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Comparative Advantages of Tomato

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Foreword

The Syrian economy is gradually going through in-depth transformations for the last decade with an increasing exposure to international competition. The agro-industrial sector has a critical role in this transformation due to its contribution to the GDP, employment and its potential for diversifying sources of foreign currencies earning through exportation increase. However, this transformation poses a number of challenges in particular for several strategic crops that have benefited, or are benefiting, from various levels of trade protection and government support. To what extent these crops and their related agro-industries will be able to adjust to an open economic environment? Concurrently, for other crops that have not benefited from any particular public support during the past decades, the larger integration of the Syrian economy in the world market may provide new opportunities for expansion. However, in this case also, their actual capacity for competing with other countries exporting similar products remains an issue.

Policy makers need a comprehensive assessment of the potential impact of possible policy changes on the economic viability of these commodities. This assessment will assist policy makers in formulating the most relevant policies required to facilitate the adjustment of the agro-industrial sector and to anticipate and control any potential drawbacks on rural population welfare.

To this end the National Agricultural Policy Centre (NAPC), with the assistance of the FAO and the Government of Italy, has carried out, a systematic review of the comparative advantage of selected agricultural commodities (cotton, wheat, olive, tomato, orange and livestock) , the Comparative Advantage Study (CAS), in order to provide the necessary information base for decision making.

This report presents the results obtained for fresh tomato and tomato paste, while the results for the other commodity has been published in separate similar commodity reports that are available from the NAPC. A synthesis has been produced putting in perspective the status of each commodity and where the methodology applied is presented in details.

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Executive Summary

The scarcity of natural resources and the ongoing opening of Syrian economy to the world markets call for an urgent need to reallocate domestic resources and tradable inputs within the agricultural sector towards the objective of increase specialization based on comparative advantages.

Comparative advantages refer to the most cost-effective compromise between economic efficiency, social equity and environmental conservation in order to allow policy makers to consider to what extent the production of certain agricultural products allows to use domestic resources efficiently, or, in other words, if it is worthwhile to substitute local production with imports.

This report investigates Syrian tomato, the most important crop among the main vegetables in terms of production and productivity. The performance of the tomato sector is documented at the aggregate level in terms of production value and value added of marketing and processing to assess the efficiency and sustainability in the use of the available resources domestic and tradable inputs, in order to identify new and more stable opportunities for Syrian exports.

The study focuses on irrigated tomato, due to the high share of the area and the productivity of this type of production compared to rainfed tomato. In Syria, irrigated tomato can be grown in the open fields in three seasons: summer, autumn, and spring. Tomato is also grown in green houses. Along the commodity chain four agents may operate. The first is the farmer who produces the raw product and sometimes sells it directly; the second is the middleman who collects the production from the farmers and either sells it to the local wholesale market or to the processors; processing is conducted as either packed fresh tomato (mainly exported) or tomato paste (mainly sold locally). The final agent is the trader who is responsible for bringing the final product to either the domestic retail market or export.

In this study, the commodity system has been broken down into representative systems on the basis of the following criteria:

- The type of the main output produced (processed tomato paste or packed fresh tomato).
- The farm level technology (open field or green house).
- The market destination (Gulf countries or European markets).

Tomato production is concentrated in two governorates: Dara for open field tomato and Tartous for green house tomato, and therefore data at farm level have been collected from these two governorates. Packaging and processing plants are located mostly in Damascus where data on the post harvest activities have been collected.

The data has been elaborated by the NAPC comparative advantage team and budgets have been constructed by using Excel spreadsheets prepared by the international consultant, Mr. Frédéric Lançon.

Tomato private and social profitability has been assessed using the Policy Analysis Matrix (PAM). Four PAMs have been constructed for fresh open field tomato, regional and international fresh green house tomato, as well as for low concentrate tomato paste by using data at the farm, processing and marketing level. The methodology leads to the construction of

an aggregated budget evaluated at both private and social prices for each agent. The private price, actual market price, is the price that is influenced by the existing policies. Social price, on the other hand, is the price that would prevail in the absence of policy or market induced distortions and is intended to reflect the scarcity of any resources for the entire society. These budgets present revenues, costs and profits. Costs are disaggregated into three main groups: fixed costs, intermediate input, and direct labor. Also, budgets distinguish, within each cost category, between tradable goods and domestic resources (labor and capital). By definition, tradable goods are goods that can be traded internationally and include the goods produced by the system (the output) and all intermediate inputs, whereas domestic factors are those that cannot be traded internationally, such as labor, land and capital.

In order to compare the economic costs of production (inclusive of implicit compensation of domestic resources) to international price references, a number of hypotheses have been made on the value of parity prices for tradable outputs, on macro-economic aggregates (such as the exchange rate and the interest rate) and on prevailing distortions in domestic factors markets.

By using this method, a set of indicators of comparative advantages have emerged. All results indicate that the Syrian tomato sector has a comparative advantage for the four representative systems analyzed, both under the current policies and in the case of absence of government intervention. With reference to the DRC indicator, tomato has a strong comparative advantage (DRC less than 0.5) for all four systems. Moreover, the results indicate that the systems of fresh green house packed tomato and tomato paste display negative transfers from these commodity systems to the rest of the economy, which means, in other words, that these systems are taxed. Explicit taxes are applied mainly on the packaging materials, such as jars, bottles and others, whereas implicit taxes are imposed by the high transaction costs and the presence of non tariff barriers (entry price).

In addition, an analysis was carried out to evaluate the sensitivity of the PAM's indicators to the following parameters: interest rate, exchange rate, processing conversion ratios, parity price of the main output, farm level yields. The results of this analysis indicate that the parity price of the main output and yield are the most crucial parameters among those that significantly influence the value of the DRC. The variations of the parity price and of the yields retained in the analysis follow the pattern of variations observed over the last decade. A simulation was carried out for the systems, using these variation ranges for those two parameters to evaluate the probability of having a DRC below unity. The results indicate that fresh tomatoes and tomato paste will enjoy comparative advantage under all price and yield conditions as recorded in the past ten years.

Finally, although, as said, the tomato sector is subject to implicit taxation (especially due to the very high tax levied on packing material, which makes the share of these costs reach the levels of 10-15% and more than 40% for fresh tomato and tomato paste respectively), it still has a strong comparative advantage.

Despite these positive findings, this report stresses the importance to improve and diversify the Syrian tomato industry to cope with the evolving demands of international markets.

Chapter 1 -Background and Justification

With the gradual shift from a state led to a market driven economy, combined with an increasing opening to the world economy and the corresponding competition with foreign suppliers, the comparative advantage of Syrian agriculture represents a crucial issue for policy formulation. A comparative advantages analysis aims at understanding if a country has to produce a good with its own domestic resources (labor, capital, land) to supply the national market, and possibly to export, or to import the good and to reallocate saved domestic resources, which are limited by assumption to the production of another good enjoying comparative advantage. Thus, policy makers can consider to what extent the productions of certain agricultural products allow to use efficiently domestic resources and if it is worthwhile to substitute local production with imports. Similarly, policy maker could identify which products might be promoted to supply the local, as well as the international market, to make the best use of domestic resources, responding to new international trade opportunities.

This technical report presents the results of a study carried out on the comparative advantages of the main tomato commodity chains in order to assess the ability of the vegetable sector to respond to its export challenges within the regional and international vegetable markets.

This Chapter presents the applied policies until 2003 and the place of tomato in the agricultural sector.

1.1. Policy issues

Syria has a favourable natural environment, characterized by a variety of producing regions, allowing keeping production activities throughout the year for tomato and other vegetables. Thus, Syria can make use of the opportunity of both the availability of supply and seasonal price competitiveness to expand its exports by identifying seasons for which Syrian prices are below producer prices in neighboring and other countries. Therefore, there is a space for tomato market to become crucial for Syrian consumption and export strategy (Alvares-Coque 2003). Moreover, tomato is a market driven crop and has received fewer subsidies. In addition, it may be considered as a crop in development that could provide alternative income to farmers and, through exports, for the economy as a whole.

Syria has been performing relatively well in exporting fruit and vegetables especially to the Arab countries. Currently, Syrian Government interest is devoted to improve its export performance to other countries; for example, EU, eastern and central Europe markets. To this end, Government has removed all the taxes related to the agricultural production and the tax on export profit¹.

Consequently, Syria has started to reform its policy from farm level up to the marketing level. Open field and green house tomatoes are planted according to the annual indicative planning procedures authorized by MAAR. Also, the government encourages farmer adopting new

¹Decree no. 15 dated 3/7/ 2001.

irrigation systems and currently many farmers have adopted this technology. Furthermore, there are reforms concerning the processors that are allowed:

- to import used packing, sorting, and waxing lines stipulated that manufacturing year is not more than 4 years old,
- to choose appropriate land and location to establish packaging houses².

