vis-à-vis the locally produced rice any attempt to improve the competitiveness of local rice production must consider its quality as well as price. However, price will still be an important factor affecting consumer decisions. The issue examined in the next section is the price competitiveness of rice produced in Northern Ghana (while rice can be and is grown in Southern Ghana, the greatest potential for expansion of production at present is in Northern Ghana). The initial measure used to measure

the price competitiveness of Northern Ghana rice production is the Nominal Protection Rate (NPR).

3.0 Nominal Protection Rate (NPR):

The nominal protection rate of a commodity is the ratio of its domestic price to its appropriate adjusted border price. The border price is defined as the price in the international market converted into local currency using an appropriate exchange rate. The formula for NPR for commodity j is stated as follows:

$$NPR_j = \frac{P_j^d - P_j^w E_0}{P_j^w E_0}$$

where P^d is the domestic price, P^w is the world price of commodity j, and E_0 is the exchange rate. NPR can take values ranging from positive to negative and each has its own meaning regarding policy. A positive NPR implies that domestic producers of the commodity are receiving higher prices after intervention than they would without intervention. This has the tendency to divert resource in favour of the production of this particular commodity and also have negative welfare implications for domestic consumers of the commodity.

A negative NPR is just the reverse of the above condition where producers are been discriminated against relative to the prevailing border price. The domestic consumers of the commodity under this condition are been subsidized. Finally if NPR is equal to zero, then the structure of protect is neutral.

An alternative measure of NPR is the Net Nominal Protection Rate (NNPR), derived by using the real exchange rate instead of the nominal exchange rate. In situations where real currency appreciation is a problem, this measure provides a better picture of the competitiveness of Northern Ghana rice production. The interpretation of net NPR can be positive, negative and neutral just as explained above.

3.1 *Data Assembly*

The essence of calculating NPR is to facilitate comparison of average domestic price (farm gate price of rice) with their border price equivalent (price of imported rice). This applies to outputs. Therefore relevant domestic prices of outputs are needed to calculate the protection offered to rice producers. The farm budget data is one of the sources whereby information on domestic prices can be obtained. Data at this level should incorporate direct payments through subsidies, and such costs as taxes and payments to marketing boards. We also take into account the transportation and marketing costs incurred in evacuating goods to the central market. These costs, which can be substantial, provide a certain level of natural protection to producers of importables and an implicit tax to the producers of exportables. Any form of transformation that the raw products have to undergo such as milling of paddy rice should be taken into account. At the processing stage subsidies received and tax payments in addition to

direct costs are spelt out. Transportation from the processing point to the port of entry/exit must also be considered.

Normally it is at the port of entry/exit of the marketing chain where government intervention is most prevalent. At this point all tariffs, taxes, subsidies, port charges and other costs associated with importation of rice are considered. It is at this stage that the border prices of the commodity and its inputs are discovered. Converting the border prices to domestic currency reflects the opportunity cost to the economy of producing the commodity (assuming away the situation where the differences between the internationally traded product and the local commodity are due to dumping and cartel activities or as a result of grade and quality).

3.2 *Adjustments:*

Adjustments are made to the border price (CIF value) of rice to facilitate comparison with domestic prices at the farm gate. These adjustments are made depending on whether the commodity concerned is imported or exported. After the adjustments are made one can conveniently compare the border prices to the estimated domestic price, since both prices refer to the same stage in production. If the commodity is imported, internal margins must be added to adjust it to the farm-gate price level. The CIF adjusted price, is the price that farmers could have received if they were allowed freely to compete with the import substitute. Unlike imports, adjustments to exports are done downwards. This is because farmers would not receive the full f.o.b. price, but rather incur the costs of internal margins necessary to deliver the goods to the port. Therefore the need to deduct these cost elements from the f.o.b. price.

