Makosholo & Jooste

The comparative advantage of selected long-term crops in Lesotho

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Abstract

This paper evaluates the comparative economic advantage (CEA) of irrigated long-term crops (cherries, peaches, apples and asparagus) in the four agro-ecological zones of Lesotho based on analyses of profitability coefficients and domestic resource costs. The analysis was carried out using the net present value (NPV) approach. The CEA analysis yielded higher private returns relative to economic returns in the Lowlands, Foothills, the Senqu River Valley and the Mountains of Lesotho for all the crops examined. In the Lowlands zone all products have a RCR of lower than one indicating a comparative advantage. In the Foothills only apples and peaches were investigated, and both show a comparative advantage of equal strength. In the Senqu River Valley the result for apples and peaches are mixed, i.e. apples show a comparative advantage, whilst peaches show a comparative disadvantage. In the Mountain zone only apples has a comparative advantage. Sensitivity analysis was also conducted related to exchange rate changes, land and water prices, and threshold prices.

1.   Introduction

Like many of the poorer rural areas of Southern Africa, Lesotho is faced with increasing poverty and unemployment. Agriculture production, which offers the most direct route to improving livelihoods in the short term (Kingdom of Lesotho, 2002), continues to decline. Despite its poor performance and its inability to become an engine of transformation, Lesotho's agricultural sector needs significant support to remain a primary source of income and food security for the rural poor. This also poses a challenge to respond and react to the food crisis that Lesotho has faced in recent years.

In 1996 the Lesotho Government instituted major policy reforms. The process led to the current policy reforms relating to poverty alleviation, household food security and employment creation. The overriding strategy for achieving the above policy goals involves commercialisation of agriculture into an efficient and competitive sector, responsive to market signals (both domestic

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and international), and utilising resources in an efficient and sustainable manner (ADF, 1997). More specifically, through the Agricultural Sector Adjustment Program (ASAP), the Government of Lesotho seeks to broaden the productive base of the rural economy by intensification of competitive crops and livestock products and diversification into higher-value commodities (ADF, 1998). Moreover, the ADF (1998) encourages investigation into the production of high-value crops, such as asparagus, apples, cherries, peaches and other crops that can be grown in Lesotho This is especially important when considering that the demand for a wider variety of fruits and vegetables is expected to grow in developed countries as their consumers are becoming more sophisticated (Johnson, 1998). It is within this framework that this study will investigate the Comparative Economic Advantage (CEA) of asparagus, apples, cherries and peaches in Lesotho.

2. Data used and methodology

2.1 Data used

Data compiled by District Marketing Officers forms the basis of the CEA analysis. Secondary data on the production of different commodities was gathered from the Lesotho Bureau of Statistics. All data used are for 1999 since this is the most recent year for which all required data is available. Supporting data was gathered from producers and co-operatives, other role-players and publications including:

- Leribe cherry producers;

- The Eastern Free State Fruit Producers' Co-operative in Bethlehem;

- The Agricultural Research Station in Ficksburg;

- Harmonia asparagus farm; and

- The Agricultural Marketing Bulletins.

To verify and ensure realism of the different budgets, the following procedures were executed:

- Data relating to the enterprise budgets was compared with information collected from farmers in the Eastern Free State and Lesotho who are producers of products included in the study.

- Different budgets for a specific enterprise within a particular zone were compared.

- Discussions were conducted with the extension, crop and horticultural officers regarding the accuracy of different budgets in each particular zone.

- Meetings with groups of farmers and horticulturists were held in each zone and in the Eastern Free State to verify the budgets.

- With regard to macro-economic data, such as foreign exchange rates, producer price indices, international prices and transport costs, the Reserve Bank, the commercial banks and Spoornet was consulted. Various international publications and the Internet were also used to obtain information related to international trade in products included in this study.

2.2   Methodology

The measure of CEA is the domestic resource cost (DRC) ratio. DRC is an analytical tool for empirical evaluation of economic efficiency among alternative enterprises, and is a commonly used criterion for measuring CEA. It generates several measures of relative economic efficiency of production alternatives, as well as determining, according to Masters and Winter (1995), the most or relatively efficient alternative production activities for a country or region, in terms of its contribution to national income.