Among Arab states, the government supports local production through a favorable trade policy that includes fresh tomato in the products subject to the GAFTA agricultural calendar. Since 1998, traders have the permission to trade the vegetables and fruits according to the Agriculture Calendar of AFTA³ with a tariff reduction of 10% till 2007. In the last two years before the full implementation of AFTA agreement 20% of tariff reduction have been applied.

In fact, only in given periods during the year, tomato is exempted from import tax, while outside such period's tomato imports are subject to a 29% tax. Noticeably, tomato paste imports are subject to a 102% tax.⁴

The Syrian negotiation with the EU association has allowed Syria to take significant shares of tomato about 15000 tons to be exported to the EU and exempted from the custom duties.

The commodity systems including tomato have also benefited from the following financial reforms implemented by the government:

- allowing private exporters to keep 100% of their export earnings⁵,
- reducing the tax on export earnings per dollar from 5% to 1% in 2002, and recently, eliminating this tax, and unifying the exchange rates⁶,
- allowing duty free import of vehicles that are no more than 5 years old⁷, and
- allowing Turkish trucks to enter Syria⁸.

1.2. Place of tomato in Agriculture

1.2.1. Place of tomato in the agricultural sector and its trends

In 2002, the agricultural sector contributed to 27% of total GDP. **In this regard**, the vegetable and fruit sector increasingly plays a crucial role. During the last three decades, vegetable and fruit production has significantly improved due to the expansion of cropped area and the intensification of cropping practices. Therefore, in 2002 it accounted for a good share of total agricultural production, with vegetables accounting for 3.8 % and fruit for 15.4%; also representing, respectively, 6.8% and 27.5% of the total plant production⁹. Supplies of such crops have significantly increased responding to consumption increase and population growth¹⁰.

Tomato production with regard to vegetable production is of major relevance. Tomato has a high production growth rate and accounts for 31% of the value of the total vegetable production. Indeed, this high growth rate (9.5% during the period 1993-2002) has caused a saturation of the local demand leading to a significant surplus of tomato products. New export market opportunities are emerging in the region and beyond, which will contribute to income growth of the sector particularly rural population.

² National consultant interview.

³ Currently, this calendar is out of application.

⁴ Ministry of Finance - General Customs Department . Customs tariff spreadsheet by harmonies system.

⁵ Decree no. 1100 dated 15/7/2003.

⁶ For more details see Syrian Agricultural Trade 2004, NAPC.

⁷ Decree no. 672 on May 18, 2002.

⁸ Generalization no. 17854 of September 2001.

⁹ Analysis of the current situation of the agricultural sector, 1992-2003.

¹⁰ Estimated at 2.45% per year.

Moreover, the value of tomato production increased by 62 % from 1998 to 2002. Table 1.1 shows that tomato is the most important crop among the main vegetables in terms of production (with a share of 45%) and productivity.

Table 1.1. Area, production and yield of major Syrian vegetables, 2002

Crop	Area (000 ha)	Production (000 MT)	Yield (MT/ha)
Potato	24	513	21
Water melon	23	97	20
Tomato	19	900	47
Dry onion	5	480	19
Total	71	1990	

Source: MAAR 2002.

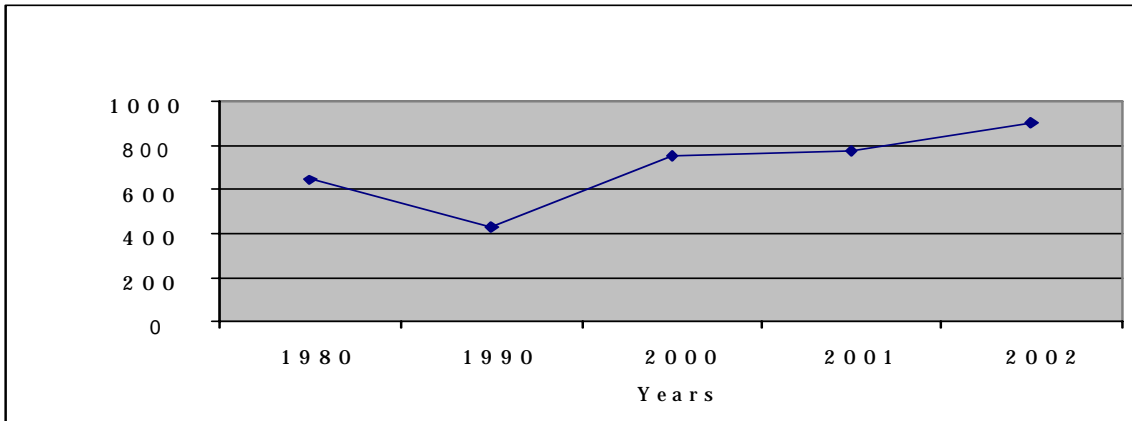
In 2002, the share of tomato in total vegetables was 14%, and the total area under irrigated tomato accounted for 11 % of total irrigated vegetables; the total cultivable area of tomato accounted for 19 thousand ha of which 78% was irrigated (the trend of the non irrigated area has decreased by 30% from 1993 to 2002). Besides, tomato is a perishable crop and its prices fluctuate to a great extent, affecting substantially the cultivated area of open field tomato. In the case of the green house tomato however the impact of the price and other factors on the cultivated area is less effective due to the following reasons:

- Green house production is considered as an early season, therefore the price is always relatively high.
- Green house tomato is based on heavy investment.
- Green house tomato is mainly used for fresh consumption.
- There is an extra demand of green house tomato outside local market.

The total production of tomato was 900 thousand MT in 2002, of which 98% is irrigated and 2% non - irrigated. Figure 1.1 shows tomato production has significantly increased by more than two folds; from 400 thousand tons in 1993 to 900 thousand tons in 2002 due to the following reasons:

- Adoption of new varieties (high yield varieties).
- Adoption of drip irrigation system.
- Establishment of new government irrigation projects.

Figure 1.1. Trend of tomato production, 1980 - 2002 (thousand tons)

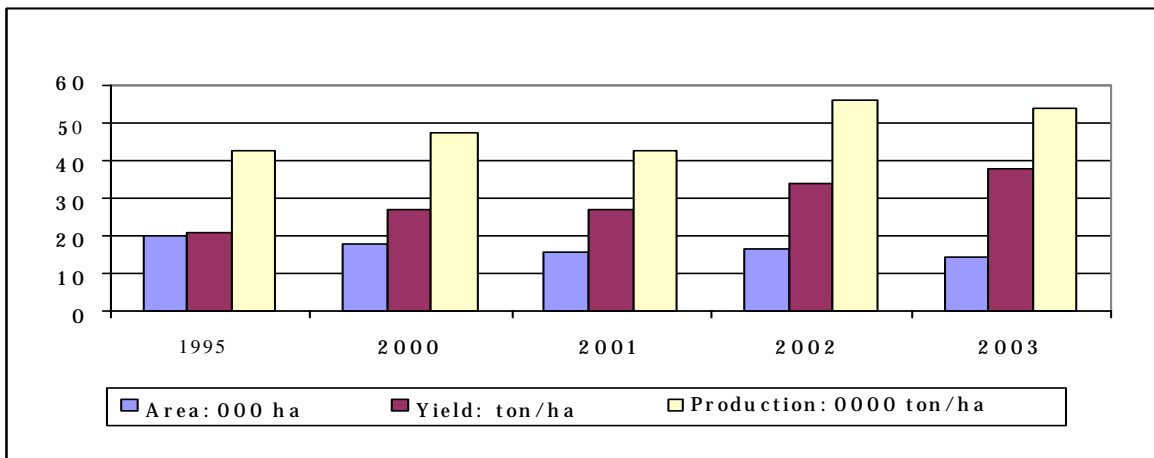


Source: NAPC Database.

Noticeably, there is a great difference in the productivity between irrigated and rainfed areas. In 2002, the yield accounted for about 60000 ton/ha in irrigated areas, and 5000 ton/ha in non-irrigated (2002).

Figure 1.2 shows that there is a decrease in the planted area under open field tomato, and productivity doubled from 1995 to 2003. The increase in productivity is related to the intensification and diversification strategies instead of area expansion.

Figure 1.2. Development of the area, yield and production of open field tomato, 1995-2003



Source: NAPC Database.

Furthermore, the domestic demand of processed food (like tomato paste and other processed tomato) is also likely to grow at a rapid pace as a result of population and income growth. The changing patterns of consumption in urban areas (where female employment is increasing and time for producing food at home is reduced), the increase in consumption of fast food and food outside the households will most probably boost demand for processed tomato. The agro-industry should, therefore, expand considerably to cope with the growing demand.

Table 1.2 compares the per person monthly quantities consumed of main vegetables between two surveys and shows that the consumption of vegetables, including tomatoes, is increasing.

