Comparative Analysis of Tomato Value Chain Competitiveness in Selected Areas of Malawi and Mozambique

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Abstract

This paper discusses Tomato value-chain performance in Malawi and Mozambique using data collected from a market study commissioned by the International Centre for Tropical Agriculture (CIAT) as part of a regional research on conservation agriculture in maize-based farming systems in Sub-Saharan Africa (SSA). The results show that Malawi has a slightly higher competitive advantage in the production of tomato compared to Mozambique. Malawi's relative competitiveness in tomato is mainly due to slightly higher productivity and the cost advantage in labour (low wages) and irrigation costs. The paper proposes policy implications aimed at raising the productivity and trade competitiveness of tomato, as this will ensure the overall productivity of the maize-based smallholder farming systems in the two countries.

Key words: Tomato, value chain, competitiveness, Malawi, Mozambique

1. INTRODUCTION

Malawi and Mozambique are among the world's poor countries. Subsistence agriculture continues to employ the vast majority of the country's work force and smallholder agricultural productivity and productivity growth is weak (Cunguara et al. 2011; Chinsinga, 2007). In both countries, the agricultural sector is dualistic comprising of smallholder and commercial subsectors. The smallholder subsector cultivates most of the land and produces most of the food crops. The smallholder subsector is characterized by small land holdings of sizes averaging 0.5 hectares and 1.8 hectares in Malawi and Mozambique, respectively.

The Malawi economy is predominately agricultural with about 80% of the population living in rural areas. Agriculture, which has benefited from fertilizer subsidies since 2006, accounts for more than one-third of GDP (33.4%) and 90% of export revenues (Chinsinga, 2007; Government of Malawi, 2007). The contributions of the industry and services sectors to the GDP in 2010 were reported to be 21.7 percent and 44.9 percent, respectively. Malawi's real growth rate was estimated at 6.6 percent in 2010 with a per capita GDP of US$800 (Government of Malawi, 2010).

Mozambique's real growth rate in 2010 was reported at 7 percent with GDP per capita (in purchasing power parity) of US$1,000 (Donovan and Tostão, 2010). In Mozambique, the contributions of agriculture, industry and services to the GDP, in 2010, were reported to be 28.8 percent, 26 percent and 45.2 percent, respectively (Cunguara et al. 2011). Agriculture provides work for 80 percent of the economically active population, and 60 percent of the people working in the sector are female (Cunguara and Darnhofer, 2011).

The horticultural sector in both countries has the potential to generate considerably higher foreign exchange earnings compared to traditional cash crops. Improving the production of high-value horticultural crops would boost export revenues and reduce risks from the heavy reliance on a few export crops like tobacco, tea and sugar. Moti (2007) in his study of econometric analysis of horticulture production in Central and Eastern Ethiopia found out that horticulture could be away out for agricultural commercialization of small-scale farmers with relatively better agricultural resources potential. In addition to economic competitiveness, horticultural crops also offer other opportunities that make them more attractive than traditional cash crops. Traditionally, the rural areas have been bound to subsistence farming aimed at food security. However, after liberalizing the economy, more emphasis is put on market-oriented production. Horticultural crops have the potential to generate increased income in the rural areas. Increased income will allow farmers to have access to inputs (fertilizers and chemicals) as well as food. The result will be improved outputs, increased profitability and increased food security.

Tomato is an important vegetable in Malawi and Mozambique (Kumwenda and Chilanga, 2002; Mondjana et al., 2010). It is grown throughout the year both for cash and food (Spurling, 1972). A study by Thindwa and Khonje (2005) reported that most farmers (98%) reported tomato as the most profitable vegetable crop in Malawi. The main districts that grow tomato in Malawi include Mzuzu, Mzimba, Nkhatabay, Salima, Lilongwe, Dedza, Ntcheu and Thyolo. Similarly, tomato is an important source of food and income generation in Mozambique, and the crop is grown, all year around, in areas where favorable agro climatic conditions (temperature, water and soils) for horticulture production prevail (Roberta, 2009). These high potential regions include the valleys

of the Incomati, Umbeluzi and Limpopo Rivers in the south of Mozambique and the high altitude areas of Manica, Angonia, Lioma and Lichinga (Tembe, 1990).

Marketing is still a serious problem facing the horticulture sector. Major contributing factors include lack of organized marketing in terms of wholesale and retail markets. In Mozambique for a long time, trade of all kinds was hampered by the war, which disrupted transport and production, and involved emergency grain provisions. Socialist marketing policies also restricted prices and traders, although there was a large proportion of marketed produce which the state did not control. The combined result is that trade remains undeveloped, and NGOs often provide the links between traders and farmer associations (Bias and Donovan 2003: 78-84). Few smallholder farmers have organized groups to market their produce. As a result, the majority of smallholders are at the mercy of vendors when it is time to sell their produce. Incidents of vendors entering into cheap contractual agreements with producers such that the smallholder producers are obliged to sell all their produce to vendors at very low prices are common. The reality on the ground is that an informal but organized cartel of vendors prey on small-scale producers. Because of the long chain involved in marketing vegetables, the final consumer pays a higher price than necessary. Marketing channels involving up to five or six middlemen (vendors) were discovered in a study on the feasibility of wholesale marketing in Malawi in 2000 (Mwandira 2003). Distortions in the current marketing of horticultural products means prevailing prices do not reflect the real value of the services being rendered. Furthermore, marketing of most of the horticultural products in most markets seem to be controlled by ordinary street vendors organized into cartels that prevent producers from accessing lucrative markets (Kauta, 2003. The vendors offer very low prices to smallholder producers and sell at high prices to the consumers.