3.3 *Analysis of Results*

Table 7. **NOMINAL PROTECTION RATES FOR RICE PRODUCERS**
(With Nominal Exchange Rate)

1. UNADJUSTED BORDER PRICE	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
(a) Exchange Rate ø/$	326	368	437	649	957	1200	1637	2050	2314	2738
(b) Border Price $ Per MT CIF	313	318	266	207	195	240	355	296	267	344
Border Price in Cedis c = a* b	102141	116970	116266	134355	186558	288103	581217	606850	617878	942045
2. BORDER ADJUSTMENTS										
(d) Import duty	25535	29242	29066	33589	46640	72026	145304	151713	154470	235511
(e) Sales Tax	15321	17545	17440	20153	27984	43215	87182	91028	92682	94205
(f) Handling charges	7456	8539	8487	9808	13619	21032	42429	44300	45105	68769
(g) Transportation	684	784	779	900	1250	1930	3894	4066	4140	6312
h = d + e + f + g	48997	56110	55773	64450	89492	138203	278810	291106	296396	404797
BPE (with intervention) i= c + h	151138	173080	172039	198806	276051	426306	860026	897956	914274	1346842
BPE (without intervention) j = c+ f+ g	110282	126292	125532	145064	201427	311065	627540	655216	667123	1017126
3. PRICE ADJUSTMENT TO PRODUCING AREA										
Marketing Cost										
(k) Transportation	4750	6720	6860	9160	10870	18190	35860	50000	59890	77390
(l) Loading & off-loading	6980	3580	3380	3520	12350	8230	12780	10000	11990	33310
(m) Marketing Margins	52640	22710	20870	19790	90610	49460	69120	32170	38610	196300
n = k+ l + m	64370	33010	31110	32470	113830	75880	117760	92170	110490	307000
BPE (without intervention) p = j - n	45912	93282	94422	112594	87597	235185	509780	563046	556633	710126
4. PRODUCER PRICE										
(q) Farm-gate Price	128310	142420	173370	240030	287360	450520	635500	812500	984110	870000
5. NPR =(q – p/p) * 100	179.5 %	52.7%	83.6%	113.2%	228.0%	91.6%	24.7%	44.3%	76.8%	22.5%

Table 7 presents estimates of the NPR for rice production in Northern Ghana over the period 1990-1999. The calculations in Table 7 provide a comparison of the actual average producer price in Northern Ghana to the equivalent price of imported rice adjusted for handling and transportation charges from the Port minus the cost of transport, marketing margins and costs from Tamale. The calculations show that throughout the 1990's the NPR was positive indicating that rice was receiving positive protection. Part of the protection was provided by the import duty and sales tax charges applied to imported rice. However, even when these charges are added to the border price equivalent, in most years (6 out of 10) imported rice had a significant cost advantage over locally produced rice in the Accra market. The continued and expanded production of local rice as shown in Table 2, would further support the argument that imported and locally produced rice markets while in competition, may also represent different market segments.

While the nominal protection rate was positive throughout the decade of the 1990's, the average rate of protection in the period 1996-1999, declined substantially in comparison with the average rate over the 1990-1995 period. Over the 1990-1995 period, the average nominal protection rate was 124.8, while for the period 1996-1999 it was 42.1 percent. This decline in the nominal protection rate was due to the increase in the average prices of rice imports over the 1996-1999 period, US$310/MT versus US$257/MT over the 1990-1995 period.

3.4 *Net Nominal Protection Rate*

The US dollar rice border price in Table 7 was converted to Cedis at the average nominal official exchange rate for the year. To the extent that the nominal exchange rate was not representative of the true value of foreign exchange, the border price needs to be adjusted to correct for the over or under valuation. An analysis of the real exchange rate over the 1990's reveals that there were periods of both real depreciation of the Cedi and periods of real appreciation (Figure 4). To examine the impact of these exchange rate movements, the NPR calculations were redone with a real exchange rate of 1990=100. Table 8 presents the results.

