Rice Production Response to Trade Liberalization in Cameroon

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Abstract: Agriculture remains the mainstay of Cameroon’s economy, and rice an important cereal crop for producers and consumers. Significant proportions of the population depend on rice production for their livelihood. Cameroon deregulated its economy and liberalised its trading system including agricultural trade in the 1990s. This study estimates supply response coefficients, and establishes the importance of policy schemes over the years. Relative world price to producer price and substitute crop price combine with variations in weather and government expenditure on agriculture to significantly account for 61.7% of the variation in production. In the short-run, the elasticities of world price to domestic price ratio on production range from 0.235 to 0.287. The significant positive relationships suggest that world market price for rice has complementary direct relationship with local rice production in Cameroon. Government’s incentive schemes for investments in agriculture and export activities encourage supply development. For rice production to remain relevant in the socioeconomic development of Cameroon, the sub-sector must take advantage of local and international demand.

Key words: Cameroon, Trade Liberalization, Rice, Supply response

JEL Classification: O13, Q11

INTRODUCTION

Since the early 1990s, Cameroon deregulated its economy and liberalised its trading system including agricultural trade\textsuperscript{(13)}. Pervasive interventions by the state in supply of farm inputs, provision of agricultural credit and produce marketing systems were reduced and the scope for private sector provision of agricultural services expanded\textsuperscript{(3)}. Despite these efforts, the response from the agricultural sector has been insufficient. For instance, Cameroon’s cereal production has averaged around 1.2 million tons for two decades, accounting for 0.06% in global share (see table 1).

\begin{table}[h]
\centering
\caption{Cameroon Cereal Production and Share in World}
\begin{tabular}{|c|c|c|}
\hline
Year & Production & Share in World (%) \\
\hline
1979 – 1981 & 866 & 0.06 \\
1989 – 1991 & 890 & 0.06 \\
1999 – 2001 & 1272 & 0.06 \\
2003 & 1584 & 0.08 \\
2004 & 1684 & 0.07 \\
\hline
\end{tabular}
\end{table}

(Source: Trade and Marketing Division, FAO)

Given its endowment of soil and climatic amenities the country can do better and occupy a top tier global position as in for other crops of cocoa, coffee and banana. So, while cereal output in the country seem to have increased steadily over the past 40 years, it has not kept pace with population growth, such that per capita production has stagnated, and even declined in some years, as shown in the trends in figure 1. The insufficient response of the sub-sector is partly due to the inefficiencies across the supply chain, from production to trade, distribution and marketing\textsuperscript{(40)}. Cameroon’s agriculture has remained largely subsistence and entails large inefficiencies in resource allocation which is compounded in the face of competition from well-protected subsidised farmers in developed countries and trading partners\textsuperscript{(4, 22)}.

The government sponsored agricultural development schemes such as the Upper Noun Development Authority (UNVDA), Southwest Development Authority (SOWEDA) and Northwest Development Agency (MIDENO) that strive to support rural producers have identified and have regular contacts with rice producers\textsuperscript{(32, 42, 12)}. The overriding challenge of rice production now is integrating traditional smallholder peasants into the market economy to stimulate growth and economic development\textsuperscript{(47)}. The impediments to sustained production includes amongst others overvalued exchange rates, varying climate, increasing transaction costs, price risks and other factors which create production and marketing barriers\textsuperscript{(46)} and thresholds for...
small-producers to effectively participate in crop markets and reap earnings much needed to impact positively on their welfare. However, much remains to be learned, both conceptually and empirically, about the commercialization process, the response of farmers, and determinants of supply response in Cameroon in the face of an increasingly globalised economy.

The dispensation of liberalization has seen increased competition with imported rice, which may have heralded consumer welfare at the expense of producers. According to Njinkeu and Monkam, local producers in countries like Cameroon are constrained in their ability to take advantage of trade opportunities as response and adjustment to market is hampered by inadequate transportation systems, weak public institutions, underdeveloped financial systems, low levels of human capital, and nonexistent safety nets. Steep rice prices recently led to political disturbances, with the government compelled to intervene actively in rice markets through manipulation of taxes on inputs and output, control of international trade, and direct participation in marketing through procurement and distribution of grains. Between 2000 and 2003 import tariffs for rice averaged 37.5% and increased to 39% between 2005 and 2006, as shown in table 2. Recent parliamentary and civil society debates have proposed further increase in import tariff to protect domestic rice farmers from competing with cheap imported rice, which cause disincentive to farmers to increase rice production. The proposals so far have not been decided by Ministers of Finance, Agriculture and the Economy.