The other problem is poor processing and packaging. Adding value in processing, packaging, grading and sorting is also very limited and this contributes to the price distortions in the marketing chain. Lack of value adding prevents realizing the real value of horticultural produce. There is a need to invest in proper marketing infrastructure, which must include pack houses and refrigerated vans.

The rest of the article is organized as follows: Section 2 discusses the value chain approach followed by methodology and data sources in section 3: Section 4 is a discussion of underlying analytical framework which guided the study while section 5 deals with main results and discussion. Synthesis of the main findings, conclusions and policy implications are dealt with in sections 6 and 7, respectively.

2. THE VALUE CHAIN APPROACH

The value chain methodology is a tradition developed from two strains of literature: the business literature on strategy and organization of Porter (Porter 1990) and the literature of global commodity chains promoted by Gereffi (Gereffi, 1994, Gereffi and Korzeniewicz 1994; Gereffi, 1999; Gereffi and Kaplinsky, 2001; Gereffi and Memodovic, 2003; Gereffi, et al. 2005) and developed in numerous studies in the late 1990s. Agricultural value chains link urban consumption with rural production. Changing demand, as a consequence of urbanization, emergence of modern consumption patterns or new trends in international trade, impacts on rural areas along value chains and spills over to marketing and production systems (Hoffler and Maingi, 2005). Value chain analysis has gained considerable importance in recent years.

Although many definitions are applied, value chains essentially represent enterprises in which different producers and marketing companies work within their respective businesses to pursue one or more end-markets. The "value chain" is defined by Kaplinsky as "the full range of activities which are required to bring a product or service from conception, through the intermediary phases of production, delivery to final consumers, and final disposal after use" (Kaplinsky 2000). UNIDO (2009) describes it as the entire range of activities undertaken to bring a product from the initial input-supply stage, through various phases of processing, to its final market destination, and it includes its disposal after use. For instance, agro-food value chains encompass activities that take place at the farm or rural level, including input supply, and continue through handling, processing, storage, packaging, and distribution. As products move successively through the various stages, transactions take place between multiple chain stakeholders, money changes hands, information is exchanged and value is progressively added. Value chain participants sometimes cooperate to improve the overall competitiveness of the final product, but may also be completely unaware of the linkages between their operation and other upstream or downstream participants (Karl et al. 2009). Value chains therefore encompass all of the factors of production including land, labor, capital, technology, and inputs as well as all economic activities including input supply, production, transformation, handling, transport, marketing, and distribution necessary to create, sell, and deliver a product to a certain destination. By revealing strengths and weaknesses, value chain analysis helps identify possible corrective measures (UNIDO, 2009).

The value chain approach, by its conceptualization, provides an indicative picture of underlying costs, profits, and trade competitiveness of various crops at a particular point in time (Karl et al 2009). The competitiveness is measured against a defined benchmark at a particular point in

time. The results make sense only when defined within the specific context, both in terms of space and time. The analysis does not capture the variations existing among individual producers, local traders and processors who have their own cost structures that may vary significantly from the estimates used for this study. It is also worth noting that it was not possible to get relevant input from a wide range of stakeholders. As such the results may only be indicative of major trends, without the accuracy required to define specific cost structures associated with majority of players in the value-chains. The analysis does not also take into account seasonal variations in crop yield, price and market opportunities. As such, the results of the analysis should be interpreted with caution as they only provide indicative trade-offs associated with different investment decisions and policy mechanisms aimed at enhancing smallholder agricultural competitiveness in the three countries.

The specific value chain analysis we have done starts with the input supply level, then farm production and assembly. Due to data limitations, we have not considered the processing and distribution stages. At every stage, the analysis is based on enterprise budgets for the most typical crop production models and assembly transactions for each commodity up to the point where total accumulated value can most realistically be compared with an import or export parity price as a final measure of trade competitiveness. By identifying the types of costs that account for the majority of total value and where these costs occur, the approach is designed to help stakeholders, focus on critical areas where attention is required to overall competitiveness along the value chain.

This paper presents the results of an analysis of the competitiveness of Malawi and Mozambique in the production of smallholder tomato. The analysis is based on data collected through a market

study conducted in selected areas of the two countries at prices prevailing in the 2010/11 agriculture season. The analysis covers only the low level of smallholder management of tomato.

The specific objectives of the comparative value-chain study across the two countries were:

- ***To determine private costs and profitability of different stages in the value chain:*** Only by understanding the costs and returns to farming and the other stages of production and distribution until the final market that policy makers and development practitioners able to understand the incentives for production, processing, and exportation as well as the incentives for improvement in each stage along the chain.
- ***To understand cost composition of smallholder farm production:*** By analyzing the detailed cost structures of individual value chain participants, value chain analysis (VCA) can identify the types of costs that account for the majority of total value, and therefore focus on specific areas where new investment or other improvement could have the greatest impact on sector profitability and growth.
- ***To measure baseline trade competitiveness among smallholder farmers that will benefit from the project:*** This was aimed at exploring smallholder farmers' competitiveness in regional and global markets so as to assess how best to facilitate farmers' access to such markets as a way of optimizing their potential benefits from the project.

