

DRIVERS OF AGRICULTURAL EXPORTS IN EASTERN AFRICA: EVIDENCE FROM KENYA, UGANDA, AND TANZANIA.

*Nyangweso P.M,
Economics and Agricultural Resource Management
Moi University
P.O. Box 1125
ELDORET, KENYA
E-mail: philoe2000@yahoo.com*

*Odhiambo M.O
Economics and Agricultural Resource Management
Masinde Muliro University of Science and Technology
P.O. Box 190
KAKAMEGA, KENYA
E-mail: moodhiambo@yahoo.com*

*Odunga P.
Economics and Agricultural Resource Management
Moi University
P.O. Box 1125
ELDORET, KENYA
E-mail: philoe2000@yahoo.com*

Abstract

Agriculture contributes substantially to the overall economic growth of East African countries. This sector alone accounts for 25%, 31.1%, and 43.2% of the GDP for Kenya, Uganda and Tanzania, respectively. More than 70 percent of the population in Eastern Africa live in rural areas and rely heavily on agriculture for their survival. Agricultural exports have continued to earn Eastern Africa the much-needed foreign exchange for financing imports for import dependent domestic industries. In 2005, export earnings in Kenya, Uganda and Tanzania, respectively were, US\$3.173 billion, \$768 million, and \$1.581 billion. Out of the total export earnings, agricultural exports contributed more than 70 percent. This paper examines the key determinants of agricultural exports in Eastern Africa. It also evaluates the impact of regional integration and differences arising across countries in the region. It uses Nerlovian Partial adjustment model to fit data for 1974-2004. Results indicate that key factors influencing agricultural exports in the region are exchange rates, regional integration and technological progress. However, there are conflicting results regarding the role of International prices and country specific policies. While some similarities are noted, some differences are recorded across countries. We recommend policies that are outward looking with governments in the region creating conducive business environment to facilitate more foreign investment in export oriented agriculture.

Key Words: *Drivers, Agricultural Exports, Eastern Africa.*

Introduction

Background on Agricultural Sector

Agriculture contributes substantially to the overall economic growth of East African countries. It accounts for 25-43 percent of the Gross domestic products of Kenya, Uganda and Tanzania (GOK, 2005, FAO, 2005). More than 70 percent of the population in Eastern Africa live in rural areas and rely on agriculture for their survival.

Kenya's Agricultural Sector

The Kenyan agricultural sector has been branded the backbone of the economy. It accounts for 25 percent of GDP, employs over 80 percent of the Kenyan population either directly or indirectly and earns more than 28 percent of visible exports (FAO, 2005). In the last four decades there was a decline in agriculture of 3.5 percent and a corresponding decline in the overall economy by 4.6 percent (GOK, 2002). However, the recovery of the sector was followed by a recovery in the Kenyan economy in the last 4 years. The major food commodities produced in Kenya include: - maize, wheat, cassava, Sorghum, and finger millet. While tea continues to contribute the largest share of total visible exports, other agricultural exports include: - horticulture (flowers, vegetables and fruits), coffee and processed foods and vegetables. In 2005, export earnings in Kenya amounted to US\$3.173 billion, (GOK, 2005). The major contributor to these earnings is agricultural exports consisting mainly of primary products. The leading export partners of Kenya are Uganda, UK, US, Netherlands, Egypt, Tanzania and Pakistan who account for 13.9%, 10.5%, 9.5%, 8.2%, 5.1%, 4.7%, and 4.5% of Kenya's total exports respectively (FAO, 2005). Uganda is the leading single importing country of Kenyan products both globally and regionally. The European market and the US consume 28 percent of the total Kenyan exports.

Uganda's Agricultural Sector

Uganda's economy is predominantly agrarian with 31.1 percent of the GDP, 81 percent of the employed labour force, and 31 percent of export earnings being derived from the agricultural sector (FAO, 2006). Only one third of the total land area is under cultivation with subsistence production representing 70 percent of the area under cultivation. Women provide over half of agricultural labour, traditionally focusing on food rather than cash crop production. The major food commodities produced in Uganda include: - plantains, cassava, sweet potatoes, and bananas. The monetary value of marketed agricultural commodities continues to fall way below estimated value of subsistence agriculture.

