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An Analysis of the World Market for Mangos and its Importance for Developing Countries[1]

Jedele, Stefan, Angela Maria Hau, Matthias von Oppen
University of Hohenheim, Agricultural Marketing in the Tropics and Subtropics, 70593 Stuttgart, Germany

1 Introduction

To date, developing countries are facing massive economic and social problems. One possible way out of this misery seems to be the opening of the economy in order to participate in the gains arising from international trade. By increasing export volume and export revenues, developing countries expect to create a momentum and, thus, the impetus to stimulate the overall economy (Borchert, 2001: 497).

1.1 Problem Statement

The importance of trade for the development process cannot be denied and neither can the importance of agriculture for the overall economy. In the 1950s and 1960s, agriculture was predominantly viewed as an exploitation source of production factors for more dynamic sectors of the economy. This opinion has since been heavily rejected. The role of agriculture has been elevated from a sector merely supplying resources to nourish industrialization to a sector of utmost importance, which increases export earnings, improves the employment situation, and raises the level of food security of developing countries (Alexandratos, 1995: 257-258).

1.2 Objectives and Hypothesis

This paper deals with the importance of the world trade of agricultural products for developing countries. It examines and analyses the world mango market. The mango was chosen, as it is a typical example of an important horticultural export product for developing countries. In fact, mango makes up 50% of all tropical fruits produced worldwide. The objective is to depict and analyze the world mango production and flows and to create an interregional trade model, which shows how mango trade contributes to the welfare of the participating countries or regions.

As mentioned before, open economy and economic development go hand in hand. Increased openness, meaning less tariff and non-tariff barriers, ultimately leads to increased foreign trade and eventually increased domestic production. Increased foreign trade has a positive influence on export revenues and thus foreign exchange inflows, if the export value exceeds the import value. Therefore, it is the hypothesis that an expansion of mango export has a positive effect on both export revenues and social welfare of developing countries.

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2 Interregional Trade Model – Theory

An interregional trade model is used to describe and analyze the world mango flows. In the literature spatial location of economic activity is distinguished in three basic forms. Location analysis concerns questions regarding the optimal location of a specific economic activity within a defined area, whereas regional analysis groups economic activities in these areas. The third possibility is to look at spatial location by analyzing interregional trade. This means that one divides a given country or area into two or more regions and examines the trade, that is the buying and selling, of inputs or products between these regions (Oppen, von and Scott, 1976: 182).

An interregional trade model is based on six major assumptions. First, as mentioned in the previous paragraph, a specific area is divided into a certain number of regions. Second, to simplify the model, demand, supply and production of each region is assumed to be concentrated in one point. Third, the transportation costs of the traded products are known for each combination of the base points. Fourth, the production capacity of each product is defined as unlimited. Fifth, it is assumed that demand is known for each product and region. Furthermore, demand is considered to be a logarithmic function of price. Sixth, each region's product supply is known and the supplied quantity is nonnegative. These six assumptions allow for the formulation of a model "that accounts for the interaction of the spatially separated economic units" (Oppen, von and Scott, 1976: 186-187). The model is able to show volumes and structures of all product flows "that will minimize the aggregate transportation and production cost and determine the pricing system of all products that accompany the optimum allocation system" (Oppen, von and Scott, 1976: 187).

In an interregional trade model, as used here, net welfare is calculated as the sum of integrals of the individual functions of demand $D_j(x_j)dy_j$ minus the total of production $S_i(x_i)dx_i$ minus transaction costs $T_{ij}X_{ij}$ as can be seen in equation 1 (Oppen, von and Scott, 1976: 187).

$$NW(y,x,X) = \int_0^{y'} D_j(x_j)dy_j - \int_0^{x'} S_i(x_i)dx_i - T_{ij}X_{ij} \quad (1)$$

The following simple two-country model (Figure 1: Back-to-Back Diagram) further explains the concept of the interregional trade model. Two countries A and B both produce one product. The countries have different functions of supply and demand and therefore different equilibrium prices for this product. In country A volume q_A is supplied at the price p_A, in country B volume q_B is supplied at the price p_B. The price p_A in country A is lower than the price p_B in country B. If the two countries engage in trade and if transportation costs are neglected, the new equilibrium product price p' will eventually be between p_A and p_B. This means that people in country A have to pay more for the product and people in country B have to pay less. The producer surplus in country A increases, whereas it decreases in country B. The opposite applies to the consumer surplus. It increases in country B and decreases in country A. Overall, the aggregated welfare of both countries increases by the sum of the two triangles ABC and FGH. Country A increases its production from q_A to q'_A and exports quantity ($q'_A - q''_A$). Country B now produces less than in autarky (q'_B) and imports quantity ($q''_B - q'_B$).