3. METHODOLOGY AND DATA

In value chain analysis, all inputs and outputs carry forward their inherited value from the previous stage. This concept is important to stress in value chain analysis where the focus is on accumulated costs at different stages as a key determinant of trade competitiveness (Karl et al. 2009; Sunderman et al. 2010). The competitiveness of any domestic product depends on the efficiency of input supply, farm production, assembly, processing, and logistics up to final delivery point where the good competes internationally as an export or import substitute. By looking at the cost composition at each stage of the value chain and comparing these costs with world standards, the methodology not only shows if the country is internationally competitive, but also helps identify key stages where costs could most effectively be reduced as a strategy for sector growth.

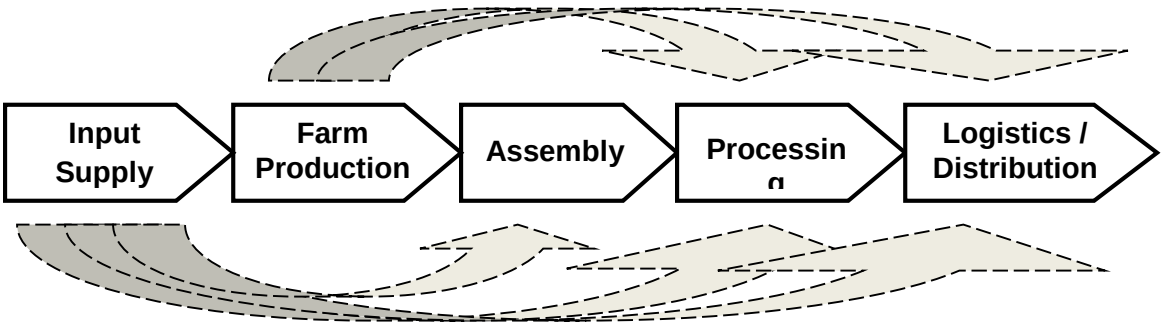

Figure 1: Stages of the Value Chain

Source: Tchale and Keyser, 2009

Data for this article was collected in selected sites of central Mozambique and Southern Malawi from July to September in 2011. These regions are dominated by the maize-mixed farming system. Principal livelihoods are based on maize, tobacco, cotton, grain legumes, small

ruminants, and poultry and off-farm work activities. In each country, 48 tomato farmers were randomly chosen and interviewed.

In addition, a limited number of input suppliers and crop traders were interviewed. The sample size of 48 was considered well enough considering the nature of our research problem. The sample size of 48 tomato farmers including other value chain actors interviewed provided enough data to answer the research questions of the study.

In addition to the household and trader interviews, complementary data on cost structure were obtained from brief literature review, key informant interviews, and sourcing of production information from crop research institutes and statistical abstracts. Some of the Malawi cost and return estimates were obtained from Mapemba (2009). Subsequent to the data collection and preliminary analysis, agricultural experts were consulted to validate the draft results and seek feedback on major bottlenecks and recommendations for improvement. The agricultural experts included agribusiness experts within CIAT, agribusiness experts from government research and development institutions in Malawi and Mozambique and agricultural value chain specialists from FAO. The initial crop budgets were examined against comments from industry stakeholders, corrected where appropriate and used to calibrate the models which have produced the results we have presented and discussed in this paper.

Table 1: Description of the smallholder and trader samples in the two countries

	Study countries	
	Malawi	**Mozambique**
Tomato farmers	48	48

Tomato traders	9	2
Input suppliers	2	2

Farmers were asked questions regarding their production and marketing of crops. From input procurement (input sources, prices, transportation, markets, challenges and many other aspects of input procurement), production (costs, methods, challenges e.g. crop pests and disease and marketing (transaction costs, marketing methods, marketing channels etc.) of their crops. The questions covered much ground regarding production and marketing of tomatoes and other crops. Input suppliers interviewed were asked questions regarding their input production, marketing and their roles in the crop value chain. Traders were also asked questions regarding their role in the crop (tomato and other crops) value chain.

4. ANALYTICAL FRAMEWORK

Based on these guiding principles, the analysis of Malawi's agriculture competitiveness was prepared using a specific methodology developed for a recent World Bank study on Competitive Commercial Agriculture in Africa (CCAA) (Keyser, 2006) also applied in Malawi by Tchale and Keyser (2010). The analytical Value-chain approach built through the CCAA is comprised of a set of interlinked Excel templates which are designed to calculate standard indicators of costs and profitability at each major stage of the production cycle. By filling in the elements of each template for individual commodities and farm systems, the methodology offers a practical way to establish benchmark prices that can be compared with international standards and identify

specific areas where costs can most effectively be reduced through policy change or other types of investments.

In the analytical approach, total costs are measured in terms of Domestic Value Added (DVA) and Shipment Value (SV), which constitute the main value chain indicators as follows.

(1) $DVA = X + Y + Z$ where DVA is the domestic value-added expressed in domestic or international currency units; X is the sum total of domestic costs and mark-ups by various players along the value-chain; Y is the sum total of domestic duties and taxes; and Z is the sum total of all unofficial charges and extra costs incurred along the value-chain.

(2) $SV = DVA + FC$ where SV is the shipment value, representing the total cost of producing and shipping the commodity to a foreign market; and FC is the sum total of all foreign costs incurred in the process of shipping a commodity to a foreign market, including any duties and taxes.