To determine which enterprise is the most efficient, this study uses the following formula employed by Hassan and Faki (1993) to generate DRC ratios for Sudan's irrigated land resources:

$$C_i = (\Sigma_r N_r X_{ri}) / (P_i Q_i - \Sigma_j R_j Q_{ji}) \tag{1}$$

Where:

C_I measures the value of domestic resources used, in saving or generating a unit value added in activity i;

N_r is the opportunity cost of a unit of non-tradable primary factor r;

X_{ri} is the quantity of factor r used in activity i;

P_i and Q_j are the import or export parity price and quantity of tradable product i, and

R_j and Q_{ij} are the import or export parity price and quantity of tradable imput j used in activity i.

The denominator in equation 1 derives value added (VAD) in activity i, and the numerator calculates the economic value or cost of domestic resources (CDRS) used to produce Qi. When CDRS is expressed in local currency and VAD in foreign currency, C_i computes the DRC ratio of activity i. Thus, the DRC analysis measures relative efficiency in terms of the cost in local currency of domestic resources required to save or generate one unit of foreign exchange. This coefficient is then compared to the effective or parallel exchange rate, entailing that if:

DRC_i < e, then the country has a comparative advantage in producing commodity i.

But if:

DRC_i > e, there is no comparative advantage. In other words, in the case of Lesotho it would cost more South African Rand (R) to produce one unit of commodity i locally than to buy the same unit abroad.

An alternative measure of economic efficiency that is easier to interpret is the resource cost ratio (RCR), which is obtained from Equation 1. When both the numerator and denominator are expressed in the same currency units, the RCR is obtained. Resource cost ratio indicates the efficiency of each production alternative in using domestic resources to earn or save one unit of foreign exchange.

The RCR value is then interpreted as follows:

0 < RCR < 1 implies that value added per unit of product i is larger than the value of domestic resource used to produce this unit; thus i has comparative advantage.

RCR_i > 1 implies that the value of domestic resources used to generate one unit of i is greater than the value added per unit of i, thus there is no comparative advantage.

RCR_i < 0 implies that the value of the tradable inputs used to generate one unit of i is larger than the unit price of i (negative value added); hence there is net loss of foreign exchange and no comparative advantage.

However, the major difficulty of using DRC and RCR methods, according to Hassan and Faki (1993), arises from valuing inputs and outputs. Two components are involved in calculating shadow prices, namely tradable and

non-tradable goods and services (Ward, Deren and D'Silva, 1991), and different criteria are used to calculate these two components. Hence, proper definitions are required. According to Gittenger (1982) tradable goods and services are those traded items for which if they are exports, f. o. b. price > domestic cost of production, or the items may be exported through government intervention using export subsidies. If the traded items are imports, domestic cost of production > cif price. Non-tradable goods and services are those for which cif price > domestic cost of production > FOB price. These goods and services may be items that are non-traded because of government intervention, e.g. import bans, quotas, tariffs and the like (Gittenger, 1982). This also means that the import price of products or services is greater than the cost of domestic production, but the cost of domestic production is greater than the price of that product or service on the world market (Sell, 1991). Tsakok (1990) defines non-tradable goods and services as those, which do not have foreign or border prices. In essence, these definitions are similar and were considered for the purpose of this study.

To determine the social or economic prices of tradables, the conversion method was employed. First, the world prices of goods and services were determined and adjusted according to the cost-insurance-and-freight components of imported goods and services (Ward *et al*, 1991). The tariff protection method, which indicates a percentage deviation of the domestic price from the international price, could also be used. In order to calculate the economic value of the Lesotho currency (Maloti), the buying power parity approach (Yao, 1997) was used. Economic price of fuel was also calculated using the conversion method, whilst the economic price of electricity was adapted from other studies (TAMS, 1999). Cognisance was also taken that the cost of production is separated into tradable and non-tradable components (Ward *et al*, 1991). Valuation of non-tradables was done according to methodologies described by Little and Mirrlees (1974); Gittinger (1982); Conningarth Consultants (1995); Tsakok, 1990 and Currie (1981). The same tradable/non-tradable composition of the value of inputs and products was used as those by Jooste and Van Zyl (1999).

In the investigation conducted by Hassan and D'Silva (1994), they concluded that it is important to conduct CEA analysis within an agro-ecological framework since agricultural production is primarily a biological process that is highly dependent on the prevailing biophysical conditions. Jooste and Van Zyl (1999) iterated that agricultural suitability reveals the similarity in natural resource endowments and production potential, and hence complementarity on competitiveness in trade, between countries.

Table 1 shows the land suitability of crops relevant for this study in different regions.