If transportation costs t are included in the model, the new price p'_A in country A will be higher than in autarky and the new price p'_B in country B will be less than in autarky. The two prices will differ in the amount of the transportation costs t (see figure 1). Production and export (DE) in country A shrink compared to the situation without transportation costs – production in country B increases while its imports (JI) decrease. Still, the aggregated welfare of the two countries

(triangles DBE and FIJ) has increased compared to the autarky situation. However, it is less than in the case of no transportation costs by the sum of the two quadrilaterals ADEC and GHIJ.

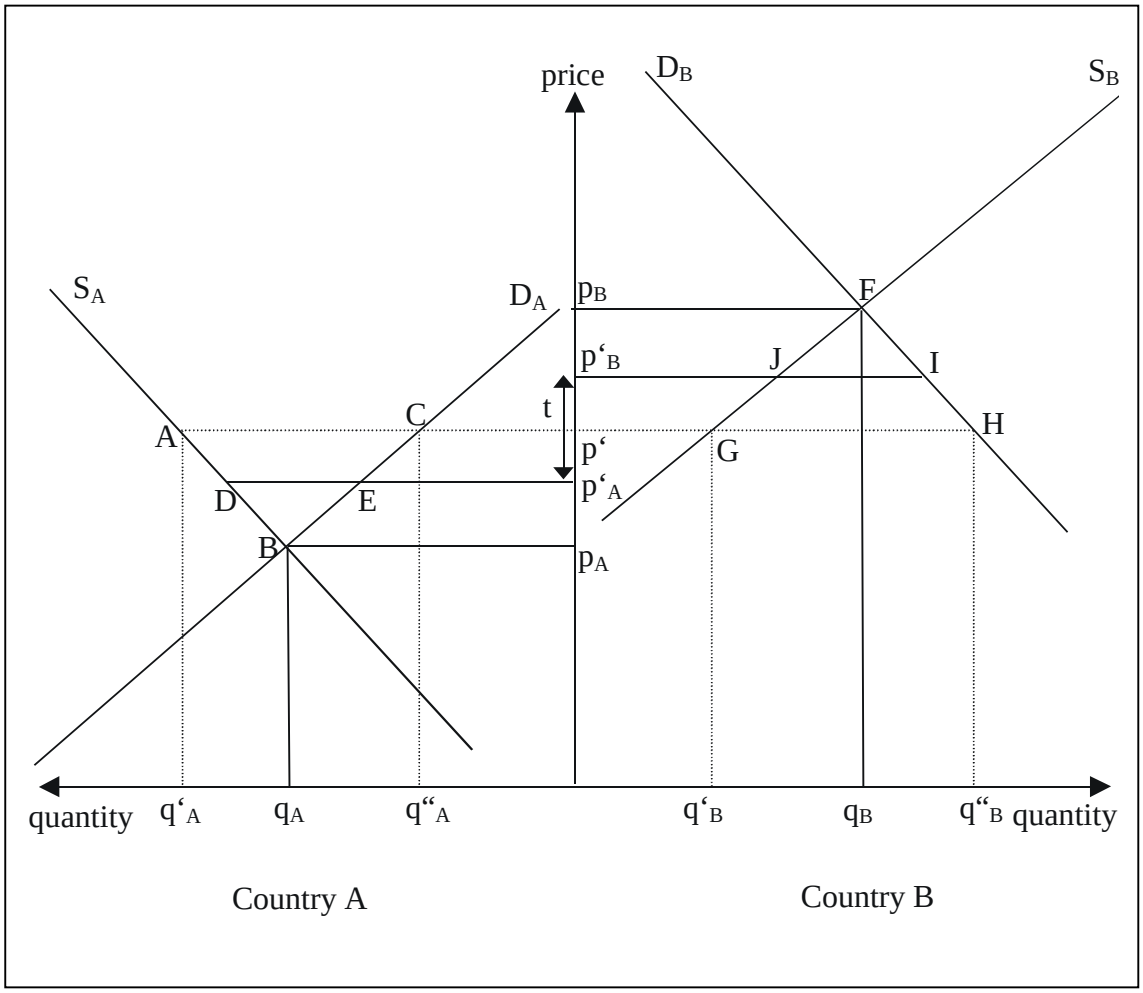

Figure 1: Back-to-Back Diagram
Source: Based on Gandolfo, 1994: 148-153 and Oppen, von and Scott, 1976: 187

The interregional trade model used in this analysis consists of seven regions, namely North America (United States of America and Canada), Latin America (all other countries from the American continent), Europe (including East European countries such as Poland, Lithuania and the Czech Republic), Africa, Arabia (Saudi Arabia, United Arab Emirates, Kuwait, Jordan, Iran, Iraq, Oman, Yemen, and Israel), as well as two Asian regions. The latter differentiate mango producing countries in Asia (Pakistan, India, Thailand, the Philippines, China, Sri Lanka, Indonesia, Vietnam, Malaysia, Laos, Cambodia, Bangladesh, and Australia) and non-mango producing countries in Asia (Japan, Hong Kong, Macao, Singapore, and the Republic of Korea).

The simulation has been calculated applying the computer program General Algebraic Modeling System (GAMS). The data necessary for computing net welfare are prices and quantities of demand and supply, transportation costs, and price elasticities of demand and supply. Most of the price, production, and trade data has been obtained from statistics of the Food and Agricultural Organization of the United Nations (FAO Statistics, 2002). Some information goes back to official publications of governments such as export and import statistics. Among these are

publications by the United States Department of Agriculture. The costs for international transportation of fresh mangos has been collected from several major container and shipping companies such as Maersk Sealand (2002), Hapag Lloyd (2002), Evergreen Marine Corporation (2002), and Orient Overseas Container Line Limited (2002). Import tariffs and duties are based on secondary sources, primarily on publications by the World Trade Organization and the Foreign Agricultural Service