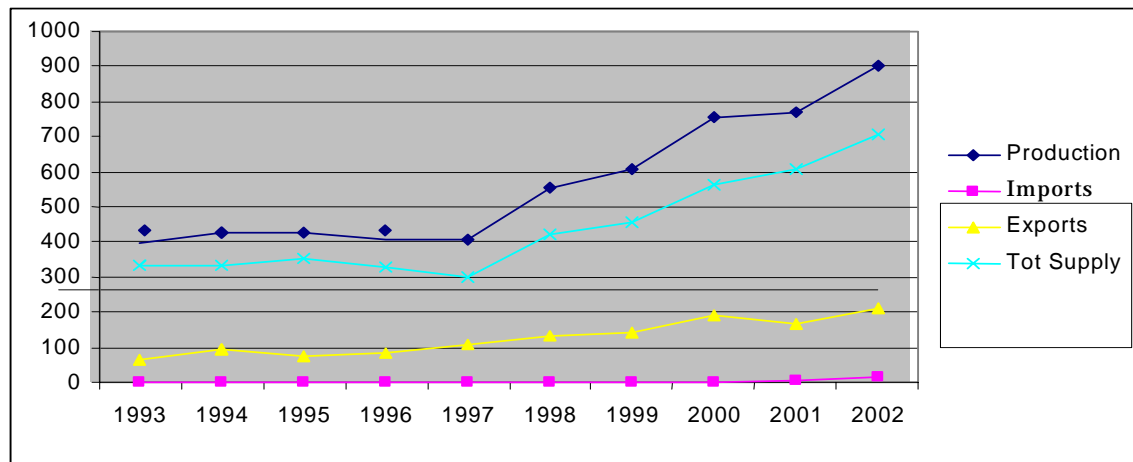
Table 1.2. Monthly average per capita consumption of selected vegetables, 96-97 and 2003-2004 (kg)

Commodity	1996-1997		2003-2004	
	Urban	Rural	Urban	Rural
Tomato	3.96	4.24	4.03	4.62
Potato	1.61	2.13	2.20	3.03
Egg plant	1.46	1.33	1.58	1.83
Cucumber	1.31	1.19	1.94	2.13
Dry onion	0.61	0.78	0.71	0.79

Source: NAPC, SOFAS 2002 and CBS, Household Survey 2003-2004.

1.2.2. Place of tomato and its derived products in Syrian trade

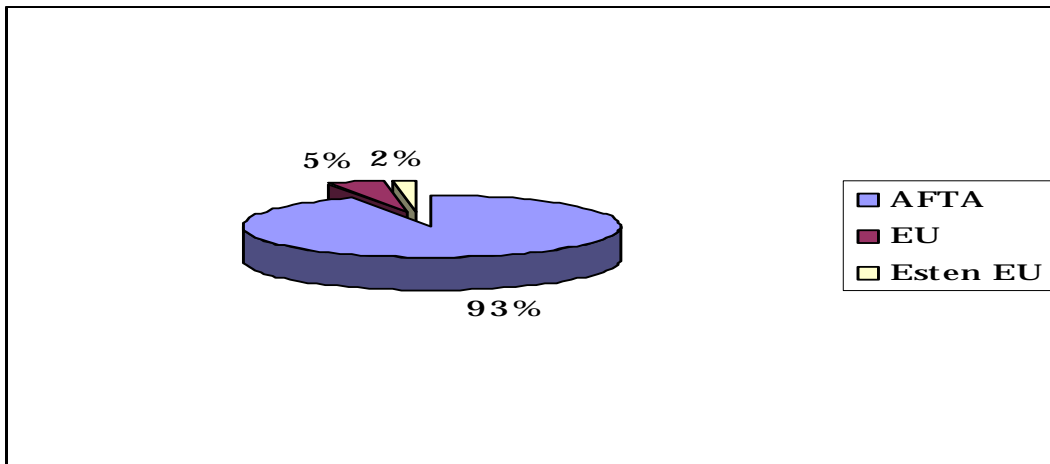
Total agricultural exports in 2002 valued 61 billion SP, out of which 3 billion SP is the value of total exported tomato (fresh tomato and tomato paste), representing 5% and 48% of total agricultural and vegetable exports, respectively¹¹. The share of exported vegetables and tomato in total agricultural exports was 46% and 10%, respectively. Fresh tomato and tomato paste shares were 48% and 5% of the total exported vegetables respectively. Figure 1.3 traces the evolution of tomato production, imports, exports and total supply. Accordingly, it can be concluded that tomato production, total supply and exports have significantly increased. Therefore, Syria is interested in improving its export performance of vegetables. The main destinations of exports are AFTA and EU markets. Figure 1.4 depicts the distribution of these destinations. The AFTA region, however, has the major share (93%) of the Syrian tomato exports.

Figure 1.3. Tomato production, import, export and total supply, 1993-2002 (thousand tons)

Source: NAPC Database.

¹¹ NAPC Database.

Figure 1.4. Distribution of exported tomato among countries, 2002 (%)



Source: NAPC Database.
Esten EU = Eastern EU.

1.3. Objectives of the study

Tomato has been selected to be covered by this study as a promising crop which may have new international market opportunities in order to assess performance, efficiency, government intervention and market distortions through:

- Describing the tomato commodity chain from primary production to final consumption to determine the internal relationships among the agents and to select the representative systems taking into account the major cropping systems, marketing and processing;
- Identifying the agents' characteristics, constructing an aggregated budget and decomposing the budget's items into tradable and domestic factors in order to calculate the policy analysis matrix;
- Calculating the policy analysis matrix and its indicators of comparative advantages to estimate the performance of the agents;
- Evaluating the sensitivity of the PAM's indicators to assess the relative impact of the selected parameters on the agents' performance;
- Providing policy makers with adequate recommendations that help the sector development.

Chapter 2 - Description of the Commodity System

Tomato harvest results from two types of production systems namely open field and green house tomatoes. Furthermore, the marketing channels of tomato can be divided into the following lines:

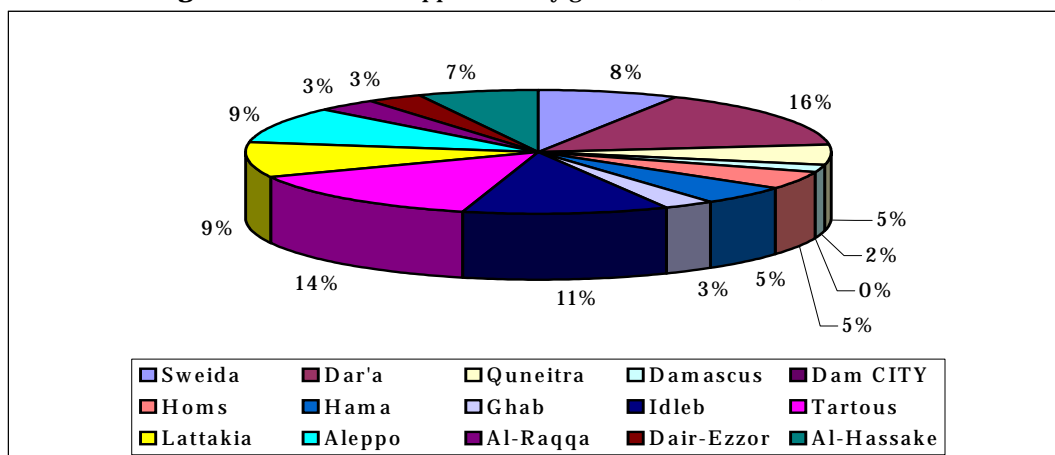
- Packed open field tomato to regional markets, representing 25% of the total production.
- Other open field tomatoes, of which 10% is used for processing and 65% for fresh consumption.
- Green house tomato of which 20% is used as packed tomato and the rest as bulk fresh tomato.

2.1. Description of the main cropping systems

Tomato is planted according to the annual indicative plan taking into account the agricultural rotation in each "mantika" (district). Tomatoes are mainly cultivated on irrigated land (78%).

During the last decade, the irrigated area has increased by 5% and the production by 139% as a result of the use of improved seeds that led to a significant improvement in yields. The geographical distribution of production concentrates in Dar'a, Tartous and Idleb which account for more than 60% of total tomato production (figure 2.1).

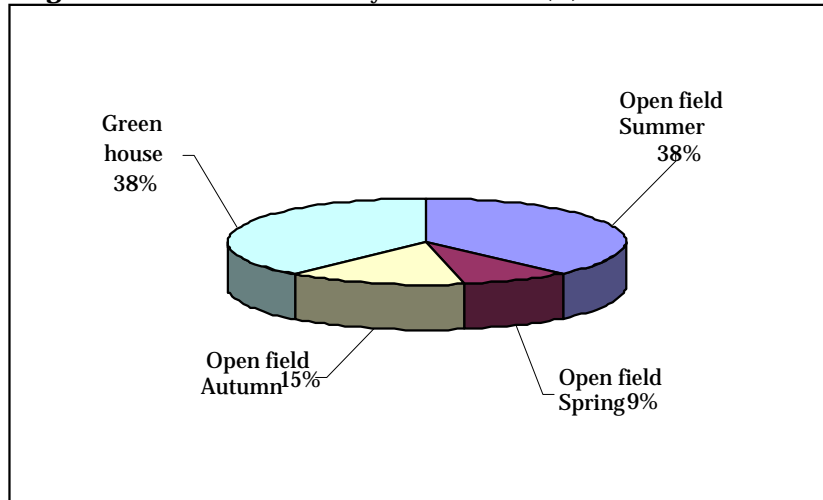
Figure 2.1. Tomato cropped area by governorates, 2002 (%)



Source: NAPC Database.