Individual countries mainly have influence over prices within their own borders. As such, the methodology is particularly interested in the composition of DVA as a leverage point for enhanced sector performance. These costs include legitimate business costs and mark-ups, official customs duties and taxes, and unofficial payments and bribes that sometimes have to be made to facilitate a particular operation. However for Malawi information on unofficial costs was unavailable and “domestic extras” were excluded from the analysis. We could not gather the information from the farmers and value chain actors included in the study. We therefore assumed zero unofficial costs in Malawi for that particular study period. If some cost accounts for a large

share of total value, or is significantly higher than an equivalent international benchmark, then new policies or investments focused on reducing that cost would likely be an effective strategy for improved competitiveness.

The final shipment value including foreign components is the most comprehensive measure of actual and potential competitiveness, when compared against regional or international benchmarks. Therefore, for any given commodity, trade competitiveness is determined by comparing SV at the final market with an equivalent parity price (either a Free on Board (FOB) price for exports or Cargo, Insurance, Freight (CIF) price for import substitutes). By examining the build-up of SV (and DVA) from stage to stage, the methodology reveals the competitiveness of the overall value-chain, including the various segments, and the key players along the chain. For example, if one stage accounts for a disproportionately large share of final shipment value, interventions focused on that part of the value chain is likely to have a significant impact on the overall competitiveness of the chain.

This approach to value chain analysis allows for comparisons of production cost and other aspects of sector performance across countries, so long as the structures being compared are relatively homogenous. Such comparative analysis has been applied to African countries such as Mozambique, Nigeria, Zambia and Cameroon, and international benchmark countries such as Brazil and Thailand (World Bank 2008). This type of cross-country comparisons produces some interesting results that help better understand development opportunities across countries. However, differences in data collection and the typification of crop models may imply that results cannot be compared exactly. Keyser (2008) gives more details of the CCAA results and discussion of the limitations of cross-country analysis.

It is also important to note that agricultural commodities take on different forms at each stage of the value chain. For example, the difference may be between a recently harvested farm product with high moisture content and one that has been assembled in a warehouse and dried for several months. Agricultural raw materials or intermediate goods may also be processed into one or more finished goods. For instance, seed cotton is processed into lint and seed while leaf tobacco is threshed to remove the tips and stems before export. Similarly, maize grain is processed into flour and tomato is processed into various commodities. DVA and SV are thus measured according to equations [1] and [2] on a per ton basis for the following product forms:

Farm production	Farm gate product
Assembly	Assembled raw material
Processing	Processed raw material
International logistics	Traded commodity

Finally, the value chain analysis is also interested in the private costs and returns that accrue to individual participants. Agriculture production, processing, and marketing begins with the decisions private investors make and it is important to have a sense of the underlying financial costs and profitability of competing enterprises first to determine if the system is viable and second to identify opportunities for poverty reduction. Because the methodology is constructed around enterprise budgets, these measurements are easy to make. At the farm level, private costs and returns are measured in per hectare and per ton terms; at later stages, values are measured in per MT terms only. From these indicators, calculations showing the rate of return to variable and

fixed expenditure, total investment requirements, demand for labor, and other components of private and social importance can be made.

In order to undertake the value-chain analysis using the quantitative methodology outlined above, a number of assumptions were used. These are presented as follows:

(i) **Farm management:** The analysis covers only the low level of management because over 90% of the farmers interviewed in all the two countries were classified under this category. This category is classified as FAM-low and implies that farmers follow a fairly basic management regime and use only the most essential farm inputs.

(ii) **Agriculture prices:** Unless noted, all prices reported in this paper are for the 2010/11 agriculture season. Farm input and output prices include transport up to the farm gate or other place where the next participant in the value chain takes over responsibility for that commodity. All prices are quoted in the local currency unit and are all expressed in the US$ using relevant exchange rates.

(iii) **Crop yields.** Crop yields reflect a realistic expectation in a year with "normal" growing conditions using low levels of inputs at smallholder farmer level. There are many variations, including seasonal growing conditions, local soil type, farmer skill, seed quality, and many other factors, that may affect the actual yields across countries, but we assume that factors affecting smallholder farming systems in these two countries are fairly similar, and therefore their yields should be comparable. The yields of fresh tomato were assumed to be 890 kg/ha and 950 kg/ha for Malawi and Mozambique, respectively. Tomato prices at farm level

were assumed to be US$320.00/ton and US$532.51/ton for Malawi and Mozambique, respectively. Tomato prices at assembly level were assumed to be US$431.30/ton and US$613.23/ton for Malawi and Mozambique, respectively. The average distance to tomato markets was estimated to be 6km for Malawi and 1.7 km for Mozambique.

(iv) **Family labor:** In calculating the DVA and SV, the value chain analysis uses an aggregate cost of all factors used in the production and marketing of each agricultural commodity. Since family labor often accounts for a large share of production costs, some proxy value is applied to impute the value of family labour. We therefore applied a proportion of the wage to value family labour i.e. at 60% of the rate for hired labor. Smallholder farmers rarely have the opportunity to sell their labor at the full wage rate and this approach is a simple way to impute the cost of family labour for purposes of competitiveness analysis. In all cases, the quantity of family labor was estimated on the basis of adult equivalents computed from household members based on their respective ages and gender, and applying proportionate adjustments for tasks that must be carried out over a limited number of days. Data on hired labour was collected directly using the structured household survey applied to households in selected areas in the two countries.