Table 8

NOMINAL PROTECTION RATES FOR RICE PRODUCERS
(With Real Exchange Rate)

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
1. UNADJUSTED BORDER PRICE										
(a) Exchange Rate ø/$	326	366	484	880	1569	1457	2081	2613	2832	3532
(b) Border Price $ Per MT CIF	313	318	266	207	195	240	355	296	267	344
Border Price in Cedis c = a* b	102141	116328	128755	182104	305982	349670	738702	773460	756251	1215015
2. BORDER ADJUSTMENTS										
(d) Import duty	25535	29082	32189	45526	76496	87418	184675	193365	189063	303754
(e) Sales Tax	15321	17449	19313	27316	45897	52451	110805	116019	113438	121501
(f) Handling charges	7456	8492	9399	13294	22337	25526	53925	56463	55206	88696
(g) Transportation	684	779	863	1220	2050	2343	4949	5182	5067	8141
h = d + e + f + g	48997	55802	61764	87355	146780	167737	354355	371029	362774	522092
BPE (with intervention) i= c + h	151138	172130	190518	269459	452762	517407	1093057	1144489	1119024	1737107
BPE (without intervention) j = c+ f + g	110282	125599	139016	196618	330369	377539	797576	835105	816524	1311852
3. PRICE ADJUSTMENT TO PRODUCING AREA										
Marketing costs										
(k) Transportation	4750	6720	6860	9160	10870	18190	35860	50000	59890	77390
(l) Loading & unloading	6980	3580	3380	3520	12350	8230	12780	10000	11990	33310
(m) Marketing Margins	52640	22710	20870	19790	90610	49460	69120	32170	38610	196300
n = k+ l + m	64370	33010	31110	32470	113830	75880	117760	92170	110490	307000
BPE (without intervention) p = j - n	45912	92589	107906	164148	216539	301659	679816	742935	706034	1004852
4. PRODUCER PRICE										
(q) Farm-gate Price	128310	142420	173370	240030	287360	450520	635500	812500	984110	870000
5. NPR =(q – p/p) * 100	179.5 %	53.8%	60.7%	46.2%	32.7%	49.3%	-6.5%	9.4%	39.4%	-13%

Note: BPE – Border Price Equivalent

The Net Nominal Protection Rate (NNPR) calculation in Table 8 reveal significant reduction is the protection rates using the real exchange rate (1990=100). In the 1990-1995 period, the average NNPR was 70.4 versus the NPR estimate of 124.8. Over the last four years (1996-1999), the change was more significant. The average NNPR for this period was only 7.2 instead of the NPR figure of 42.1. This change should not be too surprising as the 1996-1999 period corresponded with the period of real appreciation of the Cedi. The real appreciation of the Cedi, helped to reduce the impact of the rise in average rice import values, and made imports cheaper and disadvantaged the rice producers of the Ghana.

Table 9 present in summary form the NPR and NNPR estimates for each year.

Table 9. Summary of NPRs for Rice Production (in percent)

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
NPR[4]	179.5	52.7	83.6	113.2	228.0	91.6	24.7	44.3	76.8	22.5
NNPR[5]	179.5	53.8	60.7	46.2	32.7	49.3	-6.5	9.4	39.4	-13.4

The figures suggest that rice producers over the period of the study were protected from direct foreign competition, though with varying degrees of protection. Thus it could be said that rice

[4] This is the Nominal Rate of Protection

[5] The net Nominal Rate of Protection was calculated using real exchange index with 1990 as the base year to adjust the current values of the nominal exchange rate.

producers were receiving higher prices for their produce than they would have received in the absence of price intervention. This price intervention is reflected in the form of high import tariffs and sales taxes imposed on imported rice to, apart from raising revenue for the government, act as a shield to protect local producers from stiff-competition. The outcome of such price intervention, if the production figure in Table 2 are correct, is encouraging rice production. The NNPR estimates indicate again the impact of macroeconomic policy on issues of competitiveness and production at the microeconomic level. The NNPR estimates suggest that Northern Ghana rice production is competitive, price wise, in Accra at rice import price levels of aboveUS$300, and an exchange rate policy that does not subsidise rice imports. This occurred in two of the last four years of the decade. If however, exchange rate policy promotes an overvalued exchange rate and rice can be imported for prices under US$300, then, in the absence of improved productivity, a self-sufficiency strategy implies that the government must be prepared to impose higher tariffs on imported rice. This option may be difficult to implement due to consumer reaction as well as the reaction by the international community.