While coffee continues to remain the primary export earner for Uganda, other export crops include: - cotton, raw sugar, tobacco, roses and carnations. In 2001 coffee earned Uganda an estimated US \$51.3 million accounting for 11 percent of the total exports (FAO, 2004). Even though the Ugandan economy is depended on agriculture only a small proportion of agricultural production is export oriented and is mainly primary products. In 2005, export earnings in Uganda were estimated at US\$768 million (FAO, 2005). Out of the total export earnings, agricultural exports contributed more than 70 percent. The leading export partners of Uganda are Kenya, Belgium, Netherlands, France, Germany and Rwanda with each country accounting for 15.1%, 9.9%, 9.7%, 7.1%, 5.1%, and 4% of the total exports respectively (FAO, 2005). While Uganda is Kenya's leading single trade partner both globally and regionally, the European market consumes more than 32 percent of Uganda's aggregate exports.

Tanzania's Agricultural Sub Sector

Tanzania's economy depends heavily on agriculture, which accounts for almost half of GDP, provides 85% of exports, and employs 80% of the work force (FAO, 2006). Topography and climatic conditions,

however, limit cultivated crops to only 4% of the land area. Industry traditionally featured the processing of agricultural products and light consumer goods. The World Bank, the International Monetary Fund, and bilateral donors have provided funds to rehabilitate Tanzania's out-of-date economic infrastructure and to alleviate poverty. In 2005, Tanzania realized export earnings to the tune of US\$1.581 billion with agricultural exports contributing more than 85 percent of the total earnings (FAO, 2005). The major export commodities in Tanzania are coffee, cashew nuts, manufactures and cotton. The leading export partners of Tanzania are China, Canada, India, Netherlands, Japan, Kenya, and Germany which account for 10.2%, 8.6%, 7.3%, 5.2%, 4.5%, 4.4%, and 4.3% respectively of the country's total exports (FAO, 2005). Just like in Kenya and Uganda, subsistence farming and export of primary agricultural products hinder rapid industrialization.

Regional Integration

Kenya, Tanzania and Uganda have had a history of co-operation dating back to the early 20th century, including the Customs Union between Kenya and Uganda in 1917, which the then Tanganyika joined in 1927, the East African High Commission (1948-1961), the East African Common Services Organization (1961-1967) and the East African Community (1967-1977). In 1977, the East African Community collapsed after ten years, amid disagreements caused by dictatorship in Uganda, socialism in Tanzania, and capitalism in Kenya. This resulted in the three member states losing over sixty years of co-operation and the benefits of economies of scale. Each of the three states had to embark upon the establishment of services and industries that had previously been provided at the Community level at a great cost.

The EAC made such political and economic sense that it was inevitable that its revival would be touted once the political climate in the region stabilized. It was no surprise, therefore, when the Treaty for East African Co-operation was signed in Arusha, Tanzania, on November 30, 1993, and a Tri-partite Commission for Co-operation established. A process of re-integration was embarked on, involving tripartite programmes of co-operation in political, economic, social and cultural fields, research and technology, defense, security, legal and judicial affairs. The East African Community was finally revived on 30 November 1999, when the Treaty for its re-establishment was signed. It came into force on 7 July 2000, twenty-three years after the total collapse of the defunct Community and its organs. The reinvigorated East African Community (EAC) articulates itself as based on the principles of good governance deemed to include adherence to democratic principles, the rule of law, accountability, transparency, social justice, equal opportunities, gender equality and most pertinently in this context, "recognition, promotion and protection of human and peoples' rights in accordance with the provisions of the African Charter on Human and Peoples' Rights (ACHPR).

Pertinent Issues in Regional Agricultural Sub Sector

Review of the status of the agricultural sub sector and regional integration in the three East African countries raises some pertinent issues. What options are there for expanding agricultural exports? Is transformation of the large subsistence sector into a commercial sector an option? Has regional integration positively contributed to enhanced agricultural exports? What role do the exchange rates, international prices play? Policy options depend on the evaluation and isolation of the drivers of agricultural exports. This paper examines the determinants of agricultural exports in Eastern Africa as well as the impact of regional integration and differences arising across countries in the region.