(v) **Investment costs.** The estimated per hectare (or per ton) cost of long term investments used at each stage of the value chain were estimated using the *capital recovery cost* method. The annual payment for simple equipment was estimated over its useful life as a basis for an estimated economic rate of return on the investment. This approach has the advantage over the simple division of an

input's value by its useful life as it accounts for the fact that if the farmer did not purchase the equipment, the money could have been invested in the next best alternative enterprise. This thus can be computed as follows:

Annual cost per hectare (or per MT) = purchase price of implement * per hectare (or per MT) share of total use * capital recovery factor. CRF = ((1+i)^n)*i/(1+i)^n-1 where i = real interest on savings and n = number of years in the implement's useful life. See Monke and Pearson, 1989 for a detailed discussion of this methodology.

(vi) **Domestic and international transportation costs.** For domestic routes a financial price of US$0.13 per ton per kilometer has been assumed based on average domestic transport costs in the two countries. This is the average price reported during data collection. The price is significantly low due to the prevalence of collective action in transporting tomato produce to the domestic markets. Moreover, the influence of adopting local means of transporting produce to markets e.g. scotch carts in most parts of Mozambique and Malawi lowered the average domestic transportation costs. **International transport.** The value chain analysis compares a country's final SV for each commodity with an international parity price, assumptions regarding road and sea freight prices are required. Since this data was not collected through the study instruments, assumptions were made based on national and international sources. For Malawi, information provided by the Ministry of Transport was used. For international transport costs for Malawi and Mozambique, an average cost of USD 80 per MT was used to calculate freight costs based on the SAFEX reference point at Randfontein to Harare plus

USD 40 per MT for onward freight from Harare to Blantyre (Malawi). Half the rates were used for Mozambique due to its proximity to the deep sea ports of Nacala and Beira.

5. MAIN RESULTS AND DISCUSSIONS

5.1 Farm-level

Table 2: Key variables used in the analysis

Variable	Malawi	Mozambique
Tomato yield (kg/ha)	890	950
Tomato price (farm-level) (US$/ton)*	320.00	532.51
Tomato price (assembly-level) (US$/ton)	431.30	613.23
Average distance to tomato markets (km)	6.00	1.7

(*) denotes fresh tomato.

Data on tomato production cost structure and returns, as well as value-chain profitability indicators are shown in Tables 2 and 3, respectively. In the case of Malawi, the results show that the average yield among tomato producers is 890 kg/ha (combined yield from two harvests per season). The tomato model assumes, as per the data, a seed-rate of 10kg/ha, application of both basal and top dressing fertilizer (NPK and Urea) and takes into the cost of the chemicals and the labour involved in spraying chemicals. As tomato production is labour-intensive, the model also

accounts for hired and family labour used. At the assembly level, transport costs and margins for the traders are considered in the analysis.

As shown in Table 3 below, the gross margin which accrues to Malawian smallholder farmers growing tomato is estimated at US$207.50 per hectare or US$233.15 per ton of tomato produced. In Malawi, most of the tomato is grown under small-scale irrigation systems in *dambos* (low lying areas with residual moisture and next to streams/rivers). Some farmers do grow tomato during the rainy season, but these are normally few because of high pest and disease infestation. In the analysis, we considered two harvests, the irrigated crop being the main crop.

The main variable costs incurred in tomato production include labour, both hired and family labour (29%), fertilizer (24%), chemicals (4%), seed (1%) and depreciation of capital equipment used for cultivation, irrigation, and harvesting (23%), and marketing (12%).

In the case of Mozambique, the results show that the average yield among tomato producers is 950 kg/ha (combined yield from two harvests per season). As with the other models, the tomato model assumes, as per the data, a seed-rate of 10kg/ha, application of both basal and top dressing fertilizer (NPK and Urea). The analysis takes into account the cost of the chemicals and the labour involved in spraying chemicals. The model also accounts for hired and family labour used. At the assembly level, transport costs and margins for the traders are considered in the analysis.

Farmers make a margin of about US$424/ha or US$449/ton of fresh tomato produced and sold. These high margins are attributed to the relatively higher tomato yield and farm-gate price

offered to Mozambican smallholder farmers relative to tomato growers in the other two countries. Furthermore, the total costs incurred by farmers are relatively lower.

Tomato production costs among smallholder farmers in Mozambique comprise fertilizer (44%), seed (8%), chemicals (6%), irrigation and machinery costs (6%), marketing (4%), and labour, both family and hired (17%).

Table 3: Comparative indicators of value-chain performance in tomato (Malawi and Mozambique)

	Malawi (US$/ha)	Mozambique (US$/ha)
Gross revenue	**284.80****	**503.22****
Production costs		
- Variable costs	77.30	79.04
- Estimated inv. cost	30.84	15.99
Gross Margin	**207.50****	**424.18****
Net farm income	**176.66****	**408.19****

*P<0.01; **P<0.001

5.2 Assembly Level

At the assembly (or trader) level, Malawian traders make about US$54/ton of fresh tomato as shown in Table 4. The cost structure leads to a total domestic value added (DVA) of US$285.09/ton and a shipment value (US$371.14/ton). This implies that it costs the trader

US$138.29 to procure a ton of fresh tomato, inclusive of the farm-level costs. If traders were to sell the fresh tomato outside of Malawi, they would incur about US$371 per ton. If the SV is higher than the export parity price, and against other competiting exporters, Malawian traders would not be competitive to export fresh tomato. Based on the comparison with the indicators for Mozambique, Malawian traders are more competitive even at the assembly level. However, the fresh tomato parity price, estimated at US$340/ton is much lower and therefore Malawian tomato would not be competitive against the export parity.