The challenges of the rice subsector are reinforced by farm characteristics. About 98% of Cameroon’s agriculture is managed by rural households and family economies associated with weak linkages to markets, high production costs and inadequate access to external inputs and extension services. Marketing services are inadequate, storage structures are poor and processing facilities are obsolete. Producers experience huge post-harvest losses close to 40%. Packaging and handling services are wasteful and time consuming. In addition, the transport network is inefficient and ineffective. The ineffectiveness is not only due to topography, poorly maintained roads and public infrastructure, but also due to ‘variability’ of weather. This spiral in agriculture has been compounded by volatility in the world-wide relative prices for traditional export commodities (e.g. cocoa, coffee, tea and banana). Cameroon’s subsistence farmers therefore face significant risks and high transaction costs. These risks are amplified by price swings that affect producers’ planning.

### Table 2: Applied tariffs for rice and other products in Cameroon, 2000 – 2006

<table>
<thead>
<tr>
<th>Year</th>
<th>Rice</th>
<th>Poultry</th>
<th>Vegetable oils</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000</td>
<td>37.5</td>
<td>38.7</td>
<td>48.7</td>
</tr>
<tr>
<td>2001</td>
<td>37.5</td>
<td>38.7</td>
<td>48.7</td>
</tr>
<tr>
<td>2002</td>
<td>37.5</td>
<td>38.7</td>
<td>48.7</td>
</tr>
<tr>
<td>2003</td>
<td>37.5</td>
<td>40.5</td>
<td>48.7</td>
</tr>
<tr>
<td>2004</td>
<td>39.0</td>
<td>42.0</td>
<td>49.0</td>
</tr>
<tr>
<td>2005</td>
<td>39.0</td>
<td>42.0</td>
<td>49.0</td>
</tr>
<tr>
<td>2006</td>
<td>40.75</td>
<td>43.75</td>
<td>50.75</td>
</tr>
</tbody>
</table>

(Source: Bamou and Mkounga, 2003)

The government of Cameroon has historically intervened in its domestic market to protect and stabilize the prices of agricultural commodities, with the result that domestic producer prices have varied substantially less than international prices. As figure 2 indicates producer and international real prices of rice declined for most part right up to 1994, and recorded large variations after the devaluation, and only settled after 1999 following token gains. The observed uneven evolution of producer real prices increased producers’ income instability and increased the disincentive in the rice sub-sector as farm values were eroded. These
effects have been exacerbated in recent times by the new policy dispensation in price deregulation and Cameroon’s accession to the WTO that heralded a Pandora-box on trade openness and its attendant consequence on small-scale producers with unlimited constraints to modern farming\cite{4,13}.

Whilst rice production may be constrained by supply-side factors, demand for rice is increasing. Since 1990, Cameroon has been experiencing prolonged and persistent surge in importation of rice. From 1999 to 2004, the importation of rice doubled from 152,000 to 301,000 tons while domestic rice production remained fairly stable\cite{16}. Since 1990 imports have been filling the gap between domestic supply and demand. The imports have trended upwards and have been increasing steadily. Import rose to 433,032 metric tons in 2006 for a value of 72.5 billion Francs CFA against 429,866 metric tons for CFA 71.6 billion in 2005\cite{25}. In three decades, rice imports increased over ten fold, to about 3.2 million tons a year, at a cost of US$1 billion\cite{2}. Comparatively, the total import bill for rice in Central Africa averages US$66,860,900. As shown in figure 3, that is a heavy price for Cameroon government’s food import bill. Import bill diverts funds for addressing other social welfare needs required to improve on the macroeconomic indicators for Cameroon. With a population of about 18 million, Cameroon’s human development indicators are those of a middle income developing country. Income per capita is estimated at US$ 800 (US$ 2350, in purchasing power parity terms) and life expectancy at birth is 56 years\cite{41}. In the face of meeting household incomes, some farmer associations consider the upward trending of imports as significant impediment to production and marketing, especially as they witness declining sales and profits. The expectation of stakeholders in the sector is that increased demand for rice should be accompanied by corresponding increase in domestic supply and sustained response from local producers. This study therefore sets out to estimate price supply response coefficients, and establish impact levels for other determinants of supply response. Reliable estimates of the determinants of rice production in a scenario of rising demand and deregulated trade are essential for policy decision to foster agricultural development.