of the United States Department of Agriculture (2002). Price elasticities of demand and supply go back to research by Nurul Islam (1990: 46) and to the classic work of Johnston and Mellor (1961: 572). In developing countries the price elasticity of demand for tropical fruits is estimated to be –0.71 and in industrialized countries –1.04. Mango supply is virtually inelastic as there is practically no option for storage. In his article Islam (1990: 46) estimates price elasticity of fresh tropical fruit supply to be 0.48 for all countries. Albeit price elasticities of fresh tropical fruits supply of 0.48, it is assumed that the three major mango producing regions Africa, Latin America, and mango-producing Asia have supply elasticities of 0.58 because they tend to have a greater impact with changes in production and supply than the other regions.

3 World Mango Production and Trade

3.1 Production

Approximately 50% of all tropical fruits produced worldwide are mangos. As there has been increasing demand for mangos throughout the world, especially in the United States of America and in Europe, production has been increasing as well over the past decade (Department of Agriculture, 1996: 2). The Food and Agriculture Organization of the United Nations estimates worldwide production of mangos at more than 23 million tons in 2001. With 10 million tons India accounts for almost half of the world production of mangos, followed by China (3 million tons), Mexico (1.5 million tons) and Thailand (1.35 million tons) (FAO Statistics, 2002). In fact, the aggregated production of ten countries is responsible for roughly 80% of the entire world mango production. And most mango producing countries still have potential to increase their production. This is especially true for such countries as China, Indonesia, and Mexico (Department of Agriculture, 1996: 2).

One noticeable fact is that basically all of the mango producing countries (more than 99%) are either developing or emerging countries (Department of Agriculture, 1996: 2). Industrialized countries only have very limited mango production. Europe is not very active in the production of mangos. The same applies to the United States of America, which only have marginal mango production (under 3,000 tons in 1999) in Florida and Hawaii (FAO Statistics, 2002). The Australian mango industry is highly innovative and based upon research. The same applies to Israel. Both countries consider mangos a serious export industry and spend a lot of money for research and development of new and better varieties (Crane et al, 1997: 203-204).