In the case of Mozambique, at the assembly level, the trader margins are estimated at about US$35 per ton of fresh tomato traded. Over 60% of the traders' costs are payments to tomato farmers, implying a much competitive price that is offered to tomato farmers, as shown in Table 4.

This implies that assembly level DVA is estimated at US$524/ton with an SV estimated at about US$594/ton of fresh tomato, as shown in Table 4 below. These are indicators are fairly high relative to those of Malawi, and would perhaps reduce the competitive edge that traders have over competitors. Given the low cost structure of tomato traders, the high domestic cost and shipment value indicators are mainly attributed to the high farm-gate price provided to farmers by assemblers, which may be a reflection of increased demand among consumers, and a fair amount of competition among tomato traders, thereby ensuring that higher consumer prices are passed on to the farmers through higher relative farm-gate prices. However, in many cases, the dilemna with high farm-gate prices is that they might lead to less competitiveness because they invariably increase the final shipment value.

Table 4: Assembly-level comparative indicators of value-chain performance in tomato (Malawi and Mozambique)

	Malawi (US$/ton)	Mozambique (US$/ton)
Gross revenue	**383.89***	**579.50***
Production costs		
- Crop purchase	284.80	503.22
- Variable costs	34.35	42.94
- Estimated inv. cost	11.16	15.11
Gross margin	**64.73**	**33.34**
Net farm income	**53.57***	**18.23***

*P<0.01; **P<0.001

5.3 Comparison of competitiveness in tomato trade

In terms of trade competitiveness, for Malawi, the total domestic value added (DVA) is estimated at US$285.09/ton and a shipment value (US$371.14/ton). This implies that it costs the farmer US$285 to produce a ton of tomato using the low management system. Due to foreign costs (most of which comprise transport costs), it costs the farmer US$371 to produce and export a ton of tomato from Malawi (around Ntcheu/Dedza area).

In the case of Mozambique, the total domestic value-added is US$524.34/ton with a shipment value of US$593.94/ton. As shown in Table 4, this high shipment value is due to the high

purchase price at the farm-level (US$503.22/ton, which is much higher compared to Malawi's US$284.80/ton). The duties, taxes and foreign costs for Mozambique are lower than those of Malawi, but Malawi still has competitive advantage in smallholder tomato production due to the lower purchase price at the farm-level (see Figure 2).

Table 5: Comparative indicators of tomato trade competitiveness (Malawi and Mozambique)

	Malawi (US$/ha)	Mozambique (US$/ha)
Domestic costs	262.42	502.31
Duties and tax	22.68	22.03
Additional expenses	-	-
Total DVA	**285.09**	**524.34**
Foreign costs	86.05	69.60
Total SV	**371.14**	**593.94**

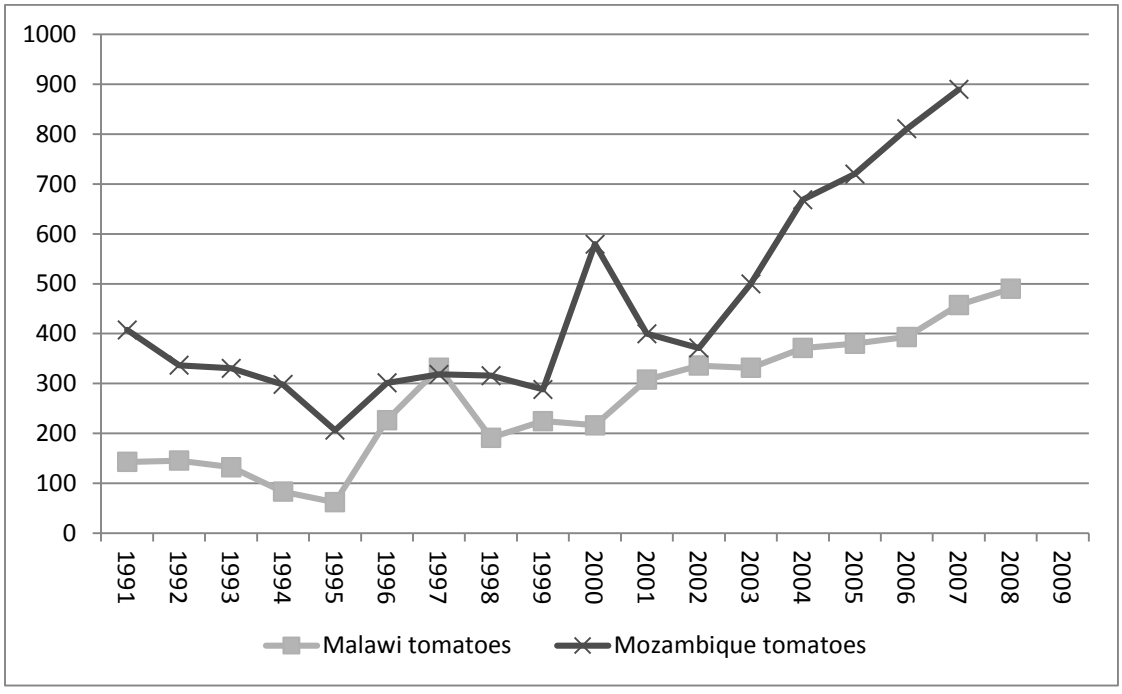

Figure 2: Domestic fresh tomato prices in Malawi and Mozambique (US$/ton)

Source: FAOSTAT, 2010

6. SYNTHESIS OF THE MAIN FINDINGS

There are four main factors that may explain the level of competitiveness in all the two countries in the study: These include: (i) farm-level productivity, (ii) cost of agricultural inputs, (iii) cost of transport and (iv) trader margins at the assembly level. We briefly describe, and where possible provide the evidence for each of these in the following sub-sections.