**MATERIALS AND METHODS**

2.1 Analytical Framework: An implicit supply response function is expressed as:

\[ Q_i = f(P_i^d, P_i^w, R_i, W_i, G_i^x, u_i) \]  \hspace{1cm} (1)

Where \( P_i^d \) is the producer price for local rice, \( P_i^w \) is the global price of rice with important indirect effects to local producers, \( R_i \) is the exchange rate of Cameroon currency to foreign currency, \( W_i \) weather condition (e.g. rainfall), \( G_i^x \) is government expenditure on agriculture, \( u_i \) is the stochastic error term assumed to be independently and normally distributed with zero mean and constant variance. *A priori* it is expected that:

\[ \frac{\partial f}{\partial P_i^d} > 0, \frac{\partial f}{\partial P_i^w} > 0, \frac{\partial f}{\partial W_i} > 0, \frac{\partial f}{\partial R_i} < 0, \frac{\partial f}{\partial G_i^x} > 0 \]  \hspace{1cm} (2)

This means that output is expected to vary positively with producer price of local rice, but it could fall with the strengthening of the local currency against major currencies. Output is expected to vary positively with land under cultivation but it could either rise or fall with changes in rainfall depending upon whether or not
there is a normal rainfall or flood or drought. Equation (1) could be modified to account for relative rather than absolute prices and irrigation. Hence we obtain:

\[ Q_t = f\left(\frac{P_t^w}{P_t^d}, \frac{P_t^s}{P_t^d}, R_t, W_t, I_t^*, I_t, z_t, u_t\right) \]  

(3)

Where \( P_t^d \) is the price of competing farm crop and \( I_t^* \) is proportion of rice irrigated area to cultivated area.

A central problem in the estimation of supply response equation is that producers respond to expected as opposed to actual prices. In addition, observed quantities may differ from the desired ones because of adjustment lags in the reallocation of variable factors. In the spirit of the Nerlovian models, these adjustment lags and the associated dynamic processes are explicitly specified. In this light, the relationship in Eq. (3) is summarily specified as:

\[ q_t^d = \beta_1 + \beta_2 P_t^e + \beta_3 z_t + u_t \]  

(4)

Where \( q_t^d \) is the expected output of rice in period t, \( P_t^e \) is the expected price, \( z_t \) is the set of exogenous shifters (e.g. weather, \( W_t \); exchange rate, \( R_t \)); \( u_t \) accounts for unobserved random effects affecting the output from cultivation and has an expected value of zero; and \( \beta_1 \)'s are parameters with \( \beta_2 \) the long-run coefficient (elasticity) of supply response for rice.

Response by rice farmers may be constrained by very small holdings combined with the need to diversify production to spread risks, credit constraints, lack of availability of inputs etc. To allow for this possibility it is assumed, in the Nerlovian tradition that the change in output between periods occurs in proportion to the difference between the expected output for the current period and the actual output in the previous period. In other words, since full adjustment to the desired output level is possible only in the long-run, the actual adjustment in production is a fraction (\( \delta \)) of the expected adjustment. This translates to output changes, i.e.:

\[ q_t - q_{t-1} = \delta(q_t^d - q_{t-1}) + v_t \]  

(5a)

Rearranging:

\[ q_t = q_{t-1} + \delta(q_t^d - q_{t-1}) + v_t, \quad 0 \leq \delta \leq 1 \]  

(5b)

Where \( q_t \) is the actual output of rice, \( q_{t-1} \) is the actual output in period t-1, \( q_t^d \) is expected output in period t and \( \delta \) is the partial-adjustment coefficient. The relationship is not deterministic, and is affected by random shocks as captured by the error term \( v_t \). The adjustment parameter \( \delta \) must lie between 0 and 2 for the adjustment to converge over time, but \( \delta > 1 \) implies persistent over-adjustment, and does not appear plausible in subsistence peasant agriculture. So we limit \( \delta \) to lie between 0 and 1.