Theoretical Considerations

Aggregate supply response

The agricultural sector, unlike the industrial sector, is considered in many countries to be non-responsive to policy incentives. Raising taxes from the sector, while it provides resources for investment in the industrial sector, it leaves the level of agricultural production unchanged. Growth of agricultural exports translates into a higher contribution of the agricultural sector to Gross domestic product. In Eastern Africa expansion of the agricultural sector is associated with economic growth. Therefore agro based countries aiming at spurring economic growth should ignore the agricultural sector at their own peril. The efficacy of export policy depends on the responsiveness of the agricultural sector. In general, policies biased against agriculture have done more harm than good, reducing growth in the agricultural sector and consequently in the economy as a whole (Bautista et al, 1993).

Modeling Supply Response

Many studies have evaluated aggregate agricultural or individual crop supply response both in developed and developing countries using time series data. The commonly used approaches are Nerlove (1956, 1958, and 1979) model, Griliches (1960) model, and error correction and co-integration models (Hallam and Zanolli, 1992, Banerjee et al, 1993, Townsend and Thirttle, 1995, Abdulai and Rieder, 1995, Townsend, 1996, Ahmed, 2000). Both the Griliches and Nerlovian models are single equation and partial equilibrium models since they do not characterize the linkages between commodities or groups of commodities via a matrix of cross price elasticities and also ignore the interaction between agricultural and non-agricultural sectors (McKay et al, 1997). However, Nerlovian models are still able to pin point inherent policy implications in the agricultural sector.

Nerlovian model describes dynamics of agricultural supply by incorporating price expectations and/or adjustment costs. The general form of the Nerlovian supply model can be specified as:-

$$X_t^* = a + bp_{xt}^e + \mu_t \quad (1)$$

Where X_t^* is the “desired” or equilibrium output X at time t and p_{xt}^e is the expectations of price P_x in time t formed at time $t-1$. When the dynamics of agricultural supply is driven by price expectations only, the desired output equals the actual output ($X_t^* = X_t$). The Nerlovian price expectations model is assumed to be adaptive since producers revise their price expectations for the current period in proportion to the error in the previous period. This model can be expressed as:-

$$\begin{aligned} P_{xt}^e - P_{x,t-1}^e &= \beta (P_{x,t-1} - P_{x,t-1}^e) \\ P_{xt}^e &= \beta P_{x,t-1} + (1 - \beta) P_{x,t-1}^e + \mu_t \quad (0 < \beta < 1) \end{aligned} \quad (2)$$

$$P_{xt}^e = \sum_{i=1}^T (1 - \beta)^{i-1} P_{x,t-1} + \mu_t$$

Substituting (2) in (1) and application of Koyck’s reduction procedure (Johnston, 1984) gives a finally derived Adaptive expectations equation (3).

$$X_t = \Phi_0 + \Phi_1 P_{x,t-1} + \Phi_2 X_{t-1} + v_t \quad (3)$$

Where $\Phi_0 = \beta a$ $\Phi_1 = \beta b$ $\Phi_2 = (1 - \beta)$ $v_t = \mu_t - (1 - \beta) \mu_{t-1}$ and μ_t, μ_{t-1} are error terms.

Adjustment costs resulting from moving factors across sectors economy wide can cause lag in output response to price changes. Majority of cited studies on aggregate supply response ignore farmers price expectations and concentrate on partial adjustment hypothesis (McKay, 1997). In the formulation the change in actual output is a fraction of the discrepancy between the desired output (X_{t-1}^*) and actual output (X_{t-1}).

$$\begin{aligned} X_t - X_{t-1} &= \lambda (X_{t-1}^* - X_{t-1}) \\ X_t &= \lambda X_{t-1}^* + (1 - \lambda) X_{t-1} \end{aligned} \quad (0 < \lambda < 1) \quad (4)$$

Assuming the expected price is the lagged price, substituting (4) in (1) followed by Koyck's reduction procedure (Johnston, 1984) gives a finally derived Partial Adjustment equation (5).

$$X_t = \psi_0 + \psi_1 P_{x,t-1} + \psi_2 X_{t-1} + \psi_3 X_{t-2} + \xi_t \quad (5)$$

Where $\psi_0 = \beta\lambda a$ $\psi_1 = \beta\lambda b$ $\psi_2 = [(1 - \beta) + (1 - \lambda)]$ $\psi_3 = [(1 - \beta)(1 - \lambda)]$ $\xi_t = \lambda \mu_t - (1 - \beta) \lambda \mu_{t-1}$ and μ_t, μ_{t-1} are error terms.