The total irrigated production was 901 thousand tons in 2002, from which 62% open field tomato, planted throughout three seasons (spring, summer, and fall), and 38% greenhouse tomato (figure 2.2).

Figure 2.2 Production ratios by season, 2002 (%)

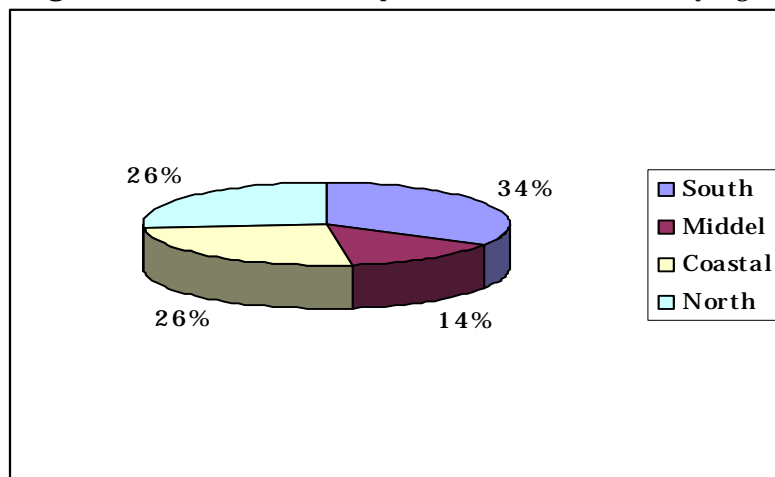


Source: NAPC Database.

Open field tomato

Open field tomato is grown in different climates from June to October. It spreads out from the Yarmok basin of Dara in the south, to Aleppo in the north. Figure 2.3 depicts the distribution of the area planted under field tomatoes by region and shows that this product concentrates in the southern region, which encompasses the governorates of Dara (43%), Sweida (27%) and Quneitra (26%).

Figure 2.3. Distribution of the planted area under tomato by regions, 2002



Source: NAPC Database.

Green house tomato

Green house tomato is harvested as an early season crop (October to June) in the coastal region mainly in Tartous (80%). The growing local demand for fresh tomato consumption and the high tomato demand from foreign markets, especially from the neighbouring countries (for early

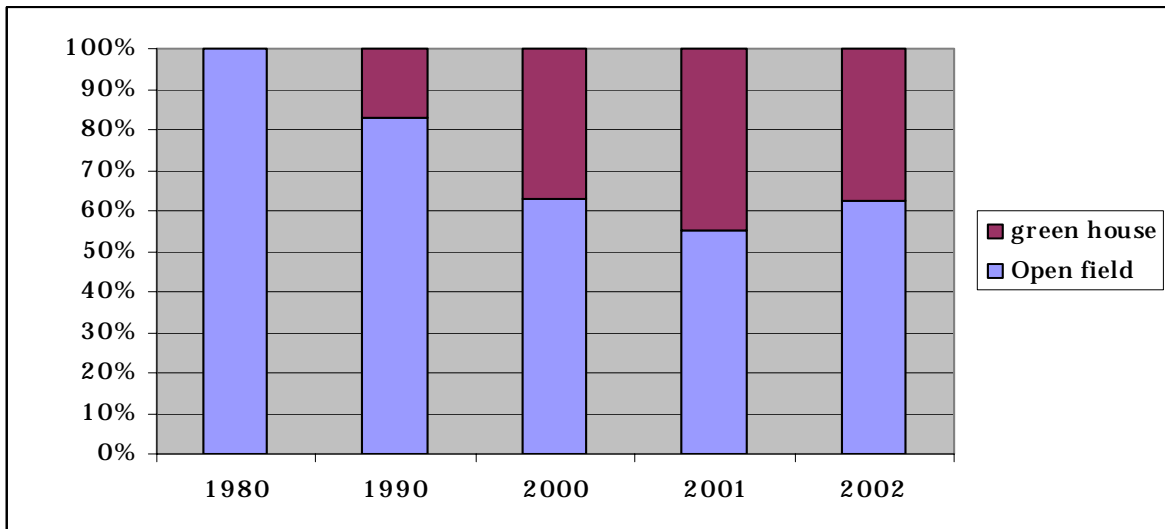
season tomato), caused a 15% increase in the total number of green houses, (49238 in 1998 to 56431 in 2002). As a result, the production increased by 72%, (from 197 thousand tons in 1998 to 338 thousand tons in 2002).

The share of production of open field to green house tomato fluctuates for two reasons:

- It is very easy to change the crops in green houses according to the profitability and the prices of the product.
- Green houses are vulnerable to storms.

Figure 2.4 depicts the evolution of the annual distribution of open field and green house production. The highest share of green house production was 38% in 2002.

Figure 2.4. Green house and irrigated open field tomato production, 1980 and 1990 – 2002 (%)



Source: NAPC Database.

2.2. Marketing and Processing

Tomato is a delicate and a very perishable commodity and must be handled with care. For this reason it is packed in the same region of production. In addition, the increase in tomato production necessitates improving of its marketing and processing. Indeed, this improvement will serve to get good fresh product suitable for ultimate consumption, supply good raw material for processing, to improve the quality of the final product, to minimize losses, and to increase the income of all economic agents dealing with this product.

There are two major utilizations of tomato; tomato is either consumed fresh or processed into tomato paste. Each product is retained in the study as a main final output.

Table 2.1 illustrates that the majority of the product is sold fresh (94%), either in the internal (69%) or foreign market (25%). Noticeable, all green house tomato production is sold for fresh consumption, while tomato paste is obtained only from open field tomatoes. 16% of open field tomato is processed (70% for the domestic market and 30% for export). This share will increase when the home made tomato paste is considered. Exported fresh green house tomatoes represent more than 1/3 of the total exported fresh tomatoes.

Tomato production has a low degree of both horizontal and vertical coordination. Co-operatives are very seldom engaged in marketing, or even in pre-marketing operations (sorting, grading, and packing). State establishments are absent at the production level and have small presence at the procurement and marketing levels. At the other end of the chain, traditional retailers

dominate the domestic market. Large retailers generally use as contractors the same mediators operating at the production level.

Table 2.1. Irrigated tomato production, 2002 (000 ton)

System	Fresh domestic market	Fresh export market	Paste local market	Paste export	Total
Green house	271	68			339
Open field	349	157	39	17	562
Total	620	225	39	17	901

Sources: MAAR.

The various utilizations of tomatoes (fresh, processed) rely on different types of operators. Traders are mainly involved in the supply of fresh tomato for the domestic market, and to a less extent in the export to the regional and the European market and the deliveries to the tomato paste factories. Indeed, fresh tomatoes sold in the domestic markets are almost sorted by the traders, while exported tomatoes are sorted and packed by packagers.

Public and private processors normally purchase directly from farmers (95%) and only to a minor extent from wholesale markets (2%) and commissioners (3%), depending on the price and the availability of large quantities. Both public and private processors can lower their activity if the price of raw material is too high. The commission paid to middlemen is about 5%.

Public and private companies are both active in the packing and processing of traditional tomato products, while in modern products, e.g. aseptic products, fruit juices, etc, the private sector is dominating. The market shares of tomato paste are about 50% public and 50% private. While for packed fresh tomato the market share of private companies is more than 90%.

There are six public companies which process fruit and vegetable; the main product is tomato paste, followed by chick peas, beans, fruit jams, and mixed vegetables. The public companies buy directly from farmers. Most of the production is canned and sold through the public sector; a part of the production is sold bulk to some private companies and to the catering. Most of the public products are sold in local markets. Table 2.2 shows the distribution of the public tomato paste companies according to governorates. Accordingly, there is an enormous improvement in capacity utilization.

Table 2.2. Processing capacity of public tomato paste, 2002 (ton)

Company name	Governorate	Tomato			Actual utilization as % of Capacity	
		Actual utilization		Maximum utilization	2002	2003
		2002	2003			
Damascus	Damascus	950	1803	2263	42	80
Idleb	Idleb	640	1100	1582	40	70
Jablah	Lattakia	930	1400	1906	49	73
Mzarib	Dara	930	2700	4624	20	58
Meyadin	Der-Alzoor		1100	1482		74
Al-Hasake	Al-Hasakee		1000	1482		67
Total		3450	9103	13339	26	68

Source: Ministry of Industry 2002.