All large mango producing countries have in common that the vast majority of their mangos are consumed domestically. In 1999, only 2% of all worldwide produced mangos were exported. The remaining 98% remained with consumers in the producing countries (own calculations based on FAO Statistics, 2002). Processed mangos only account for very small percentages of consumed mangos (in the range of one and two percent). Most processing is done by the farmers and their families for their own consumption or for selling it on local retail markets. Only a small part is commercial processing and intended for international trade (Department of Agriculture, 1996: 15-16).

3.2 Exports

Between 500 and 1,000 different varieties of mangos exist throughout the world according to different estimates – however, only a few are traded internationally (Morton, 1987 and Londonfruit, 2000). In 1999, the entire world mango trade was 576,000 tons. Mexico is the world's largest exporter of mangos, accounting for more than 200,000 tons (35% of global mango exports) in 1999. Brazil and India follow, each having a share of approximately 50,000 tons or 9%, respectively (FAO Statistics, 2002).

Mexico and other Latin American countries, mainly Brazil, Colombia, Ecuador, Guatemala, Haiti, Venezuela, and Peru are exporting the majority of their mangos to North America, especially to the United States of America, but also to the European Union. In fact, Mexico is the major supplier of the United States of America and Brazil is the major supplier of Europe (MarketAg, 2002). More than 91% (i.e. more than 186,000 tons) of all Mexican mango export is shipped to its neighboring country in the north (Crane et al, 1997: 207). The total volume of Latin American mango exports in 1999 was approximately 326,000 tons, almost half of all the world's mango exports (own calculations based on FAO Statistics, 2002). Major exporters from Africa are South Africa and Côte d'Ivoire. Their most important markets are France and the Netherlands as well as other countries from Europe. Other African suppliers include Kenya, Mali, Burkina Faso, Gambia, and Guinea (MarketAg, 2002). In 1999, total fresh mango exports from the entire African continent accumulated to more than 31,000 tons (own calculations based on FAO Statistics, 2002).

In the Middle East, Israel mostly produces for the European Union and regional markets. Fresh mango exports from Arabian countries, including Israel were 10,649 tons in 1999 (own calculations based on FAO Statistics, 2002 and MarketAg, 2002). Asia, the largest producer of mangos, exported close to 144,000 tons of fresh mangos in 1999. With less than one fourth of world mango exports, Asia is the second most important mango exporting region after Latin America. However, more than 4,600 tons are re-exports, especially from Hong Kong (own calculations based on FAO Statistics, 2002). The most important market for India and Pakistan is the United Kingdom. Other important mango exporters from Asia such as the Philippines, Australia, Taiwan and Thailand predominantly ship their varieties to regional Asian markets, especially to Japan, Singapore and Hong Kong. This is mainly due to the fact that consumers in the Far East have been familiar with mango and mango products for thousands of years whereas it is still a rather exotic fruit in the western hemisphere (MarketAg, 2002).

Europe's fresh mango exports of 64,000 tons are only intra-European re-exports. The fresh mangos arrive in the harbors of Rotterdam, Hamburg and Antwerp and are then distributed further among the countries in the Union (own calculations based on FAO Statistics, 2002 and MarketAG, 2002).

3.3 Imports

Mangos are rather unique in the way that they are imported in significant volumes by industrialized countries as well as by developing countries. Major importing regions are North America with 42% of global fresh mango imports, followed by Europe and the Far East, accounting for 24% and 17%, respectively. The countries of the Near East import 14%, Japan merely 3% of total world mangos. The developing world as a whole accounts for roughly one third of global mango imports, the Near and Far East being responsible for the largest volume of imports of developing countries (FAO, 2000: 115 and 118).