4.0 Effective Protection Rate:

More often than not, government pricing policy affects both the prices of output and inputs. In this regard, it would be necessary for the analyst to calculate Effective Protection Rate to capture the entire incentive impact of policy on the production structure. In other words the Effective Protection Rate gauges how interventionists measures on a product and its tradable inputs jointly affect value-added in a particularly activity. With this indicator one is in a position to assess the resource allocation effect of a tariff structure.

However the problem that arises from incorporating the effect of tariff on inputs in capturing the entire incentive structure is that, inputs are often subject to both tariffs and quantitative restrictions. Thus product quality and defining an appropriate border price for a direct price comparison can be a problem. This study looks at the major purchased inputs in upland rice production in Tamale with improved technology, which include fertiliser, seedlings, cutlasses, hoes and sacks.

ERP is a ratio of the value-added at domestic prices (intervention) to the valued-added at world prices (without intervention). Value added is defined as the value that is added through the production process, over and above the value of traded inputs.

The formula for EPR for commodity j is as follows:

$$EPR_j = \frac{Va_j^d - Va_j^w E_0}{Va_j^w E_0}$$

where Va^d and Va^w are value-added at domestic and world prices, and E_0 is the appropriate exchange rate.

When the official exchange rate is used to calculate EPR, without making adjustment for overvaluation (undervaluation), the result is an estimate of the gross value of EPR. To

ascertain its net value, the official exchange rate has to be adjusted to reflect the opportunity cost of foreign exchange to the economy.

4.1 *Data Requirement*

The type of rice being considered is the upland rice. The production system used is the improved technology within the Northern Savannah ecological zone. Prices of direct and indirect tradable inputs are required to calculate the EPR. One of the relevant sources of data on input prices is the farm budget estimates developed by the MOFA. Also, the farm budget provides estimates of the technical coefficients for converting inputs into output for the purpose allotting input cost per output.

Table 10. Average Prices of Some Inputs in Tamale

Year	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
NPK	-	-	9300	9843	18500	21119	26667	33917	36000	35000
SOA	-	-	8277	8300	14000	15643	21500	25083	26000	26667
SACKS	-	-	474	412	689	991	2000	1775	1950	2200
CUTLASS	-	-	1267	1332	1963	2659	4792	5375	6375	7200
HOE	-	-	463	418	518	1008	1975	2019	2678	3500

Source: PPMED of Ministry of Food and Agriculture (MOFA)

Table 8 above provides annual estimates of the average prices of the key inputs used in rice production in Northern Ghana for the period 1992-1999. Another input that is of importance for the purpose of this study is improved seeds but a time series of the price of improved seeds were not available, so it was assumed that farmers retain some of their rice to use as seed (a common practice in the area). The input/output coefficients were derived from a farm budget compiled by PPMED of MOFA and additional information from the CEPA report 2000. With this data it is now possible to calculate Effective Protection Rates to see how the entire incentive structure influence the competitiveness of Northern Ghana rice production.

4.2 *Interpreting EPRs for Policy*:

The policy interpretation of EPR is similar to that for NPR. For positive EPRs, the returns to the domestic producer on the resources they employ given intervention outweigh what they would have received in the absence of intervention. In effect they are enjoying positive protection. A positive EPR, however, denotes a potential incentive, not an actual one. On the contrary, a negative EPR, depicts a situation where producers could have receive a higher return if they faced border prices instead of domestic prices on both output and inputs. Finally, for EPRs equal to zero, the structure of protection is neutral. Producers are neither favoured nor discriminated. Calculation of EPRs becomes redundant in a situation where inputs are a small proportion of output. Also, the calculation of EPRs may contain some biases because of input substitution possibilities. Due to the almost impossibility of calculating elasticities of substitution, these biases are assumed away in practice.