There are more than 80 private companies of tomato paste production. Their technical level varies from very low technology (semi auto line) to a very high technology (aseptic system). These companies are not working on their optimum capacity due to many reasons. The main reasons are:

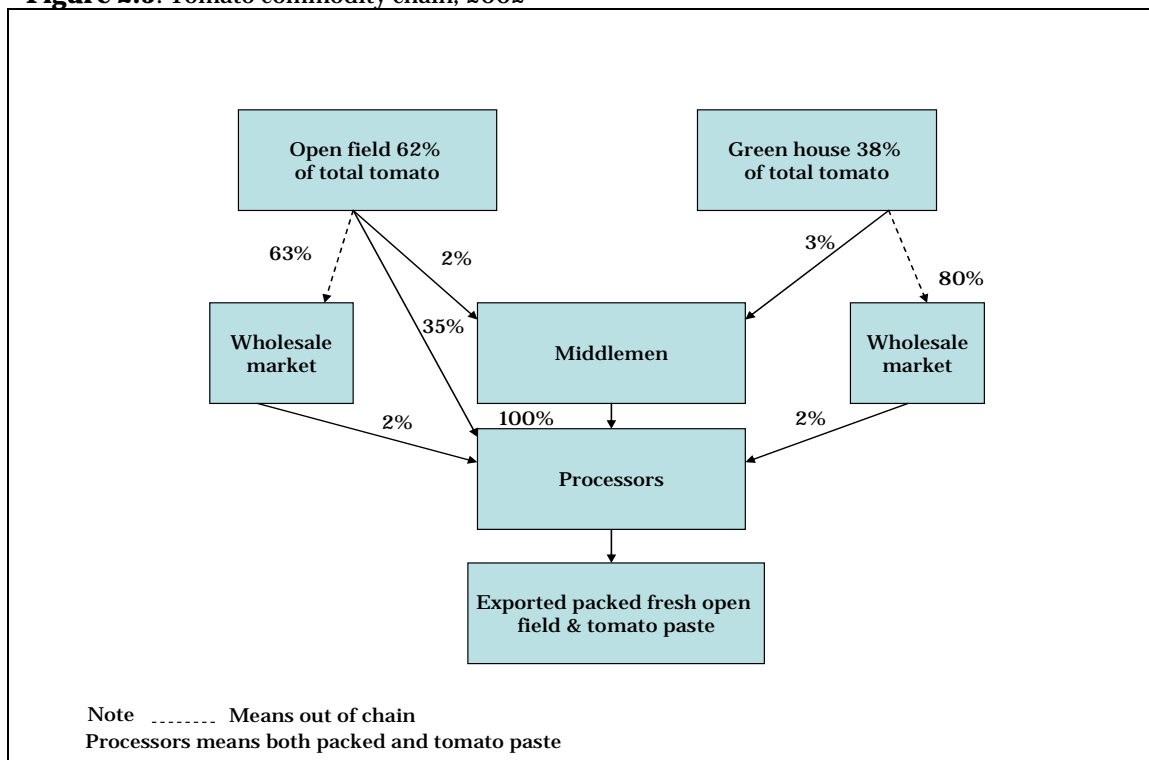
- Seasonality and perishability of the raw materials.
- Incompatibility of Syrian products with the International market standards.
- The international regulations of tomato exports, which impose a tax (entry price) upon each extra amount exceeding tomato quota.

Normally, for domestic market, farmers or commissioners make the preliminary sorting for the products. For export, there is a need to sort more strictly by packagers. There are about 60-70 packagers who are direct exporters. Packagers are specialized in export; they buy preferably and directly from farmers and sell the remaining tomato after selection in the wholesale market. But, the majority of exported flows are operated in the packing houses and by non specialized processors.

2.3 Selected Representative Systems

Tomato commodity chain describes the different channels tomato follows, from its origin as a raw material, through several transformations, up to the final output. In general, it can be said that the chain shows the gradual generation of the value added. Thus, in order to determine the bottlenecks (inefficient points in the chain) and the impacts of any policy on the chain, each parity product is considered a separate unit. Figure 2.5 represents the marketing chain of the whole system of tomato production.

Figure 2.5. Tomato commodity chain, 2002



The tomato chain encompasses four agents. The first agent is the farmer who produces the raw material; the second one is the middlemen who collects the production from the farmers and

transfers it to the processors (farmers usually transfer directly the production to the processors in most of the cases); and the third actor is the processor who delivers his products either to the exporters (the fourth agent) or to the consumers.

Tomato commodity system has been broken down into representative systems on the basis of the following criteria.

The type of the main output produced: Tomatoes are being processed into different final outputs that don't have the same importance in the system such as packed fresh tomato and tomato paste.

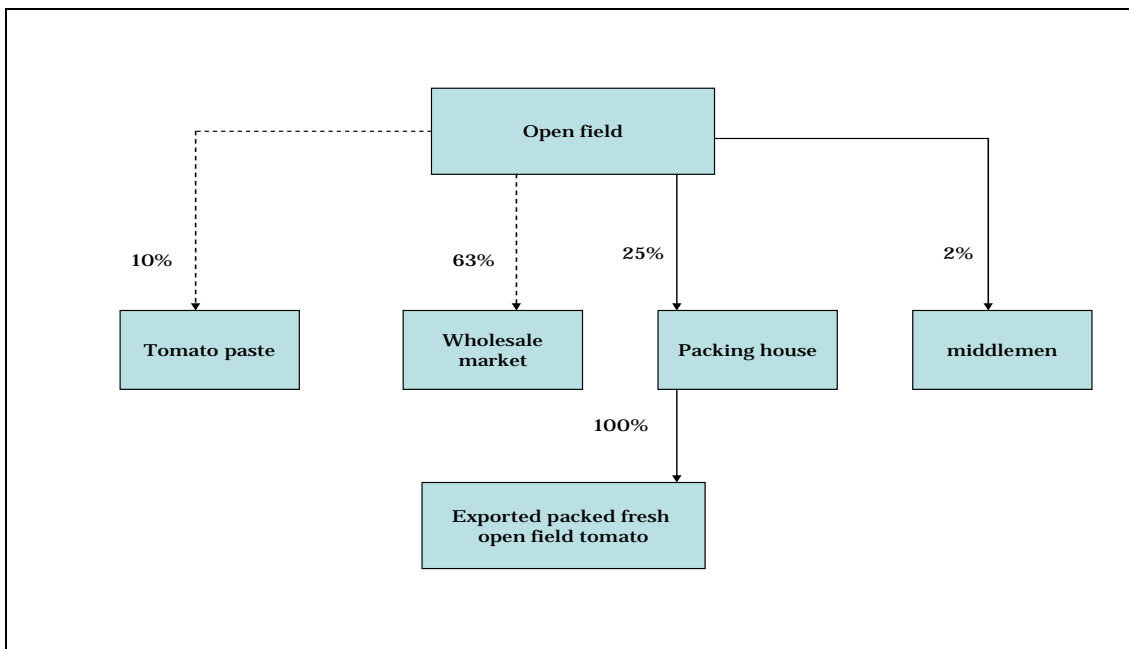
Farm level technology: Tomato can be produced through two different techniques at farm level namely open field and green house.

Targeted Market: Tomato is exported to Gulf and EU markets.

2.3.1 Exported packed fresh tomato

Figure 2.6 depicts the chain of packed fresh tomato. The first agents of the chain are farmers. Farmers' production of open field tomatoes is sold directly to the packing houses (25%), to the tomato paste firms (10%), and to the middlemen (2%). The rest goes to the domestic market (63%) and won't be considered in our study. Transportation costs are paid by farmers themselves or, alternatively, through local commission agents (collectors that usually own a lorry) who offer as a service just the transportation of the primary product (at 0.25 SP/kg). The second agent is the processor who directly purchases open field tomato from farmers. The only system applied in packing houses is the manual one for all stages: sorting, filling up the product in boxes, labeling and covering. The third agent is the exporter who usually is the processor itself.