Ninety-five percent of fresh mango flows to North America go to the United States of America (220,000 tons in 1999). Significant importers of mangos from other regions of the world are the

United Arab Emirates, China and Malaysia, accounting for 38,000, 32,000 and 25,000 tons, respectively (FAO Statistics, 2002). Hong Kong is importing large volumes of mangos in order to re-export them to the United States of America, Saudi Arabia, and Singapore (Department of Agriculture, 1996: 15). The largest European importer of fresh mangos in regards to volume are the Netherlands (63,000 tons), followed by France (30,000 tons), Germany (24,000 tons) and the United Kingdom (23,000 tons) (FAO Statistics, 2002). The Netherlands account for almost one third of all imports into the European Union (FAO, 2000: 118). This is not surprising as mangos are usually shipped in containers by sea and Rotterdam is Europe's most important harbor (Hilpert, 1998: 178). Almost two-thirds of all Dutch mango imports are, however, re-exported to other European countries. The same applies to Belgium and France that also re-export a large share of their fresh mango imports. All in all, 63,000 tons of Europe's total 180,000 tons fresh mango imports are based on intra-European trade (FAO Statistics, 2002).

Demand for mangos is presently rising, especially in developed countries, as consumers become increasingly aware of this tropical fruit. For example, in the first half of the 1990s, mango demand in the United States of America has been increasing by 15 to 20% annually (Department of Agriculture, 1996: 13). This leads to increased mango production and ultimately to heavier competition for mango exporting countries. Producers have to pay more attention to appearance, quality and price of their mangos and cannot simply rely on volume exports to increase their revenues and gain foreign exchange (MarketAg, 2002).