Similarly, the price farmers expect to prevail at harvest time is not observed, and account for their expectations based on actual and expected prices. Sadoulet and de Janvry[37] show that:

\[ P_t^e - P_{t-1} = \gamma(P_t - P_{t-1}) + \omega_t \]  

(6)

Where \( P_t \) is current price, \( P_t^e \) is expected price. Rearranging:

\[ P_t^e = \gamma P_t + (1 - \gamma) P_{t-1} + \omega_t \]  

(7)
Where \( P_{t-1} \) is the price that prevails when decision making for rice cultivation in period \( t \) occurs, \( \gamma \) is the adaptive-expectation coefficient and \( \omega \) is a random term with zero expected value. This formulation accounts for the learning process in which farmers adjust their expectations as a fraction (\( \gamma \)) of the magnitude of the mistake they made in the previous period, by relying on the average price over a long-run period. Since \( P_t^e \) and \( q_t^d \) are not observable we eliminate them from eq. 4, 5a, 5b, 6 and 7. We substitute Eq. (4) and Eq. (7) into Eq. (5b), and rearrange to yield the reduced form:

\[
q_t = \theta_1 + \theta_2 P_{t-1} + \theta_3 q_{t-1} + \theta_4 q_{t-2} + \theta_5 z_t + \theta_6 z_{t-1} + \epsilon_t
\]

Where:

\[
\theta_1 = \beta_1 \delta 
\]

\[
\theta_2 = \beta_2 \delta 
\]

\[
\theta_3 = \beta_3 \delta 
\]

\[
\theta_4 = - (1 - \delta) (1 - \gamma),
\]

\[
\theta_5 = - \beta_4 \delta,
\]

\[
\theta_6 = - \beta_5 \delta (1 - \gamma),
\]

\[
e_t = \nu_t - (1 - \gamma) \nu_{t-1} + \delta u_t - \delta (1 - \gamma) u_{t-1} + \beta_5 \delta \omega_t.
\]

Eq. (9) is the estimable form of the rice supply response model defined by equations (5), (6b) and (8). Estimating eq. (9) and using the relationships of \( e \), we derive unique estimates of \( \beta_1 \) and \( \beta_2 \), but not those of \( \beta_4 \) as noted in Eq. (4). To derive unique estimates of \( \beta_4 \), we require (unique) estimates of \( \delta \) and \( \gamma \). It is possible to obtain \( \hat{\delta} = 2 - \hat{\theta}_2 \) and \( \hat{\gamma} = 1 + \hat{\theta}_3 - \hat{\theta}_2 \) which may possibly yield estimates of \( \delta \) and \( \gamma \). However, this does not allow for computation of unique estimates of the long-run supply elasticities with respect to the 'nonprice' variables (\( z \) and \( z_{-1} \)). We nonetheless rely on eq. (9) since it allows us to derive estimates of the long-run elasticity of supply with respect to (expected) price, and provides opportunity to test our research hypothesis. However, the reduced form of eq. (9) is over-identified, since there are six reduced-form coefficients (\( \theta \)) but only five structural parameters (\( \theta_1, \theta_2, \theta_3, \gamma, \) and \( \delta \)). To obtain a unique solution for the latter, a nonlinear constraint is imposed on the parameters of the reduced form:

\[
\theta_0^2 - \theta_4^2 \theta_3 + \theta_3 \theta_5 \theta_6 = 0
\]

The model is estimated using nonlinear, maximum-likelihood techniques. The presence of the lagged dependent variable term introduces (first-order) autocorrelation in the error term and correction must be made for the serial correlation. The structural coefficients are solved with the following equations:

\[
\theta^2 + (\beta_3 - 2) \delta + 1 - \beta_3 - \beta_4 = 0
\]

\[
\gamma = 1 + \beta_1 \delta (1 - \delta),
\]

\[
\beta_1 = \theta_1 / \delta 
\]

\[
\beta_2 = \theta_2 / \delta 
\]

\[
\beta_3 = \theta_3 / \delta 
\]

The short-run price response is estimated by \( \theta_1 \), and the long-run price response is calculated as \( \beta_1 \), where \( \beta_2 = \theta_2 / \delta \geq 2 \) since both \( \delta \) and \( \gamma \leq 1 \). As expected, the long-run supply response exceeds the short-run supply response.