Figure 2.6. Commodity chain of packed fresh tomato, 2002

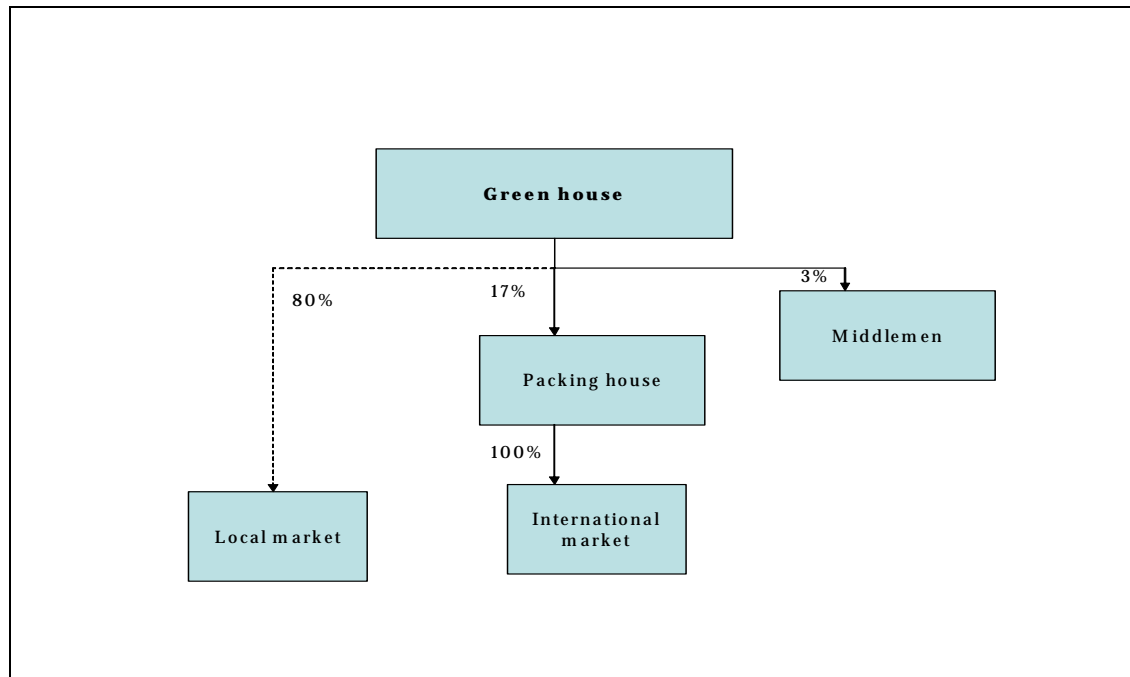


2.3.1 Exported packed green house tomato

The same agents of the packed fresh tomato are operating in the fresh green house tomato commodity chain and the only difference between the two systems (open field and green house) is the share of the product going to the domestic market which is 80% for green house. Also, the

green house tomato is sorted more strictly than the open field tomato due to the high quality standards of the export destination (Western Europe). The share of the exported main final output for green house and open field is 75%, and 55% respectively; the rest is sold in the local market. Figure 2.7 shows the Commodity chain of packed green house tomato.

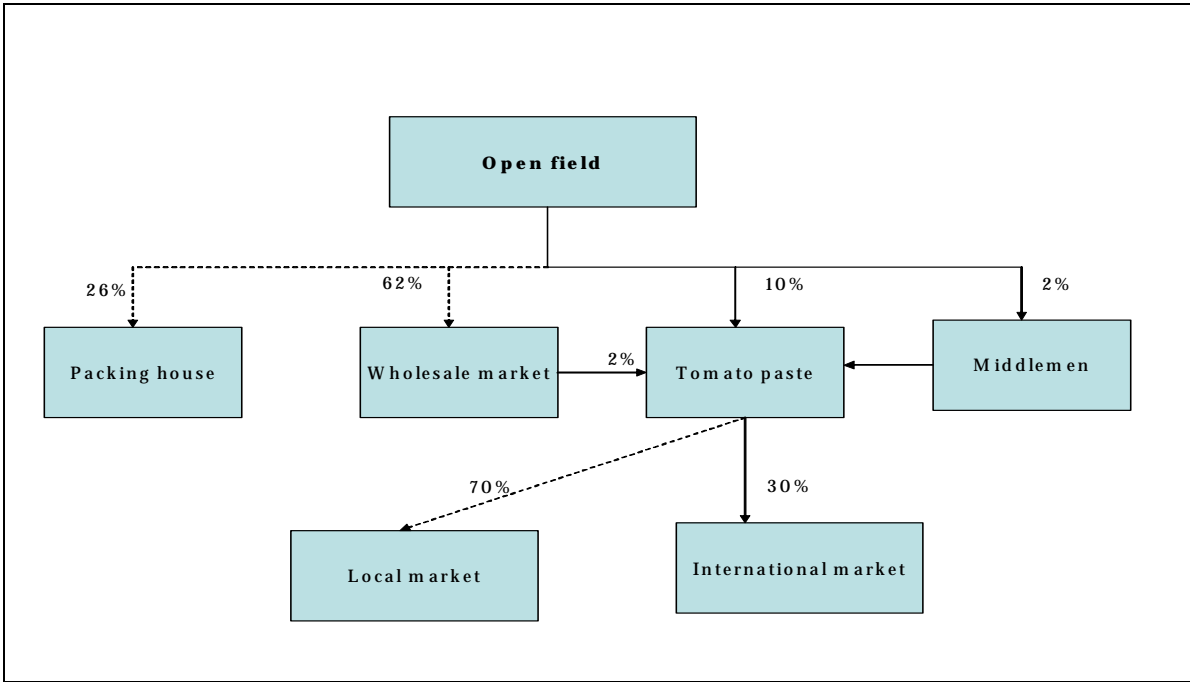
Figure 2.7. Commodity chain of packed green house tomato, 2002



2.3.2 Exported packed tomato paste

The raw material of this commodity chain is open field tomato. Normally, farmers sell open field tomato to the processor at factory gate according to supply and demand conditions. The price includes loading (0.05 SP/kg), unloading (0.05 SP/kg) and transportation costs, which vary between 0.10 SP/kg and 0.25 SP/kg, depending on the distance between the farm and plant. The other source of raw material for the agro- food industry is middlemen (3%), who gather production from many farms and get 0.25-0.5 SP/kg for the service of transferring open field tomatoes to the plant. Also, wholesale markets may supply processors (2%) with fresh tomato according to processor needs. The technology varies from the manual small workshops to aseptic systems, but the prevailing system at the local market is the semi auto line system. There are two kinds of final products: the low concentrate (28-30%) and the high concentrate (36%) tomato paste. The latter is mainly produced in aseptic system. The final agent of the chain is the exporter, who might be the processor itself. Figure 2.8 depicts the commodity chain of packed tomato paste.

Figure 2.8. Commodity chain of tomato paste, 2002



Chapter 3 – Agents' Characteristics

3.1. Source of Information

The on farm level data are primary data collected through a survey conducted by NAPC within the activities carried out to perform “the Syrian Farming System”. The study identified six major farming systems in Syria to provide policy makers with a better understanding of the geographic differentiation of the agricultural sector and of the socio-economic characteristics of rural households and their different exposure to policy changes. Information and data have been gathered by the farming systems team from the two governorates that mainly producing tomato: Daraa for open field and Tartous for the green house tomatoes. The three main sources of information are: the extension units, key informants (such as the Mukhtar or/and the head of the villages’ cooperatives) and samples of farmers. An average gross margin for 6 open field spreadsheets was used in the farm budget for intermediate inputs costs, revenue and productivity. Each cost item is divided into tradable for both input and outputs and domestic factors

Data on post-harvest operation (fixed and variable cost, technology, capacity and actual utilization of capacity, procurement and marketing channel) were collected by the comparative advantage study (CAS) team through interviews of private operators, while the information on public agents was obtained through the assistance of the national consultant involved in the study. The post harvest budget for the private operators were constructed by selecting the most reliable information obtained from the interview, based on the quality of the contact with the private operators (openness) and the comprehensiveness of the data coverage.

The Comparative Advantages Team has conducted a survey in order to build the budget of each representative system from producer to the targeted market. The survey concentrated on the two main final outputs: packed tomato (open field and green house) and tomato paste. With regard to the former, the team visited three governorates: Latakia, Tartous and Damascus. It interviewed five packing houses and built budget for three packagers, so three PAMs have been built for packed tomato. They are packed open field tomato regional, packed green house tomato regional and packed green house to the EU market. Although, many tomato paste factories have been visited one in Dar’a and four firms in Damascus and rural Damascus. One regional PAM has been built for tomato paste low concentrate (24-28%).

3.2. Farm budget

Farm budget consist of price, quantities and total value of inputs and outputs taking into account the cropping calendar. The quantity of input—output is based on one hectare at farm level. It is assumed that the drip irrigation from well is the prevailing system, and open field and green house tomato is the final output at farm level. Inputs are classified into fixed, direct labor, and intermediate inputs. Table 3.1 shows the cost at market price for both open field and green house tomato.