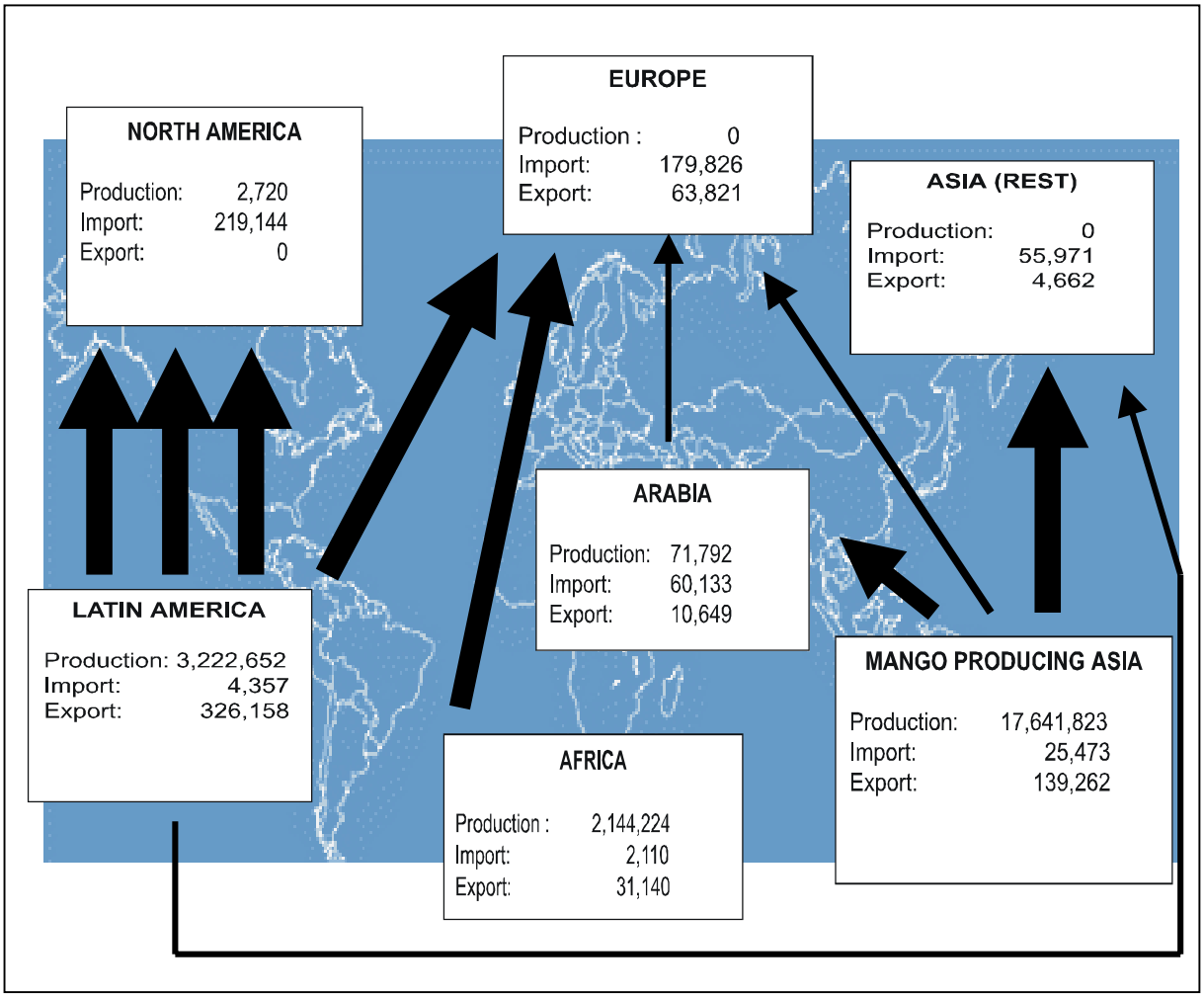

Figure 2: World Mango Flows 1999 (in tons)
Source: Based on MarketAg, 2002 and FAO Statistics, 2002

4 Results of the Interregional Trade Model for Mango

4.1. Results of Base Model

All data concerning each region's prices, quantities, and elasticities of supply and demand, as well as all transportation costs was entered into the computer model described above. The results of the calculations suggest that four of the seven regions engage in mango production. These regions are Africa, mango-producing Asia, as well as North and Latin America. The last three regions should only produce enough mangos for their domestic markets. However, Africa has a strong comparative advantage in mango production and should, therefore, supply its own market as well as Europe, Arabia and all non-mango-producing countries in Asia.

This means that, as an optimum solution, Africa produces 2.92 million tons of mangos out of which 2.38 million tons satisfy domestic demand. 229,797 tons are exported to Arabia, 98,114 tons to non-mango-producing Asian countries, and 220,410 tons to Europe. Mango-producing Asian countries should grow 22.06 million tons and Latin America 1.31 million tons, respectively, for their own markets. According to the model, the optimum production in North America is 99,839 tons of mangos. Total fresh mango production is 26.39 million tons. These volumes lead to a welfare of $1.16 billion[2] for Africa (11% of total world welfare). This is only topped by mango-producing Asia, which has by far the greatest welfare resulting from mango trade, namely $8.59 billion or 85% of the aggregated welfare. Latin America's welfare of $31.24 million is the lowest of all major mango-producing regions and only approximately three times the North American welfare – which is the lowest of all regions at $11.89 million. The net welfare of Arabia amounts to $158.80 million, non-mango-producing Asia achieves $57.93 million, and Europe $113.88 million. These five regions' welfares are only marginal with shares of less than 1 to 2% of total welfare. The aggregated welfare of all seven regions amounts to $10.12 billion. Consumer surplus is responsible for $6.07 billion or 59.9%. Aggregated producer surplus amounts to $4.05 billion or 40.1%.

The very small North American welfare from mango trade is due to the equilibrium prices of supply ($176 per ton) and demand ($2,350 per ton) and the equilibrium quantity of 99,839 tons of mangos suggested by the General Algebraic Modeling System. De facto, North American mango imports are more than twice as much.

The other three mango supplying regions (according to the model) offer their mangos at $267 per ton (mango-producing Asia), $312 per ton (Africa), and $38 per ton (Latin America). This leads to an average supply price of $198. Prices of demand in all regions vary between $45 per ton in mango-producing Asia and $2,350 per ton in North America. On average, the demand price in these seven regions is $597 per ton. If one excludes North America from the analysis, the average price of demand for one ton of mangos is $305.

4.2 Results of Reduced Tariffs Model

In order to calculate changes in regional welfare when tariffs are reduced it was assumed that the prices of supply in the base model include presently existing tariffs. For the reduced tariff scenario, it was necessary to eliminate current tariffs and use future tariffs instead. As producer prices and import prices date back to the second half of the past decade, the term 'current tariffs' refers to 1995 tariffs. 'Future tariffs' mean tariffs that countries agreed to implement according to the World Trade Organization by 2000 or following years. For example, the European Union had a tariff of 6% on mangos in 1995 and agreed to reduce it to zero by 2000 (Foreign Agricultural Service of the United States Department of Agriculture, 2002). Therefore, the price of fresh

[2] The '$' symbol refers to the currency of the United States of America.

mango supply from the first scenario ($1,115 per ton) was divided by 1.06 in order to derive the price with reduced tariffs ($1,052 per ton). The other regional demand prices were calculated accordingly, using their specific 1995 and 2000 tariffs. Comparable to the first scenario, the prices of demand per ton were assumed to be $237 greater than the prices of supply. All other data – price elasticities, transportation costs, and upper and lower boundaries – were assumed to be the same as in the first scenario.