The “Adaptive Expectations” model emphasizes price uncertainty as the determinant of production lags while “Partial Adjustment” model stresses technological uncertainty as the key determinant of these lags. There are conceivable circumstances when both forms of uncertainty are present (Johnston, 1984). Under such circumstances a “mixed model” is used, but presents estimation problems. A choice has to be made between the two Nerlovian models. In situations of price uncertainty the Adaptive Expectations model is preferable, whereas in situations where price uncertainty is removed by government guaranteeing of producer prices, the partial adjustment model is applicable (Griliches, 1967). Even though the world market is turbulent, international trade in agricultural commodities is associated with contractual arrangements through either bilateral or multilateral agreements between trading partners. Such arrangements tend to improve certainty of international transactions favoring choice of partial adjustment model in this study. The estimated partial adjustment model is as follows:-

$$X_{ti} = \beta_{0i} + \beta_{1i} X_{(t-1)i} + \beta_{2i} V_{(t-1)i} + \beta_{3i} E_{(t-1)i} + \beta_{4i} I_{(t-1)i} + \beta_{4i} T_i + \mu_{ti} \quad (6)$$

Where X_{ti} and $X_{(t-1)i}$ are current and previous year's exports supply for country i, $i = 1, 2, 3$.

$V_{(t-1)i}$ = Real value per unit of exports for country i.

$E_{(t-1)i}$ = Country i's exchange rate in period t-1

$I_{(t-1)i}$ = Dummy for integration in country i.

T_i = Time trend as a proxy for technological change in country i.

$\beta_{0i}.. \beta_{4i}$ and μ_{ti} are country specific parameters to be estimated and error terms.

Other variables such as regional weather patterns, even though considered crucial for agricultural production, were omitted in the model due to non-availability of data.

Methods

Data Types and Sources

The types of data used in the study include volumes and values of aggregate agricultural exports, unit value of aggregate agricultural exports, value of exchange rates, participation in the East African community and budgetary allocation to the agricultural sectors in the three east African countries. The study used mainly time series data for the period 1974-2004. The data was retrieved from a variety of data banks. Volumes and values of agricultural exports were retrieved from the FAO trade statistics data bank. Country specific exchange rates data was retrieved from the IMF statistical data bank. Other sources of data were annual reports of Central banks and Ministries of finance from in the respective countries.