6.1 Low productivity

The study results indicate low tomato yields in both countries. Although tomato yield in Malawi is slightly lower (0.89t/ha) compared to Mozambique estimated at 0.95t/ha, both yield levels are low by regional and international standards. These yields represent less than 10% of the average yields estimated for the region (estimated at over 10t/ha). This implies that there is a lot of scope for promoting productivity in tomato production.

The very low yields in tomato are attributed to among other factors: the low levels of fertilizer intensity and use of low yielding crop varieties, mostly as a result of the high cost of agricultural inputs, especially in Malawi which is land locked and faces high levels of international transport costs compared to other countries such as Mozambique. We simulated the impact of raising productivity on net incomes and overall value-chain competitiveness and found that a 1% increase in productivity raises net profit and value-chain competitiveness by 3.5% in Malawi and over 5.5% in Mozambique.

6.2 Low levels of organization

The other challenge affecting tomato productivity is the low value obtained by smallholder farmers who mainly produce and sell the primary fresh tomato to consumers and processors. The value obtained at the farm-gate is only a small proportion of the total value of processed products such as canned peeled tomatoes, tomato paste, tomato sauce, dehydrated tomato flakes, tomato powder, tomato ketchup and many other processed products. Farmers should therefore be encouraged to organize themselves and undertake semi-processing (cleaning, grading and packing) so that they can obtain higher than the primary value. Both Malawi and Mozambique are easily accessible to the growing South African market, but to be able to compete there is need to raise productivity and be more organized than is currently the case where many farmers operate on an individual basis.

6.3 High cost of agricultural inputs as a result of high transport costs

Malawi's costs for fertilizer and other agricultural inputs are generally higher than most comparator countries. These countries, which are both far from deep water ports, normally face very high transport costs. The high costs of transport invariably increase the domestic price of inputs. We have limited evidence from the study, given that we did not control for the specific types of inputs, but indicative results attest to the fact that the cost structure faced by Malawian smallholder farmers is highly dominated by high input costs as a result of high foreign costs that largely constitute transport costs. For example, the major cost in Malawi is fertilizer (44%) while in Mozambique fertilizer constitutes only 24% of the total farm costs. See figure 3 and 4 respectively. The cost of pest management and irrigation is much lower in Mozambique (5%) compared to about 12% in the case of Malawi. Incidence of pest and disease attack was reported

slightly high in Malawi as compared to Mozambique. This to a certain extent justify high costs of chemicals, pest and disease management as shown in figures 3 and 4.