Concerning the location of the mango production and directions of the world mango flows, the results from the scenario regarding „future tariffs“ show no differences compared to the base model. The main mango producing region is still Asia with a slight increase at 22.18 million tons. The model suggests that Latin and North American mango productions remain constant at 1.31 million tons and 99,839 tons, respectively. Again, the Latin and North American production is solely intended for domestic supply. According to the model, the only mango exporting region is Africa. In the case of reduced tariffs, the optimum African production is 3.21 million tons of mangos, 10% more than suggested in the base model. Export destinations are Arabia, Europe, and non-mango-producing Asian countries. Furthermore, it is proposed that North America increases its production for self-supply to 377,169 tons. Aggregated world mango production is 26.79 million tons according to the scenario. The average equilibrium supply price is $282 per ton and the average demand price is $649 per ton.

The aggregated producer surplus achieved by this scenario is $5.01 billion; the aggregated consumer surplus is $5.51 billion. Total world welfare accumulates to $10.52 billion. Net welfare in Africa is $1.68 billion, ranking second after mango-producing Asia ($8.67 billion). With almost $11.67 million, North America has the smallest welfare of all seven regions. According to the model, non-mango-producing Asia’s net welfare is $13.65 million. Europe’s welfare is similar to Latin America’s with $36.67 million and $31.27 million, respectively. The welfare of Arabia amounts to $79.08 million. Percentage wise, mango-producing Asia’s welfare accounts for 83% and Africa for 16% of the world’s total welfare. The share of the other five regions is one or less than one 1% each.

5. Conclusion and Outlook

A comparison of the two scenarios shows that the aggregated world welfare increases to if tariffs are reduced. In this case, the increase is 3.9% of the current welfare while the aggregated consumer surplus decreases by 9.2% and a tariff reduction raises the producer surplus by 23.5%.

Comparing changes in regional welfare, Africa shows the largest welfare gain (44.7% of the region’s current welfare). Mango-producing Asia is the only other region experiencing net welfare gains (9%). According to the simulation, net welfare of Latin America remains constant when tariffs are reduced as in the model. The welfare of all other four regions is reduced by values between $217,280 and $79.72 million.

The comparison shows that a reduction of tariffs leads to increased production and increased trade. It also proves that increased exports have a positive influence on the aggregated world welfare and on the welfare of at least two major mango-producing regions. Even though the model suggests that Asia should not export mangos the region’s welfare increases. Therefore, the hypothesis of this paper – an expansion of mango export has a positive effect on both export revenues and social welfare of developing countries – is only partly validated. The example of Africa proves that increased production and increased export is positively linked with welfare gains. As mentioned above Africa’s welfare gain due to reduced tariffs is 44.7%. Also, if the base model’s mangos are valued at current prices and the reduced tariff scenario’s mangos at

suggested prices, African revenues resulting from the production and export of fresh mangos increase. Presently, all African mangos are valued at $625.48 million (FAO Statistics, 2002). The base model suggests an optimum value of $912.54 million. African export revenues increase from $171.15 million to $361.19 million. In contrary welfare in mango-producing Asia increases solely through an increased production and supply of domestic consumers. However, it is questionable if the suggested focus on domestic Asian markets is reasonable.

Overall, the evaluation of present international mango trade shows that mangos are a very important export product for several developing countries from Asia, Africa, and Latin America. However, mango trade is relatively small compared to the actual production. This is especially true for Asian mango-producing countries, which have an aggregated share of 76% of total world mango production. Yet, the region is only responsible for 25% of all mango exports. As demand for fresh mangos is presently rising in industrialized countries, especially in the United States of America and in Europe, increased production and export of mangos offer a great possibility for the regions mentioned above to increase their welfare and nurture their development process. The simulations of the interregional trade model show that increased production and export are positively correlated with aggregated world welfare and with the welfare of mango-producing regions. Additionally, the models prove that tariff reductions lead to an expansion of trade and to increased export revenues for developing countries.