Table 3.1. Fresh open field and green house tomato budget at farm level, 2002 (SP)

Item	Market price open field	Market price green house
FIXED INPUT		
Well	1519	2088
Pipes	14082	8801
Establishing green house		5613
Changing the plastic cover		6770
TOTAL	15601	23273
DIRECT LABOR		
Land preparation	2200	1500
Leveling	700	0
Other	750	0
Sowing & planting	1585	2240
Fertilization	425	300
Chemicals	542	800
Irrigation	25	25
Weeding		3733
Harvesting	10067	35000
Post harvesting	50	0
TOTAL	16344	43598
INTERMEDIATE INPUT		
Seed/seedling	6541	63842
Manure	2024	29362
Nitrogen	1234	2333
Phosphate	2640	1167
Potash	400	2971
Other fertilizer (liquid)	5100	1200
Pesticides	3911	5221
Herbicides	111	0
Fungicides	4579	11822
Tillage	4635	7253
Leveling	805	0
Others	444	16667
Fertilizer application	150	
Manure application	200	
Herbicide application	207	333
Packing and loading	31200	
Transport costs	400	54000
Animal draft		
Warming cost		64000
Packing		
Water requirements	27000	
Pumping		37800
Water value	30000	
Land rent	70000	170100
Other1		21879
Other2		23000
Interest on revolving funds	3952	15550
TOTAL	195533	528500

3.2.1. *Fixed costs*

Fixed costs are the cost of fixed inputs, irrespective of the level of operational activity, including wells and pipes for open field and green house tomatoes. The imputed value of the well establishment is weighted on the basis of the need for water of one hectare of tomato. The initial cost of the well is estimated at 270000 SP (Varela Ortega and Sagardoy 2001, and Westlake 2000), assuming that each well can irrigate 7 ha, the expected live of the well is 50 years and the salvage value is zero. The initial cost of the pipes is estimated at 90200 SP; the pipe used up value is equal 8/12 (open field tomato is cultivated during 8 out of 12 months); and the expected live is 5 years with a salvage value of zero.

The fixed costs of other agricultural equipments are taken into account through disaggregating of the total cost paid by the farmers to benefit from the services provided by the equipment. It is assumed that all equipments are rented by the farmers and the cost is calculated as a share on the basis of the utilization of the equipment.

3.2.2. *Direct labor*

Labor is considered a domestic factor. Labor is assumed to be either qualified labor, that benefits from social insurance and retirement schemes, according to a formal employment contract (drivers, technician, engineers, clerks, and managers), and non-qualified labor, such as seasonal workers and all workers without any formal contract.

At farm level the total costs for each operation equals the required hours of the operation per hectare multiplied by the cost of each hour.

3.2.3. *Intermediate inputs*

Variable inputs include costs such as seed, fertilizer, mechanized operation ... etc. The intermediate input prices are calculated at farm gate, including all the costs of marketing and delivery. Moreover, all prices are standardized to common time period which is at the end of the "cropping season".

The water value computed for tomato at private price is 6 SP/cm taking into account the highest agro-climatic and market risk attached to tomato cropping, that tomato is a perishable crop and the yield is lower for tomato grown in wheat and cotton producing area than in the tomato specialized areas, and assuming that the actual value (social price) of water foregone by a farmer who decides to crop wheat or cotton rather than tomato would 3 SP/cm.

Farm budgets distinguish, within each cost category, tradable goods and domestic resources (labor and capital). For physical goods directly purchased by an agent, 5% of the purchase value was arbitrarily assigned as qualified labor, 5% as non-qualified labor and 10% as capital cost to account for the domestic resources spent to market the product up to the delivery point. The remaining 80% was considered as tradable input. Complementary investigation and computations were made for complex intermediary input, such as energy purchase, maintenance services, transport, that incorporate a more balanced share of labor, capital and tradable. Specific budgets were developed on the basis of data already collected by NAPC or additional data collected by the FSS to estimate more precisely the labor, capital and tradable content of one hour of tractor, or water pumping and so forth

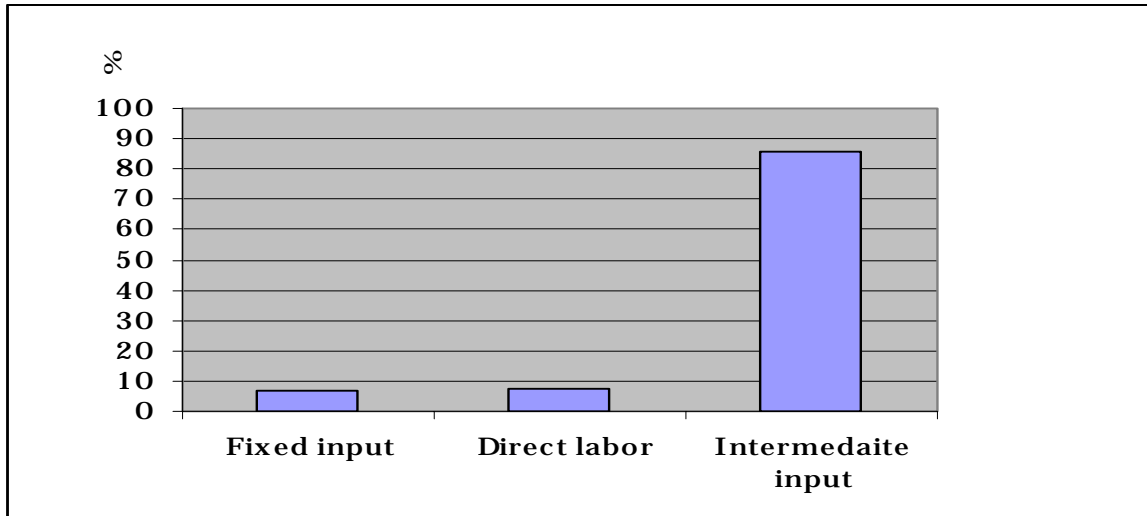
Open field tomato

Figure 3.1 illustrates that the share of the fixed inputs used to cultivate one ha of open field tomato is 7% of the total cost. Almost the same share applies to direct labor, while the highest share is represented by the intermediate inputs (86%).

Figure 3.2 shows that the fixed costs of fresh tomato at farm level are distributed as following: 4% non qualified labor, 4% qualified, 49% capital and 43% tradable, while intermediate inputs

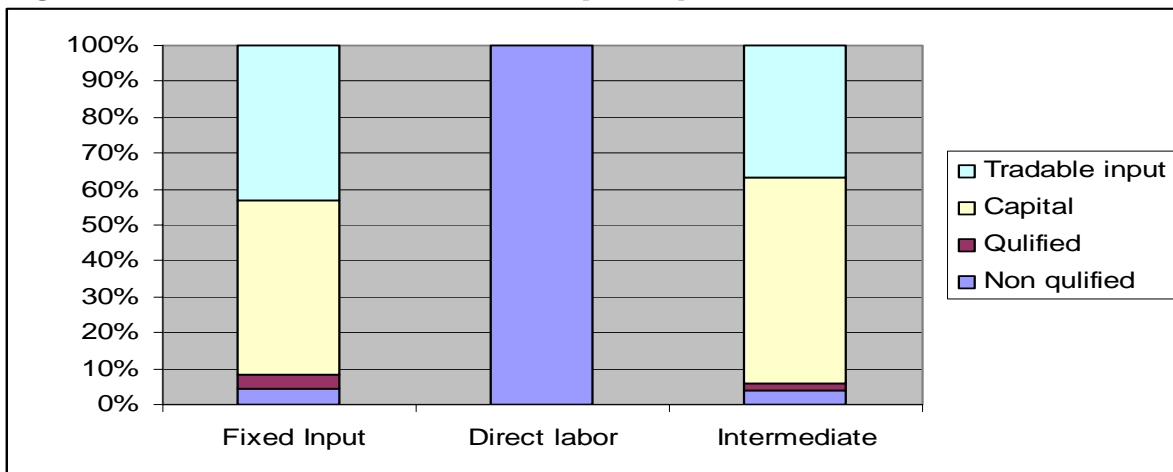
are distributed as the following: 4% labor non qualified, 2% labor qualified, 58% capital, and 37% tradable.

Figure 3.1. The share of the major budget items of open field tomato at farm level, 2002 (%)



Source: NAPC elaboration.

Figure 3.2. Share of tradable and non - tradable inputs of open field tomato at farm level, 2002 (%)



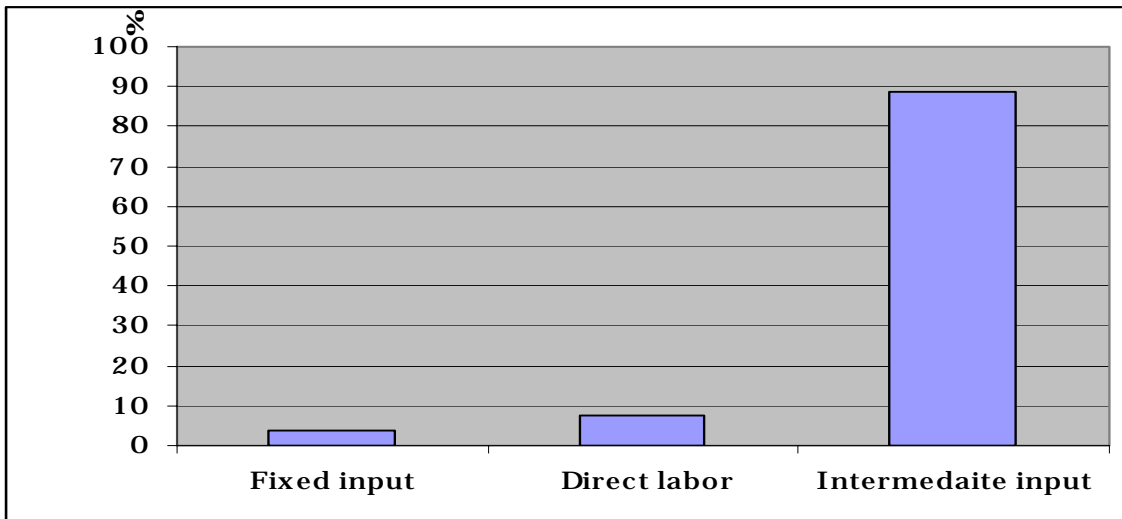
Source: NAPC elaboration.