Table 1: Land suitability for selected crops

Crop	Lowlands (zone1)	Foothills (zone 2)	Mountains (zone 3)	Senqu River Valley (zone 4)
Apples	Suitable	Suitable	Suitable	Suitable
Peaches	Suitable	Suitable	Temperature, frost limiting - unsuitable	Suitable
Asparagus	Suitable	Soils limiting	Soils limiting	Soils limiting
Cherries	Suitable	Suitable	Soils, temperature limiting	Temperature, location with regard to central market limiting

As the commodities being dealt with by this study are mainly long-term crops, variations in production over the crop cycle (a 20-year) must be valued before DRC is analysed. In this regard a similar approach is used than that used by Hassan and Olbrich (1999) to do a comparative analysis of the economic efficiency of water use by plantation forestry and irrigation agriculture in the Crocodile River catchment area in South Africa.

3.   Results of net private and economic profitability using the NPV approach

Net private and economic profitability for each crop in all agro-ecological zones is shown in Table 2. The results show that all enterprises that were analysed have higher private than economic profitability. Thus, should economic values of inputs and outputs prevail farmers would receive lower returns. The results show that the crops are effectively subsidised. One of the main reasons for this state of affairs can be traced back to the fact that the shadow exchange rate used to calculate shadow returns revealed that the Maloti was undervalued. An undervalued currency could stimulate investments, but the question arises whether returns on such investments can be sustained if the Maloti regain strength. The danger of an undervalued exchange coupled with the expectation that it will remain undervalued, could result in expansion of production that may not be sustainable when the currency strengthens.

Table 2: Private and economic profitability using NPV

Item	Lowlands	Foothills	Senqu River Valley	Mountains
Net private returns to land (Maloti)				
Apples	971608	768423	739041	854275
Asparagus	160515	-	-	-
Cherries	336573	-	-	-
Peaches	836987	525672	374417	-
Net economic returns to land (Maloti)				
Apples	784152	602382	565271	532262
Asparagus	152117	-	-	-
Cherries	263131	-	-	-
Peaches	700176	413107	289814	-

4.   The domestic resource cost analysis

The result of the RCR analysis is reported in Table 3 and summarised below:

- In the Lowlands zone all products have a RCR of lower than one indicating a comparative advantage. Cherries production has a relative weak comparative advantage compared with the other products investigated in this zone. Peaches show the strongest comparative advantage.

- In the Foothills only apples and peaches were investigated, and both show a comparative advantage of equal strength, which implies, amongst other things, that these crops are ideally suited for diversification.

- In the Senqu River Valley the result for apples and peaches are mixed, i.e. apples show a comparative advantage, whilst peaches show a comparative disadvantage. Moreover, peaches should not be produced in this zone since it extracts more value from the zone than it earns.

- In the Mountain zone, only apple production was analysed. The results show that this region has comparative advantage in producing apples. In other words the cost of domestic resources used to produce a kilogram of apples is less than the value added per kilogram of apples.

Table 3:   Resource cost ratios using NPV

Product	Lowlands	Foothills	Senqu River Valley	Mountains
Apples	0.24	0.36	0.36	0.35
Asparagus	0.20	-	-	-
Cherries	0.85	-	-	-
Peaches	0.13	0.36	1.33	-

5.   Sensitivity analysis

The analysis in the previous sections showed that the differences in private and economic profitability could mainly be explained by the difference that exists between the actual and shadow exchange rate. Distortions on the input side only contributed marginally to differences between private and economic profitability. However, cognisance should be taken that cost related to water and land was excluded from the analysis thus far due to current policy regimes pertaining to these to production factors. Hence, in this section the sensitivity of the RCR to changes in the exchange rate, introduction of land and water costs and the threshold price of products to remain efficient will be considered.

5.1   The effect of the foreign exchange changes on comparative advantage

Table 4 shows the RCRs for the products under investigation if the exchange rate depreciates by 20 per cent. As expected all products show improved RCR, i.e. a depreciation in the exchange rate improved the comparative advantage of the crops considered in the analysis; peaches that showed a comparative disadvantage in the previous section now has comparative advantage too. Also important to note is that the current analysis excludes the effect of changes in the exchange rate on input prices due to a lack of information related to the interaction between input prices and changes in the exchange rate. One could however expect that the effects will be lagged in nature, and the magnitude of the effect will be dependent on the amount of inputs (or its components/ingredients) that is imported.