The established technical relationships from Eq. (1) to Eq. (5) allows for the specification of an empirical parsimonious supply function (possibly in the double log form) as follows:

\[
\ln q_t = \theta_1 + \theta_2 \ln Q_{t-4} + \theta_3 \ln P_{t-4}^a + \theta_4 \ln P_{t-4}^d + \theta_5 \ln P_{t-4}^w + \theta_6 \ln C_{t-4} + \theta_7 I + \epsilon_t
\]

The variables are as previously defined. Given that the research employs time series data, techniques in time-series statistical and econometric analysis are employed to establish the validity of the model[10]. The Engle-Granger approach is employed[11,13,20], and a test for
possible Cointegration is carried out. To ascertain whether the data series for each variable involved in the empirical model exhibit similar statistical properties, test for stationarity in each of the series is undertaken.

3. Nature and Source of Data: The data used in this study covers the period 1961-2006. Data on rice output (paddy equivalent) and irrigation are obtained from the FAO online statistical database, FAOSTAT. Import quantities for rice into Cameroon and international prices are obtained from UNCTAD’s Trade Analysis and Information System (TRAiNS). Information on producer prices for local rice and maize are obtained from Ministry of Trade and Industrial Development. Information on government expenditure on agriculture used to capture incentives to farmers is obtained from the Annual Statistical year book from the Ministry of Economy and Planning. Time series information on rainfall is obtained from the FAO’s Africa Rainfall and Temperature Evaluation System (ARTES). This data is generated for countries by the National Oceanic and Atmospheric Association’s Climate Prediction Centre based on ground station measurements of precipitation and temperature. In this study the coefficient of variation of wet season (May – October) rainfall measured in millimetres is used. The importance of irrigation is tested, with information on irrigated area obtained from FAO.

RESULTS AND DISCUSSION

4.1 Long-run Dynamics Trade Policy Effects: The ADF test statistics for unit root of the individual series are presented in table 3. According to the results, the null hypothesis for the existence of unit root cannot be rejected for the series in their level form as the ADF statistics are above the critical value of -3.27. They are observed to be stationary when differenced. The ADF test statistics together with the details on number of lags indicate non-stationarity property in some of the series and the possibility of a long-run equilibrium relationship in their difference form. These observations are robust as they compare favourably with the Phillips-Perron (PP) nonparametric test.

Relative world price to producer price and substitute crop price combine with variations in weather and government expenditure on agriculture to significantly account for 61.7% of the variation in production, as shown by the adjusted R² in table 4. Rice production may increase 2.35% for a ten percent increase in relative world price to producer price, respectively. A ten percent increase in relative price of substitute maize crop accounts for 1.34% rice production. Weather, government expenditure and irrigation account for 3.01%, 2.99% and 1.27% proportionate increase in rice production.

Cointegration is revealed by the ADF statistic for

\[ \ln q_t, \quad \frac{\ln P^w_t}{P_t} \quad \text{and} \quad \frac{\ln P_c}{P_t} \].

Chow - F test for structural stability in the mean of the variables and the slope coefficient is in line with observations in the policy environment in table 5, indicating that rice productivity growth may have been constrained partly by the implementation of structural adjustment programmes in the 1990s that ushered increased openness to trade and the elimination of the commodity boards. The SAP package brought a whole new vista of opportunities and challenges on supply response, as government policies for the crop sector changed significantly from "high support and high protection" since the 1970s to "low support and low protection" since the mid-1990s. Given its level of importance for producing and consuming households and the nation and the existence of competitive markets for local and imported rice, Cameroon’s agriculture and rice policies have swung over the years, as shown in table 5, from command-and-control in 1960s to market deregulation of the rice sub-sector in the year 2000, and from the creation of commodity boards e.g. the Société d’Expansion et de Modernisation de la Riziculture de Yagoua (SEMRY) in 1954 to a partial ban on rice imports and establishment of reference prices 1990s. These policy regimes have without doubt influenced production levels and market shares and overall productivity and profitability of the sub-sector. This concurs with Badawi who posits that sustainable response of rice production systems depend on four major areas: Government policy and commitment to the implementation of programs; improved technology and better crop management to maximize yield of the improved varieties; external support for marketing inputs and outputs; and farmer participation and acceptance of new technology.