Whether a potential incentive translates into an actual positive incentive will depend on the choices or options available to the producers. This makes reference to what other commodities the producer can produce and with what technology. Relative net returns among competing crops are an accurate indication of relative actual incentives. If a crop enjoy a positive EPR, but generates lower net returns than a competing crop with a negative EPR, profit-maximizing farmers will choose the competing one (assuming equal risk factor for both crops). This may be a clear case of a less efficient productive activity being positively protected at the expense of a more efficient one. On the other hand, the crop may face a positive EPR or a negative EPR, where the individual producer would be left with no choice other than to stick to what is being produced currently. The long-term decision in such an instance may be to divert operations elsewhere.

Estimating Effective Protection for Upland Rice Production in Northern Ghana.

Appendix 1 presents the calculation for EPR for upland rice production for the period 1992-1999. From the first two items, labelled q and p, it is clear that the concept of EPR starts where that of the NPR ends. The EPR calculations are just expanding the NPR to include tradable input prices.

The calculation above took four tradable direct inputs into account (see section 2 of table 10). These tradable direct inputs are improved seeds, NPK fertilizer, SOA and sacks. Both the domestic and border prices are shown with the technical coefficient of input. The technical coefficient here is the amount of input per ton of milled rice. They were derived using a conversion factor of 3 bags of paddy rice to 2 bags of milled rice and the yield per hectare of 35 bags (80kg) of paddy rice in addition to the quantity of input used as provided in a farm budget from MoFA. Each of the inputs is valued at both their domestic and border costs. Using 1992 as an illustration the sum of the direct tradable inputs valued per ton at their domestic price is ø12604 and at the border price is ø12604. This implies the absence of price intervention in the form of either subsidies or taxes.

For section 3, two tradable indirect inputs, were valued, the cutlass and hoe. Using the same format just as in section 3, the sum of the indirect tradable inputs per ton at their domestic price for 1992 is 1730 Cedis and at the border price is 1730 Cedis. Combing sections 2 and 3 yield the total costs involved in employing tradable inputs in the production of upland rice.

In section 4, the value-added at both domestic and border price is calculated. Value-added at domestic prices is the domestic price of output per ton less the total tradable inputs (direct and indirect) valued at their domestic price. For 1992, the domestic price of output per ton is 173370 Cedis and the border price equivalent is 94422 Cedis. The sum of tradable direct and indirect inputs valued at their domestic prices is 14334 Cedis and the border prices for the same is 14334 Cedis. Thus, the value-added at domestic prices is 159036 Cedis, and at border prices is 80088 Cedis.

Section 5 presents the calculations for EPR. For 1992, the EPR is the difference between the value-added at domestic and border prices, (159036-80088=78948 Cedis), divided by value-added at border prices. The outcome is 98.6%.

4.3 *Analysis of Results*

Available information indicates that for the period of the study, all agricultural input subsidies were non-existent. However comparing the nominal NPRs with the nominal EPRs reveal an increase of the EPRs over the NPRs. The positive protection gained may be attributed to lower input/output coefficients, which may reduce the costs of production to producers. Also for the same reasons as stated above the average effective protection for the period 1992-1995 (162.2%) is higher than that of 1996-1999 (46.9%). Therefore, for domestic rice production to be competitive, the average price of imported rice must be above $300 threshold.

Since the country experienced periods of both depreciation and appreciation of the domestic currency (figure 4), the EPRs were also calculated using the real exchange rates for the period of the study, to find out how movements of the real exchange rate impact on the protection enjoyed by rice producers. Appendix 2 presents the results of net EPRs. The net EPRs depict that the period 1996-1999 where the average price of imported rice was above $300 local rice was more competitive than the periods before, 1992-1995.

Table 11. Summary of EPRs for Rice Production (in percent)

Year	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
EPR[6]	-	-	98.6	129.5	3149	105.6	27.4	49.1	86.0	25.2
EPR[7]	-	-	71.4	53.4	43.4	57.0	-6.2	11.2	44.3	-13.5

Table 12 presents a summary of nominal and net EPRs. The positive EPRs witnessed for the period 1992-1999, may be suggestive of the fact that the whole gamut of government pricing policy seems to be in favour of rice production. This should be enough incentive to encourage rice producers to increase output and boost local investment in the rice industry. However, such pricing policies come with their negative welfare impacts on domestic consumers, since they are forced to pay higher prices for imported rice than would normally be the case. Furthermore there is the tendency for rice producers in the face of such protective shields either to refuse to grow or lack the initiative to grow. Just as in the previous case, incorporating real exchange rate effect leads to lower protection being offered to rice producers.