The analysis shows that mango is an important agricultural product for the economy of the developing countries in the tropics, both for domestic trade and for export. Production techniques should be improved in order to increase yield. A stronger focus on varieties that are demanded by foreign consumers could improve the countries' fresh mango export situation. This requires detailed research on consumer preferences in foreign countries and on new mango varieties that have a longer after-harvest life and, thus, allow for longer transportation times.

If export revenues from mango trade are used in a productive way, they can be a great contribution to the development process of mango-producing countries. It is important for these countries to concentrate on products that offer them comparative advantages – in most cases labor-intensive products. Yet, at the same time, other, more advanced industries should not be neglected.

References

Alexandratos, Nikos (editor) (1995), *World Agriculture: Towards 2010 – An FAO Study*, Chichester: Food and Agriculture Organization of the United Nations and John Wiley & Sons.

Borchert, Manfred (2001), *Außenwirtschaftslehre: Theorie und Politik*, 7. Auflage, Wiesbaden: Gabler Verlag.

Crane, J.H. et al (1997), *Crop Production*, in: Litz, Richard E. (editor), The Mango: Botany, Production and Uses: 203-256, New York: CAB International.

Department of Agriculture (1996), *Development Guideline for Mango Production in the 8th National Economic and Social Development Plan (1997-2001)* (translated from Thai original), Bangkok.

Evergreen Marine Corporation (2002), http://www.evergreen-marine.com/ date of download: March 28, 2002.

FAO (2000), *Agricultural Commodity Projections to 2005*, http://www.fao.org/waicent/faoinfo/economic/ESC/esce/escr/tropfruits/tropfPe.htm date of download: January 10, 2002.

FAO Statistics (2002), http://apps.fao.org/page/collections?subset=agriculture date of download: January 10, 2002.

Foreign Agricultural Service of the United States Department of Agriculture (2002), http://www.fas.usda.gov/scriptsw/wtopdf/wtopdf_lout.asp date of download: April 14, 2002.

Gandolfo, Giancarlo (1994), *International Economics I: The Pure Theory of International Trade*, Second, Revised Edition, Berlin: Springer-Verlag.

Hapag Lloyd (2002), http://hapag-lloyd.de, eva.gjersvik@hlag.de date of download: April 5, 2002.

Hilpert, Hanns Günther (1998), *Wirtschaftliche Integration in Ostasien in raumwirtschaftlicher Analyse, Schriften des ifo Instituts für Wirtschaftsforschung Nr. 146*, Berlin: Duncker & Humblot.

Islam, Nurul (1990), *Horticultural Exports of Developing Countries: Past Performances, Future Prospects, and Policy Issues*, Research Report 80, April 1990, International Food Policy Research Institute, Washington.

Johnston, Bruce F. and Mellor, John W. (1961), *The Role of Agriculture in Economic Development*, in: The American Economic Review Volume 51, 1.: 566-593, Nashville: American Economic Association.

Londonfruit (2000), *Facts and Myths*, www.londonfruit.com/mangofacts.html date of download: January 10, 2002.

Maersk Sealand (2002), http://www.maersksealand.com/
date of download: April 14, 2002.

MarketAg (2002), *World Market for Mango – RAP Market Information Bulletin No. 9*,
http://www.marketag.com/ma/bulletins/market/mango.stm
date of download: January 15, 2002.

Morton, Julia (1987), *Mango*, in: Morton, Julia F., Fruits of Warm Climates: 221-239,
http://newcrop.hort.purdue.edu/newcrop/nexus/Mangifera_indica_nex.html
date of download: January 15, 2002.

Oppen, von, Matthias and Scott, J.T. (1976), *A Spatial Equilibrium Model for Plant Location and Interregional Trade*, in: Abbott, John (editor) (1993), Agricultural and Food Marketing in Developing Countries: Selected Readings, Wallingford: C.A.B. International, in cooperation with Ede: The Technical Centre for Agricultural and Rural Co-Operation (CTA): 182-196.

Orient Overseas Container Line Limited (2002), http://www.oocl.com
date of download: April 15, 2002.