As shown in the schema in figure 4, the prevailing agricultural policy and government-imposed distortions in trade policy and regulation (e.g. taxes/ tariffs, labour laws) are self-reinforcing and important for both supply response and export development. These effects could be enhanced by prices, exchange rate and infrastructure. The prevailing exchange rate can be a potent driver for export growth and diversification. Overvaluation of the currency such as the traditionally high valued and pegged CFA Franc to major currencies can undermine export competitiveness, as it lowers returns to entrepreneurial activity. The volatility of the real exchange rate may in addition create a risky climate for export investment, as it makes future returns and payments uncertain, especially in regions and countries where financial markets are underdeveloped and risks cannot be hedged.
Table 3: Unit Root Tests for Selected Variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>ADF (k)</th>
<th>PP</th>
<th>Variable</th>
<th>ADF (k)</th>
<th>PP</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\ln Q_t$</td>
<td>-2.681 (1)</td>
<td>-2.341</td>
<td>$\Delta \ln Q_t$</td>
<td>-3.527 (1)</td>
<td>-3.604</td>
</tr>
<tr>
<td>$\ln \frac{P^w_t}{P^d_t}$</td>
<td>-2.347 (1)</td>
<td>-2.365</td>
<td>$\Delta \ln \frac{P^w_t}{P^d_t}$</td>
<td>-3.438 (1)</td>
<td>-3.599</td>
</tr>
<tr>
<td>$\ln \frac{P^d_t}{P^f_t}$</td>
<td>-3.275 (3)</td>
<td>-3.148</td>
<td>$\Delta \ln \frac{P^d_t}{P^f_t}$</td>
<td>-3.313 (2)</td>
<td>-3.482</td>
</tr>
<tr>
<td>$\ln W_t$</td>
<td>-2.362 (2)</td>
<td>-2.428</td>
<td>$\Delta \ln W_t$</td>
<td>-4.260 (2)</td>
<td>-4.268</td>
</tr>
<tr>
<td>$\ln G_t$</td>
<td>-2.299 (4)</td>
<td>-3.778</td>
<td>$\Delta \ln G_t$</td>
<td>-4.588 (3)</td>
<td>-4.765</td>
</tr>
<tr>
<td>$\ln I_t$</td>
<td>-2.582 (2)</td>
<td>-2.581</td>
<td>$\Delta \ln I_t$</td>
<td>-3.425 (2)</td>
<td>-3.432</td>
</tr>
</tbody>
</table>

Critical values at 5% level of significance are -3.27 and -3.41, respectively.

Fig. 4: Causal link of Agricultural Supply Response and Trade (Author’s conceptualisation)

Dawe\(^{(10)}\) asserts that while increased production stability may be due to irrigation, pest and disease resistance of modern varieties, green revolution and access to cheaper fertilizer, and the ease of market entry by some major exporters, however policies and the role of government in liberalizing international rice trade significantly account for the production structure and performance of rice trade. Agricultural market liberalisation plays important role in influencing production levels through spillover effects\(^{[19]}\). Market liberalisation may not only stimulate the development of new markets and the participation of the private sector in the distribution channels, but can also have a strong effect on rice development\(^{[19]}\). However, McKay et al.,\(^{[19]}\) assert that while trade liberalisation is beneficial, both through improving incentives to exports and providing gains to consumers, it is not a guarantee of economic growth, or even of growth in exports.

4.2 Error Correction and Short-run Dynamics of Rice Production: On assessing the rice response, price and weather effects do have significant influence on
production. As shown in the step-wise regressions in table 6, weather in terms of rainfall has a strong positive effect, so also is the public investment variable. The elasticities of world price to domestic price ratio on rice production are 0.266, 0.287, 0.258, 0.259 and 0.235, respectively. The significant positive relationships suggest that world market price for rice has complementary direct relationship with rice holdings in Cameroon. Regarding cross price effects, the coefficient of lagged substitute crop price to world price has expected negative sign and is significant at 10 percent level suggesting a competitive inverse relationship with rice output in Cameroon. A ten percent increase in the relative international price of maize leads to a reduction of 1.05%, 0.39%, 0.28%, 0.26% and 0.15% respectively, in rice production levels. The elasticities of government expenditure in agriculture range from 0.249 to 0.258, thus indicating that the role of government’s broad effort in agriculture significantly affects the rice sub-sector. Irrigation enhances rice production by 2.59% for a proportionate increase in irrigated area.
Table 5: Rice Production and Trade Policy Regimes in Cameroon, 1961 - 2008