5.0 Summary and Conclusions

Rice is emerging as an important staple food crop for Ghanaian urban dwellers. The consequence has been a variable but upward trend in rice imports into Ghana. This increase in imports has led some to argue that Ghana should be able to meet its rice needs from domestic production, and that programs should be established to increase rice production in Northern

[6] Effective Protection Rate (nominal)

[7] Effective Protection Rate (net)

Ghana (the main producing area). This discussion is ongoing with little or no analytical work to shed light on the question as to the competitiveness of Ghanaian rice production. To address this problem, Sigma One Corporation Accra Office undertook an analysis of the competitiveness of rice production in the northern regions of Ghana. The measure of competitiveness used was the calculation of nominal and effective protection. The methodology and results are presented in the attached report.

The results presented, showed that Northern Ghana rice production at nominal prices and exchange rates have received nominal protection throughout the 1990's. The rate of protection declined in the 1996-1999 period relative to the 1990-1995 period. The protection was relative, as Northern Ghana rice could not compete price wise in the Accra market, but neither could imported rice compete price wise in the northern half of the country. When the real exchange rate is used, rather than the nominal rate, the Northern Ghana rice can compete on price (if not on quality) in the Accra market when world market prices exceed US$300 per ton. This occurred in two of the last four years of the decade. The analysis revealed little difference between the nominal and effective protection rates due to the low level of technology of rice production. In terms of rice imports competing against domestic production from Northern Ghana, imports are cheaper in the Accra market but the cost advantage disappears as imported rice is transported to interior markets. If Ghana is to become self-sufficient in rice production (relying on Northern Ghana production) then either higher tariffs will be needed on imported rice (with corresponding increases in consumer prices and therefore not recommended) or ways must be found to reduce domestic production and marketing costs through increases in productivity. Among the options identified for consideration were improved technology, improved road networks and lake transport to lower costs, and improved handling and milling to improve quality. It was also suggested that the competitiveness of Northern Ghana rice in Sahelian markets should be investigated, to determine whether a more acceptable strategy would be to import rice for the coastal market and export rice to neighbouring Sahelian countries.

Appendices

Appendix 1

EFFECTIVE PROTECTION RATES OF UPLAND RICE PRODUCTION (Nominal)														
1.OUTPUT					1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
	Domestic Price			Per Ton	128310	142420	173370	240030	287360	450520	635500	812500	984110	870000
	Quantity			# of Tons	1	1	1	1	1	1	1	1	1	1
q)	Value at Domestic Prices				128310	142420	173370	240030	287360	450520	635500	812500	984110	870000
Border Price Equivalent				Per Ton	45912	93282	94422	112594	87597	235185	509780	563046	556633	710126
	Quantity			# of Tons	1	1	1	1	1	1	1	1	1	1
p)	Value at Border Price Equivalent				45912	93282	94422	112594	87597	235185	509780	563046	556633	710126
2. TRADABLE DIRECT INPUTS														
	Improved Seeds													
r)	Domestic Price				918	1034	1124	1455	1952	3726	6042	7936	8617	10000
s)	Quantity				0.54	0.54	0.54	0.54	0.54	0.54	0.54	0.54	0.54	0.54
	Domestic Cost t = r * s				496	558	607	786	1054	2012	3263	4286	4653	5400
u)	Border Price Eq. Cost			Per Ton	496	558	607	786	1054	2012	3263	4286	4653	5400
	Fertiliser:													
	NPK													
v)	Domestic	Price					9300	9843	18500	21119	26667	33917	36000	35000
	Quantity						0.54	0.54	0.54	0.54	0.54	0.54	0.54	0.54
	Domestic Cost w = v * s						5022	5315	9990	11404	14400	18315	19440	18900