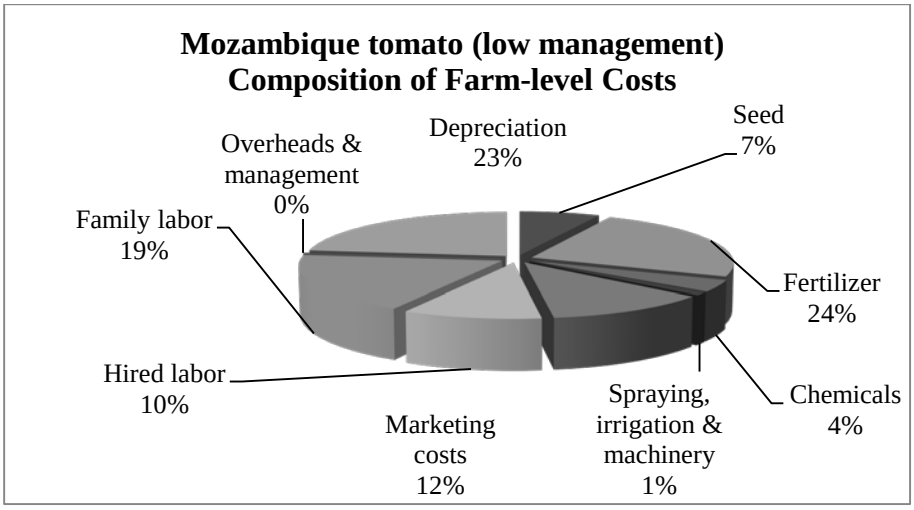

Figure 3: Composition of farm-level costs for tomato production in Mozambique

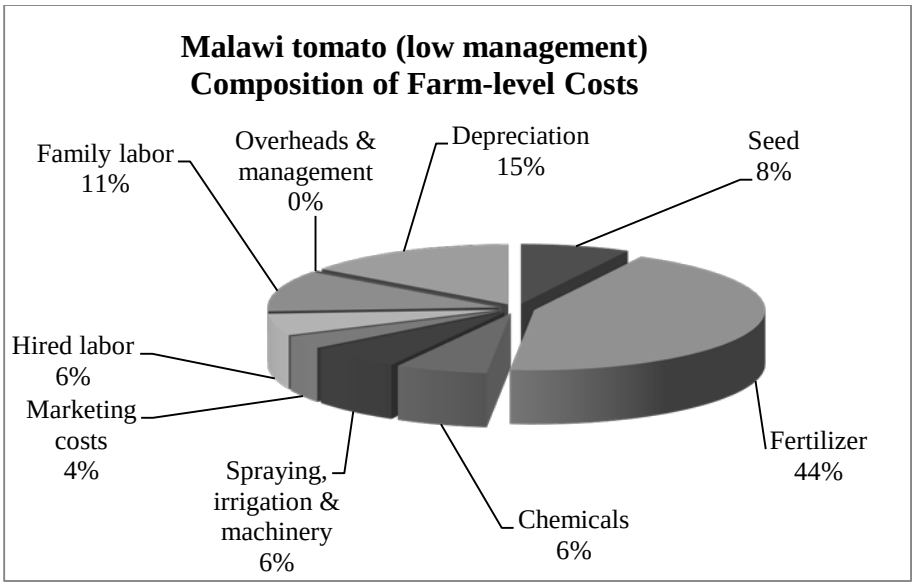

Figure 4: Composition of farm-level costs for tomato production in Malawi

6.4 Trader/Assembler margins

Findings from the study suggest higher margins that accrue to traders at the assembly level, especially in Malawi. We examined tomato traders' profit margin (per metric ton) at import parity and found that it is very high compared to the profit that accrues to the producer. This is because on average, traders handle more volume that producers, thereby making their total margin higher as a proportion of the farmers' margin. Such high margins are often attributed to high perceived transaction risks in the remote areas that often limit competition. As such only few traders with transport facilities are able to reach remote areas where they reap monopolistic rents. Through appropriate interventions that improve the development of private traders, thereby enhancing the structure of markets, it is possible that some of the margins that are captured by the traders could be passed on to the producers thereby improving the farm-gate prices. This, however, is linked to the extent and quality of public goods, such as access roads.

6.5. Trading of tomatoes

Tomato producers in the study were mainly found to trade their tomato at primary level. That is to say they sell their produce at the nearby trading center. Secondary trading to major cities in the two countries was found to be done mainly by individuals from outside production areas and with capital to do so. Tertiary level trading of tomato was done mainly in the city. The situation was the same in both Mozambique and Malawi.

7. CONCLUSION AND POLICY IMPLICATIONS

The study's main findings are that smallholder farmers from Malawi and Mozambique face different, albeit similar levels of competitiveness in the production of tomatoes produced under the rain-fed farming systems. Competiveness indicators for smallholder tomato show that Malawi has indicatively some competitive advantage in the production of tomato over Mozambican farmers.

The key factor that determines such low levels of competitive edge is the very low productivity in all the crops under study. Estimated smallholder productivity levels in both Mozambique and Malawi are quite low by regional and international standards. Secondly, due to high transport costs, Malawi faces relatively higher trader margins and intermediation costs along the value chains. Inorganic fertilizer and other agricultural inputs are costly mainly due to high international and domestic transport costs as well as high trader margins as a result of high transaction risks associated with agricultural input trading. It is therefore likely that the high cost of inputs further leads to low uptake of fertilizer and improved seed, leading to low uptake of improved technology.

The results imply that interventions in the smallholder sector should focus on improving agricultural productivity, because keeping all factors constant, it is likely that raising productivity alone would significantly raise the competitiveness of smallholder farmers in the two countries. Otherwise it will be futile to link these farmers to regional and international markets at such low levels of productivity, because they are unlikely to compete. Productivity is the most important factor towards improving agricultural competitiveness as a basis for improving farmer returns. Among other interventions, promotion of proven technological and institutional innovations that provide an incentive for private and public sector investments in agricultural research and development is critical and primary in order to unlock smallholder potential.

The study shows that productivity gains are more important than other cost savings along the value chain. Other gains aimed at improving returns and competitiveness among smallholder farmers would accrue from interventions aimed at reducing the cost of fertilizer, seed and other agricultural inputs. Among others, Governments need to continue investing in public goods aimed at reducing the transport costs, such as for example, reduction in domestic taxes and duties. These are relatively more critical for land-locked countries such as Malawi which face high transport costs. Furthermore, there is need to consider promoting innovative approaches in the management of fertilizer and other input supply chains i.e. through timely procurement and bulk-buying arrangements with other countries in the region so as to be able to get lower prices at the origin. Increasing the efficiency of inorganic fertilizers through technologies such as conservation agriculture would also improve the cost-effectiveness of inorganic fertilizer. The pay-off for smallholder farmers of such technologies is significant and would justify increased investments in research and development. Given the high cost of establishing viable research and development initiatives, it is worthwhile to promote regional investments.

The overall performance of value-chains, and the pay-off to smallholder farmers would also improve if appropriate interventions are made to improve the development of private traders, thereby enhancing the structure of commodity markets. This is likely to help smallholder farmers because some the margins that are captured by the traders, in both the input and output market, could be passed on to the producers thereby improving the farm-gate prices.

Acknowledgment

We gratefully acknowledge research funding from the Forum of Agricultural Research in Africa (FARA) and International Centre for Tropical Agriculture (CIAT). We also thank all reviewers for their comments and suggestions on earlier drafts of this article. In particular we are grateful to Dr. Katherine Snyder of CIAT for her detailed review of all sections of the paper. The authors would like to thank Janine Smit editorial services for editing the English language in this paper.

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