Table 4:   Effect of exchange rate

Commodity	Lowlands	Foothills	Senqu River Valley	Mountains
Apples	0.16	0.21	0.20	0.19
Asparagus	0.15	-	-	-
Cherries	0.44	-	-	-
Peaches	0.09	0.22	0.57	-

5.2   Effect of changes in product price on comparative advantage

All products under investigation were tested for threshold sensitivity if the world prices decrease, with all other factors remaining constant. Table 5 shows the decrease in price that can be absorbed for the respective products before they lose their comparative advantage. For example, in the Lowlands zone apple prices can decline to up to 32 per cent before it will lose its comparative

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advantage. Asparagus production has the highest threshold value of the crops under consideration, whilst cherry production can only absorb a marginal decrease in prices. Important to note is that the bigger the share of production that are destined for exports, the higher the sensitivity towards changes in international prices. For example, high threshold value for asparagus can be attributed to the fact that low volumes of asparagus is exported, since most of the production is processed and the rest goes into the domestic market. The implication of this is that the more export orientated an industry is, the more sensitive is the industry to volatility in world market prices. Markets are build and maintained over long periods and hence it is important that an industry are able to withstand volatility in world market prices since it is very difficult to leave and enter markets at will.

Table 5:   Effect of a decrease in product prices

Commodity	Lowlands	Foothills	Senqu River Valley	Mountains
Apples	-33%	-19%	-16%	-17%
Asparagus	-82%	-	-	-
Cherries	-3%	-	-	-
Peaches	-45%	-21%	5%	-

5.3   The effect of land prices on comparative advantage

In this section land prices was assumed to be R2,000 per hectare. This is the market price for agricultural bare land in the neighbouring Eastern Free State where a market for different land types exists. For the purpose of the sensitivity analysis this price is assumed to be the same across all agro-ecological zones of Lesotho. The RCRs were therefore recalculated for an alternative price. Table 6 shows the results if the cost of land is included in the RCR analysis. All the crops experience a decline in comparative advantage; in fact where cherries showed a comparative advantage in Table 3 it now has a comparative disadvantage. Since the land price included in this study could be an under estimation of the actual land prices (due to a general paucity of information pertaining to the issue) the results holds important implications for policy makers in Lesotho when reforming the land market in Lesotho. It is not the purpose of this study to provide policy directions, but rather to show the possible impact of increased land prices on the comparative advantage of crops under investigation. Hence, this is an area that needs further in depth investigation.

Table 6:   Effect of land prices

Commodity	Lowlands	Foothills	Senqu River Valley	Mountains
Apples	0.28	0.45	0.47	0.45
Asparagus	0.36	-	-	-
Cherries	1.95	-	-	-
Peaches	0.17	0.53	3.28	-

5.4   The effect of water prices on efficiency ratios

Assuming that irrigation water in Lesotho might be paid for in future, the sensitivity analysis in this section will show the effect of water on the comparative advantage of the irrigated crops investigated. The results from the sensitivity analysis in Table 7 show that cherries in the Lowlands and peaches in the Senqu River Valley will not be efficient if Lesotho farmers pay for irrigation water.

Table 7:   Effect of water prices

Commodity	Lowlands	Foothills	Senqu River Valley	Mountains
Apples	0.28	0.45	0.48	0.46
Asparagus	-	-	-	-
Cherries	3.33	-	-	-
Peaches	0.20	0.80	10.03	-

6.   Conclusion

In this paper the extent of policy intervention on four high value crops in Lesotho was investigated. The results show that in general producers receive higher returns than would have been the case without any policy intervention, meaning that they are subsidized. Of particular importance is the impact of the exchange rate since it is in large a non-controllable factor for Lesotho since Lesotho is part of the Common Monetary Area, and as a result the Maloti are fixed to the South African Rand. This entails that economical and political issues, as well as exchange rate policy, in South Africa will directly affect the value of the Maloti. In this regard is important to take note that the South African economy is much more advanced than the Lesotho economy which might require different monetary incentives to grow.

The analysis also revealed that policies pertaining to land and water could have a significant impact on crops that could act as engines to reduce poverty and improve livelihoods in rural Lesotho.

Although the analysis did not investigate competitiveness per se, it revealed the status of comparative advantage that exists. This analysis could therefore serve as the basis for further analysis into the value chains of the crops that showed comparative advantages in order to point out interventions needed to improve their competitiveness locally and internationally.

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