x)	Border Price Eq. Cost		Per Ton			5022	5315	9990	11404	14400	18315	19440	18900
	SOA												
y)	Domestic Price					8277	8300	14000	15643	21500	25083	26000	26667
z)	Quantity					0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27
	Domestic Cost $\xi = y * z$					2235	2241	3780	4224	5805	6772	7020	7200
						Table 10	(Cont)						
						1992	1993	1994	1995	1996	1997	1998	1999
λ)	Border Price Eq. Cost					2235	2241	3780	4224	5805	6772	7020	7200
	SACKS												
ψ)	Quantity					10	10	10	10	10	10	10	10
ϕ)	Domestic Price					474	412	686	991	2000	1775	1950	2200
	Domestic Cost $\theta = \psi * \phi$					4740	4120	6860	9910	20000	17750	19500	22000
ϑ)	Border Price Eq. Cost					4740	4120	6860	9910	20000	17750	19500	22000
	Total Direct Input (Domestic costs)	$\epsilon = t +$	$w + \xi + \theta$			12604	12462	21684	27550	43468	47123	50613	65200
	Total Direct Input (Border Pr. Eq. costs)	$\Omega =$	$u + x + \lambda + \vartheta$			12604	12462	21684	27550	43468	47123	50613	65200
3. TRADABLE INDIRECT INPUTS													
	Cutlass												
ξ)	Quantity					1	1	1	1	1	1	1	1
Π)	Domestic Price					1267	1332	1963	2659	4792	5375	6375	7200
	Domestic cost $\Theta = \xi * \Pi$					1267	1332	1963	2659	4792	5375	6375	7200
$)	Border Price Eq. Cost					1267	1332	1963	2659	4792	5375	6375	7200

	Hoe													
	Quantity						1	1	1	1	1	1	1	1
£)	Domestic Price						463	418	518	1008	1975	2019	2678	3500
	Domestic cost & = £ * ǩ						463	418	518	1008	1975	2019	2678	3500
∝)	Border Price Eq. Cost						463	418	518	1008	1975	2019	2678	3500
	Total Indirect Input (Domestic costs) $\mu = \mathfrak{D} + \&$						1730	1750	2481	3667	6767	7394	9053	10700
	Total Indirect Input (Border Pr. Eq. costs) $\chi = \$ + \propto$						1730	1750	2481	3667	6767	7394	9053	10700
	Total Direct & Indirect Input (Domestic costs) $\Re = \epsilon + \mu$						14334	14212	24165	31217	50235	54517	59666	75900
	Total Direct & Indirect Input (Border Pr. Eq. costs) $\Lambda = \Omega + \chi$						14334	14212	24165	31217	50235	54517	59666	75900
									Table 10	(Cont)				
4. VALUE ADDED														
	At Domestic Prices $\beta = q - \Re$						159036	225818	263195	419303	585265	757983	924444	794100
	At International Prices $\delta = p - \Lambda$						80088	98382	63432	203968	459545	508529	496967	634226
5. EPR(Nominal) = (β-δ)/δ							98.6%	129.5%	314.9%	105.6%	27.4%	49.1%	86.0%	25.2%

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Appendix 2

EFFECTIVE PROTECTION RATES OF UPLAND RICE PRODUCTION
(Net-Using Real Exchange Rate)