<table>
<thead>
<tr>
<th>Period</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-independence</td>
<td>Creation of Société d’Expansion et de Modernisation de la Riziculture de Yagoua (SEMRY) in 1954</td>
</tr>
<tr>
<td>1961 – 1970 (Post Independence)</td>
<td>Establishment of the Office National de la Recherche Scientifique et Technique (ONAREST) in 1965 to promote agricultural research, training and extension. Establishment of Bureau de Developpement de la Production Agricole (BDPA) in 1967. However, more focus on export crop as major sources of revenue, and neglect of food crop including rice.</td>
</tr>
<tr>
<td>1996 – 2008 (Post-SAP)</td>
<td>Lowering of tariffs and taxes (applied tariffs for rice and other products in Cameroon, 2000 – 2006 average 38.4%). See table 1. Uplifting of partial ban on rice imports Strengthening of trade surveillance systems (institutions include amongst others the customs, the police and the Port Authority). Reorganisation of Institute of Agricultural Research for Development (IRAD) and increased collaboration with International Rice Research Institute (IRRI) and the West African Rice Development Authority (WARDA). Increased participation of NGOs, Farmer Organisations and public debate by consumer rights group (e.g. Association for the Defence of Consumer Rights – ACIDIC).(Source: Author’s summary)</td>
</tr>
</tbody>
</table>

Table 6: Production Response of Rice in Cameroon

<table>
<thead>
<tr>
<th>Regressors</th>
<th>Model I</th>
<th>Model II</th>
<th>Model III</th>
<th>Model IV</th>
<th>Model V</th>
<th>Model VI</th>
<th>Model VII</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\Delta \ln Q_{t-1}$</td>
<td>0.348</td>
<td>0.383</td>
<td>0.307</td>
<td>0.301</td>
<td>0.215</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(4.117)**</td>
<td>(2.243)**</td>
<td>(2.630)**</td>
<td>(2.536)**</td>
<td>(2.347)**</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$\Delta \ln P_{w,t-1}^w / P_{d,t-1}^d$</td>
<td>0.266</td>
<td>0.287</td>
<td>0.258</td>
<td>0.259</td>
<td>0.235</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>(2.223)**</td>
<td>(2.627)**</td>
<td>(2.327)**</td>
<td>(2.233)**</td>
<td>(2.225)**</td>
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</tr>
<tr>
<td>$\Delta \ln P_{t-1}^s / P_{t-1}^d$</td>
<td>-0.105</td>
<td>-0.024</td>
<td>-0.028</td>
<td>-0.026</td>
<td>-0.015</td>
<td></td>
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<tr>
<td></td>
<td>(-1.793)*</td>
<td>(-1.815)*</td>
<td>(-1.609)*</td>
<td>(-1.530)*</td>
<td>(-1.243)*</td>
<td></td>
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</tr>
<tr>
<td>$\Delta \ln W_{t-2}$</td>
<td>0.347</td>
<td>0.298</td>
<td>0.309</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(2.613)**</td>
<td>(2.513)**</td>
<td>(2.343)**</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$\Delta \ln G_{t-3}^s$</td>
<td>0.249</td>
<td>0.258</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(1.843)*</td>
<td>(1.815)*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$\Delta \ln l_{t-2}$</td>
<td>0.259</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(1.538)*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intercept</td>
<td>0.1712</td>
<td>0.1419</td>
<td>0.1348</td>
<td>0.1627</td>
<td>0.3712</td>
<td>2.1078</td>
<td>2.1542</td>
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<tr>
<td></td>
<td>(3.830)***</td>
<td>(3.569)***</td>
<td>(2.852)***</td>
<td>(3.209)***</td>
<td>(3.258)***</td>
<td>(2.327)***</td>
<td>(3.316)***</td>
</tr>
<tr>
<td>$\mu_{t-1}$</td>
<td>-0.087</td>
<td>-0.137</td>
<td>-0.128</td>
<td>-0.191</td>
<td>-0.199</td>
<td>-0.235</td>
<td>-0.274</td>
</tr>
<tr>
<td></td>
<td>(-2.758)**</td>
<td>(-2.524)**</td>
<td>(-2.297)**</td>
<td>(-2.365)**</td>
<td>(-2.096)**</td>
<td>(-1.835)**</td>
<td>(-2.245)**</td>
</tr>
<tr>
<td>$R^2$ adj.</td>
<td>0.395</td>
<td>0.426</td>
<td>0.459</td>
<td>0.527</td>
<td>0.559</td>
<td>0.578</td>
<td>0.656</td>
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<tr>
<td>DW likelihood</td>
<td>1.835</td>
<td>1.885</td>
<td>1.920</td>
<td>1.957</td>
<td>1.865</td>
<td>1.809</td>
<td>1.927</td>
</tr>
<tr>
<td>Akaike AIC</td>
<td>1.423</td>
<td>5.537</td>
<td>1.173</td>
<td>2.229</td>
<td>2.546</td>
<td>3.147</td>
<td>3.378</td>
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<tr>
<td>Schwarz criterion</td>
<td>2.746</td>
<td>5.529</td>
<td>3.544</td>
<td>3.851</td>
<td>4.237</td>
<td>4.228</td>
<td>4.355</td>
</tr>
<tr>
<td>Box-Pierce $\chi^2$</td>
<td>2.649</td>
<td>2.985</td>
<td>3.025</td>
<td>3.214</td>
<td>3.346</td>
<td>3.675</td>
<td>3.720</td>
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<tr>
<td>$J-B$ $\chi^2$</td>
<td>4.119</td>
<td>4.528</td>
<td>4.619</td>
<td>5.128</td>
<td>5.385</td>
<td>5.289</td>
<td>5.621</td>
</tr>
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</table>