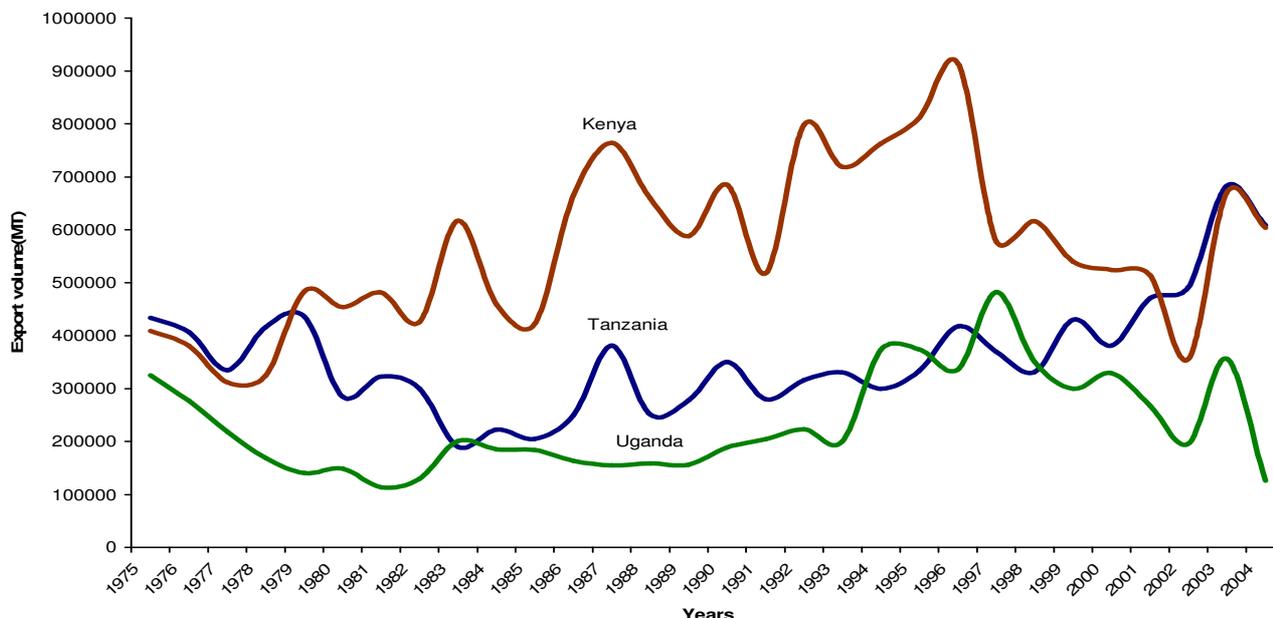
Data Analysis

Descriptive statistics were used to describe emerging trends of the key determinants of agricultural exports. The study used a linear form of Nerlovian Partial adjustment model to fit data for 1974-2004 because it exhibited a better fit than its log linear form. Multiple regression analysis was used to estimate the aggregate agricultural export supply function. Durbin-Watson's D-statistic was used to scan for serial correlation in the time series data. Multicollinearity was tested using Farrah-Glauber test and Klein's rule.

Results and Discussion

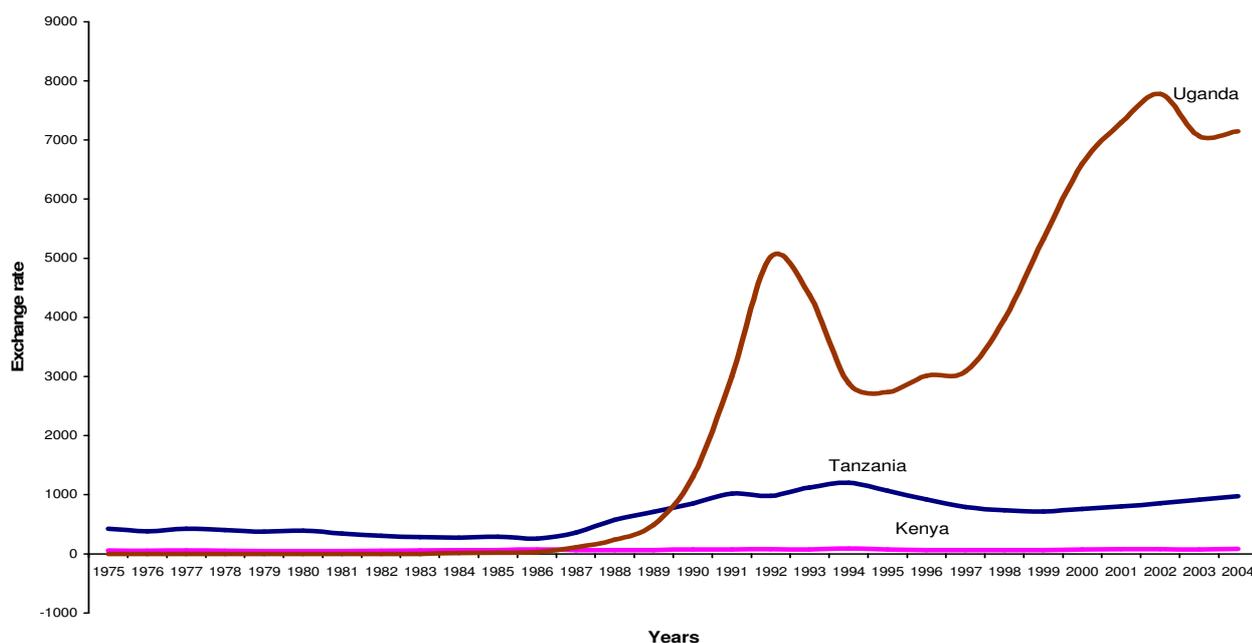
Fig 1 shows the trend of agricultural exports in Kenya, Uganda and Tanzania. After recovering from the oil crisis of the early 1970's, agricultural exports in the three East African countries grew steadily over the last three decades, with Kenya recording higher exports for the better part of the period than its two neighbors.