			1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
1.OUTPUT												
	Domestic Price	Per Ton	128310	142420	173370	240030	287360	450520	635500	812500	984110	870000
	Quantity	# of Tons	1	1	1	1	1	1	1	1	1	1
q)	Value at Domestic Prices		128310	142420	173370	240030	287360	450520	635500	812500	984110	870000
Border Price Equivalent		Per Ton	50762	92589	107906	164148	216539	301659	679816	742935	706034	1004852
	Quantity	# of Tons	1	1	1	1	1	1	1	1	1	1
p)	Value at Border Price Equivalent		50762	92589	107906	164148	216539	301659	679816	742935	706034	1004852
2. TRADABLE DIRECT INPUTS												
	Improved Seeds											
r)	Domestic Price		918	1034	1124	1455	1952	3726	6042	7936	8617	10000
s)	Quantity		0.54	0.54	0.54	0.54	0.54	0.54	0.54	0.54	0.54	0.54
	Domestic Cost t = r * s		496	558	607	786	1054	2012	3263	4286	4653	5400
u)	Border Price Eq. Cost	Per Ton	496	558	607	786	1054	2012	3263	4286	4653	5400
	Fertiliser:											
	NPK											
v)	Domestic Price				9300	9843	18500	21119	26667	33917	36000	50000
	Quantity				0.54	0.54	0.54	0.54	0.54	0.54	0.54	0.54
	Domestic Cost w = v * s				5022	5315	9990	11404	14400	18315	19440	27000
x)	Border Price Eq. Cost	Per Ton			5561	7204	16385	13841	18302	23344	23794	34830

	SOA													
y)	Domestic Price						8277	8300	14000	15643	21500	25083	26000	40000
z)	Quantity						0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27
	Domestic Cost $\xi = y * z$						2235	2241	3780	4224	5805	6772	7020	10800
							Table 10	(Cont)						
							1992	1993	1994	1995	1996	1997	1998	1999
λ)	Border Price Eq. Cost						2475	3037	6200	5126	7378	8632	8592	13932
	SACKS													
ω)	Quantity						10	10	10	10	10	10	10	10
ϕ)	Domestic Price						474	412	686	991	2000	1775	1950	2200
	Domestic Cost $\theta = \omega * \phi$						4740	4120	6860	9910	20000	17750	19500	22000
θ)	Border Price Eq. Cost						4740	4120	6860	9910	20000	17750	19500	22000
	Total Direct Input (Domestic costs)	$\epsilon = t +$	$w + \xi + \theta$				12604	12462	21684	27550	43468	47123	50613	65200
	Total Direct Input (Border Pr. Eq. costs)	$\Omega =$	$u + x + \lambda + \theta$				13383	15147	30499	30889	48942	54011	56539	76162
3. TRADABLE INDIRECT INPUTS														
	Cutlass													
ξ)	Quantity						1	1	1	1	1	1	1	1
Π)	Domestic Price						1267	1332	1963	2659	4792	5375	6375	7200
	Domestic cost $\eta = \xi * \Pi$						1267	1332	1963	2659	4792	5375	6375	7200
$)	Border Price Eq. Cost						1267	1332	1963	2659	4792	5375	6375	7200
	Hoe													

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	Quantity						1	1	1	1	1	1	1	1
£)	Domestic Price						463	418	518	1008	1975	2019	2678	3500
	Domestic cost & = £ * ₫						463	418	518	1008	1975	2019	2678	3500
∝)	Border Price Eq. Cost						463	418	518	1008	1975	2019	2678	3500
	Total Indirect Input (Domestic costs) $\mu = \mathfrak{D} + \&$						1730	1750	2481	3667	6767	7394	9053	10700
	Total Indirect Input (Border Pr. Eq. costs) $\chi = \$ + \propto$						1730	1750	2481	3667	6767	7394	9053	10700
	Total Direct & Indirect Input (Domestic costs) $\Re = \epsilon + \mu$						14334	14212	24165	31217	50235	54517	59666	75900
	Total Direct & Indirect Input (Border Pr. Eq. costs) $\Lambda = \Omega + \chi$						15113	16897	32980	34556	55709	61405	65592	86862
									Table 10	(Cont)				
4. VALUE ADDED														
	At Domestic Prices $\beta = q - \Re$						159036	225818	263195	419303	585265	757983	924444	794100
	At International Prices $\delta = p - \Lambda$						92793	147251	183559	267103	624107	681530	640442	917990
5. EPR(Nominal) = $(\beta - \delta)/\delta$							71.4%	53.4%	43.4%	57.0%	-6.2%	11.2%	44.3%	-13.5%

TOPIC: Seminar on Competitiveness of the Rice Production in Ghana: An Analysis of Nominal and Effective Pr

DATE: February 11, 2002

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