Note: Dependent Variable: production ($\ln Q_t$). ***=significant at 1%; **=significant at 5%; *=significant at 10%. DW is the Durbin-Watson statistic. J-B is the Jarque and Bera statistic with a critical value of 5.89. The critical value for the Box-Pierce statistic is 13.52.
In the policy context of liberalisation and increased openness, several reasons explain the limited agricultural supply response from developing countries such as Cameroon. On one hand, recent reforms do not significantly affect the price received by producers. On the other, devaluation of the exchange rate increased the domestic currency value, therefore increased incentives to producers and exporters. However, the ability for producers to increase production and exports in order to respond to increased incentives is constrained by limited access to inputs, credit and new technologies. Poor infrastructure and natural barriers act as a tax, often very high, on production. Delays in implementing subsequent institutional reforms have been suggested as one factor limiting supply response. The insufficient response of domestic enterprises to meet supply expectations further enhance or even reinforce the noted challenges on the performance of trade. Stronger supply response and generated surpluses ensure food-sufficiency; industrial inputs and feeds export requirements for token contributions to export-led growth. Page observes that agricultural export is one of three promising strategies for promoting pro-poor growth. Supply response schemes are therefore plausible policy drives for shared growth strategy, which promotes the engagement of the poor a significant amount of who are small-scale agriculturists to ensure that they are active participants in, and beneficiaries of growth. It is therefore probable that if some key policy measures are taken e.g. improved irrigation or proper alignment of the exchange rate regime, in a bid to enhance domestic production, then the potential contribution of rice to Cameroon’s export basket could be enhanced and the ensuing trade policy regime could as indicate induce both direct and indirect incentives for exporting activities.

5. Conclusion: Liberalization of Cameroon’s domestic markets, through lowering of quantitative restrictions on trade, and opening up of economies to internal trade opportunities is an important step accelerating the process of commercialization in the country’s subsistence agrarian sector. However, the opening up of markets also exposes producers to increased risk due to the greater volatility of world prices. That notwithstanding, Cameroon’s rice sub-sector must take advantage of local and international demand. For this to happen, it must be able to generate adequate surplus, as the potential to export may in turn encourage domestic production and farm response. Government’s incentive schemes for investments in agriculture, irrigation, export activities and access to finance at reasonable cost can be important for both productivity and supply development. Overall, the impacts of weak supply response may be severe and double-edged in a society such as Cameroon in which 70% of the consumers are equally agrarian producers. They may reap gain in consumer welfare and possibly incur declines in producer welfare. This composite situation calls for constant examination of the impact on producer groups.

REFERENCES


20. IMF (International Monetary Fund), International Financial Statistics Year Book, various issues, Washington DC.