Figure 1: Agriculture export trend across countries 1976-2004



A steady growth in agricultural exports in Kenya is attributed to a mixture of macroeconomic stability, policy incentives and government restraint. Macroeconomic stability ensured a stable exchange rate thus stabilizing exports income. Policy incentives have also been used in the same period to expand exports. Such incentives came in the form of input subsidies, crop and livestock development loans, market and other infrastructure development programmes and export compensation schemes. Success of the horticultural sector, on the other hand, has been attributed more to government restraint than motivation. It is one sector that has seen rapid expansion with limited interference from the government.

Fig 2 shows the exchange rate fluctuation in Kenya, Uganda and Tanzania over the last three decades. Kenya has comparatively experienced a relatively stable exchange rate regime in the region. Uganda's currency recorded prolonged stability between 1975 and 1987 with its value comparing strongly with the value of the Kenyan currency, but relatively stronger than the value of the Tanzanian currency. However, the post 1987 period witnessed drastic fluctuation in Uganda's exchange rate with its value falling way below the value of Tanzanian and Kenyan currencies. Even though the Kenyan exchange rate appears comparatively stable in the post 1987 period when plotted against the other two regional currencies, some fluctuation is recorded when the currency is analyzed individually.

Figure 2: Regional real exchange rate fluctuations by country 1876-2006**Table 1: Estimated Agricultural Export Coefficients for Eastern Africa.**

| Variables | Country | | | | | |
|---------------------------------|--------------------------|-----------------|-------------------------------|----------------|------------------------------|-----------------|
| | Kenya | | Tanzania | | Uganda | |
| R | 0.729 | | .843 | | 0.965 | |
| R² | 0.531 | | 0.710 | | 0.931 | |
| Adjusted R² | 0.421 | | 0.649 | | 0.916 | |
| Durbin -Watson Statistic | 1.94 | | 2.2 | | 1.9 | |
| Constant | -155997 | (-0.711) | 21647.60 | (0.263) | 18407.664^b | (2.046) |
| Lag agric. exports | 0.104 | (0.268) | .335^b | (1.881) | 0.409^a | (3.024) |
| Real unit value | 18.7 | (0.69) | 2.413^b | (1.737) | 7.352^a | (3.272) |
| Real exchange rate | 10995^a | (2.65) | 45.976 | (0.667) | 17.249^a | (2.923) |
| Integration | -19173 | (-1.368) | 101693.036^a | (2.705) | 809.910 | (0.203) |
| Time trend | 568.821 | (0.063) | 7817.323^a | (2.531) | -1964.613^a | (-3.375) |

a_ Significant at 1 % level of significance

b- Significant at 5 % level of significance

t-values are in parentheses

Results indicated that previous periods exports, integration in the East African community, real unit value of agricultural exports, a proxy for international prices, and technological progress over the last three decades significantly influenced agricultural exports in Tanzania. Such results can be used to convince Tanzania to enthusiastically embrace the East African Community since its economy is already reaping

the benefits of integration. The real exchange rate is not so crucial in Tanzania as far as agricultural exports are concerned.

Results showed further that in Kenya real exchange rate is the most significant factor influencing agricultural exports. As discussed earlier (fig 2) real exchange rate in Kenya has comparatively undergone prolonged periods of stability over the last three decades. However, considered individually the Kenyan currency has exhibited some fluctuations though not as drastic as witnessed in Uganda and Tanzania in the post 1987 period. After devaluation of the Kenyan currency during implementation of the structural adjustment programmes the value of the Kenyan shilling fell to about 90 shillings a dollar before stabilizing between 65 and 80 shillings a dollar. Liberalization of the exchange rate and removal of import licensing and export taxes boosted export crop values and earnings (Odhiambo et al, 1998). Stability in the Kenyan currency has tended to create predictability in expected export earnings thus stabilizing agricultural export growth in Kenya. Appreciation of the Kenyan Shilling causes a lot of uneasiness in the tea, coffee and cut flower industries due to the accompanied erosion of profits.

In Uganda, previous periods exports, international prices and exchange rate significantly influenced growth of agricultural exports in the last three decades. This shows that agricultural exporters in Uganda formulate their export plans based on their previous period's experiences. Therefore review of past behaviors of export firms may yield some insight into their future behavior. Since international prices are crucial determinants of agricultural exports in Uganda, and are known to be fragile, contractual arrangements between Uganda's agricultural exporters and trading partners can cushion the country from unpredictable world markets. Devaluation of the local currency (fig 2) led to drastic loss in value of the Ugandan shilling resulting in massive gains by agricultural exporters in the country. This explains why agricultural exporters in Uganda take depreciation of the local currency as a sign of better things to come. In addition, results point towards a technological decline in the agricultural sector over the last three decades. This could be attributed to the dictatorial regime in the early 1970's which expelled a number of foreign investors from Uganda and the upheavals that followed after it was toppled hindering expanded investment in the agricultural sector. Consequently, a large subsistence agricultural sector continues to persistence in Uganda. The lack of clear benefits from integration in Kenya and Uganda could be attributed to measurement errors during data collection at the various government agencies. However, this calls for a more empirical evaluation of the benefits and costs of regional trade among the East African countries.

Concluding Remarks

Agriculture contributes substantially to the overall growth of Eastern Africa. A large proportion of the population in the region, who live in rural areas survive on agriculture. Agricultural export earnings in Eastern Africa, apart from providing foreign exchange for financing import dependent domestic industries, constitute a substantial proportion of the total exports.

In an effort to evaluate drivers of agricultural exports in Eastern Africa, the study isolates a number of issues. Some of these issues include exchange rates, regional integration, technological progress, international prices and previous experience. While some similarities are noted, some differences are recorded across countries. Some factors are more significant in one country but less significant in another country. We recommend policies that are outward looking with governments in the region creating conducive business environment to facilitate more foreign investment in export oriented agriculture. It is crucial to tailor measures for tackling country specific peculiarities.

References

- Abdulai A. and P. Reider(1995): “ The Impact of Agricultural Price policy on Cocoa Supply in Ghana: an Error Correction Estimation. *Journal of African Economies*, 4(3): 315-35.
- Ahmed N (2000): “Export response to trade liberalization in Bangladesh: a co-integration analysis”. *Applied Economics*, 32(8): 1077-1084(8).
- Banerjee A. J Dolado and J. Glabraith and D. Hendri (1993): *Co-integration, Error Correction and the Econometric Analysis of non-stationary data*, Oxford. Oxford University Press.
- Bautista, R. and A.Valdes (1993): *The Bias Against Agriculture*. San Francisco: ICS.
- FAO (2006): Food and Agriculture Organization Trade Statistics.
- FAO (2005): Food and Agriculture Organization Trade Statistics
- GOK (2005): Economic Survey. Ministry of Planning and National Development.
- GOK (2002): Statistical Abstract. Central Bureau of Statistics. Ministry of Planning and National Development.
- Griliches Z. (1960): “Estimates of the Aggregate US Farm Supply Functions”. *A Journal of Farm Economics*, 42(2): 282-293.
- Griliches Z. (1967): “Distributed Lags: A survey”. *Econometrica*, 35: 16-49.
- Hallam D. and R. Zanolli (1992): “Error Correction Models and Agricultural Supply Response”, *European Review of Agricultural Economics*, 2: 111-20.
- Johnston J. (1984): *Econometric Methods*. McGraw Hill Book Company, New York.
- Mckay A., O. Morrissey and Vaillant C. (1997): Aggregate Export and Food Crop Supply Response in Tanzania. DFID-Trade and Enterprise Research Programme (TERP) Credit discussion paper 4(CDP04). Center for Research in Economic Development and International Trade. University of Nottingham.
- Nerlove M. (1956): “Estimates of the Elasticities of Supply of Selected Agricultural Commodities”. *Journal of Farm Economics*: 38: 496-512.
- Nerlove M. (1958): “Distributed Lags and Estimation of Long Run Supply and Demand Elasticities”. *Journal of Farm Economics*: 40: 301-314.
- Nerlove M. (1979): “The Dynamics of Supply: Retrospect and Prospect”. *American Journal of Agricultural Economics*.
- Odhiambo M.O, H.K. Maritim and Kidane W. (1998): “The Impact of Reforms of Parastatals on Agricultural Development and Food Security in Eastern and Southern Africa”. Proceedings of Sub-Regional Expert Workshop. FAO Sub-Regional Office for Eastern and Southern Africa

Townsend R and C. Thirtle (1995): “Dynamic Acreage Response an Error Correction Model for Maize and Tobacco in Zimbabwe, University of Reading”. *Discussion Paper in Development Economics, Series G 2(20)*

Townsend R. (1996): “Price Liberalization, Technology and Food Self-Sufficiency. An Analysis of Summer Grains in South Africa”, mimeo.