Green house tomato

Figure 3.3 illustrates that the share of the fixed inputs used to cultivate one ha of green house tomato is 4% of fixed cost, 7% of the direct labor and the highest share is represented by the intermediate inputs (89%).

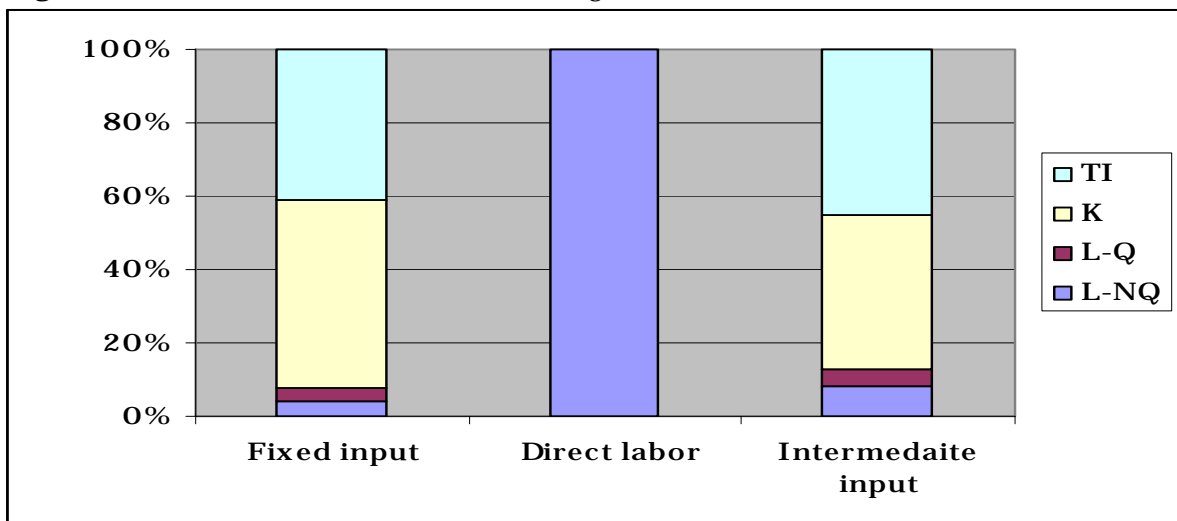
Figure 3.4 shows that the green house fixed costs of the green house are distributed as the following: 4% non-qualified labor, 4% qualified, 51% capital and 41% tradable; the intermediate inputs are distributed as the following: 8% non-qualified, 5% qualified, 42% capital and 45% tradable inputs.

Figure 3.3. Share of the major budget items of green house tomato at farm level, 2002 (%)



Source: NAPC elaboration.

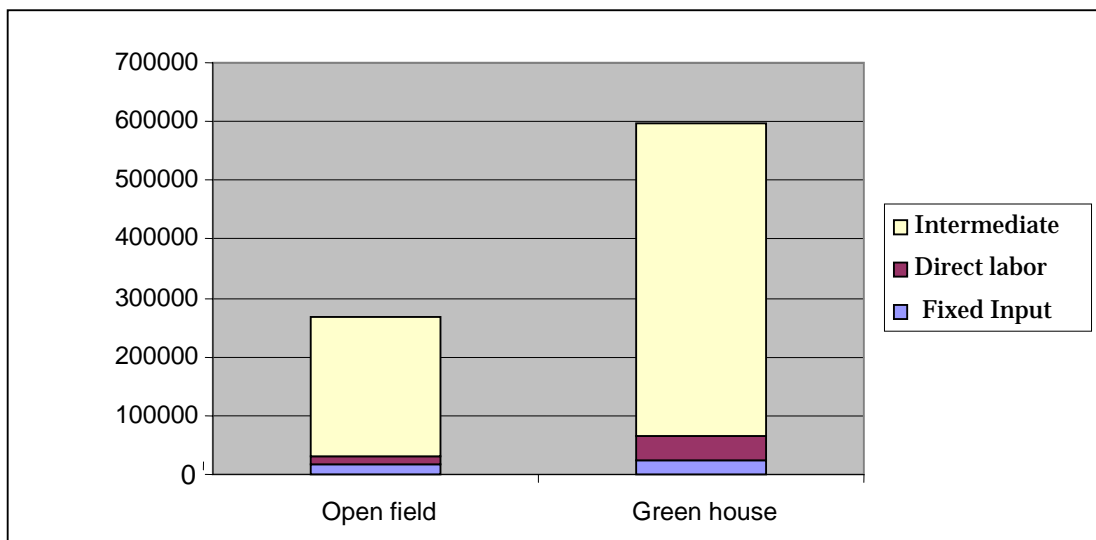
Figure 3.4. Share of tradable and non - tradable of green house tomato at farm level, 2002 (%)



Source: NAPC elaboration.

Comparison between open field & green house tomato

Comparing between open field tomato and green house tomato, it can be noticed that the total cost of green houses is more than 2 times than that of open field, Figure 3.5 shows that the fixed cost of green house tomato is higher than that of open field by 1.5 times, due to the additional cost of green house construction; and the cost of both direct labor and intermediate inputs is about 3 times higher, due to additional cost factors like warming costs.

Figure 3.5 Comparison between open field & green house tomato of the major budget items at farm level, 2002

Source: NAPC elaboration.

3.3. Packing and Processing budget

Tomato is mainly processed as manual packed fresh tomato and tomato paste. The main output of the first one is exported packed fresh tomato. It is worth to mention that packed tomato is not sold in the local market but its byproduct, fresh tomato, is used for local consumption and tomato paste. The by-product of tomato paste concentrate (concentration is 26-28%) is tomato cake which has marginal value and is sold to farmers as a feed. Figure 3.2 shows the budget of packed fresh tomato.

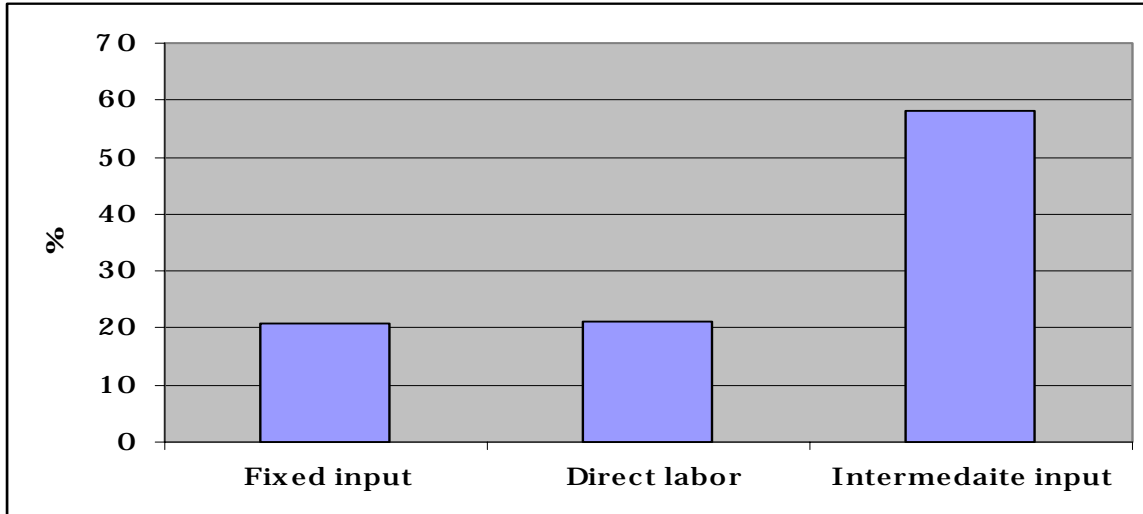
Table 3.2. Processor budget of packed fresh tomato, 2002 (SP)

FIXED INPUT	Market price
Building	264
Small generator	5
Supplier electricity Reservoir	83
Vehicles	691
TOTALS	1043
LABOR	
Direct labor	
Permanent labor	186
Female labor	417
Male labor	467
TOTALS	1070
INTERMEDIATE INPUTS	
Box	2000
Pallet	250
Maintenance	38
Energy and water	525
Fuel	15
Phone	75
Boxes for picking in field	6
Interest on revolving funds	17
TOTALS	2926

Source: NAPC elaboration.

The total cost of producing one ton of packed tomato is 5038 SP, of which 60% intermediate inputs and 20% fixed inputs and direct labor (Figure 3.6). The actual utilization of these processing units relies on seasonality, availability of supply, prices of competing countries (market factors) and agricultural calendar.

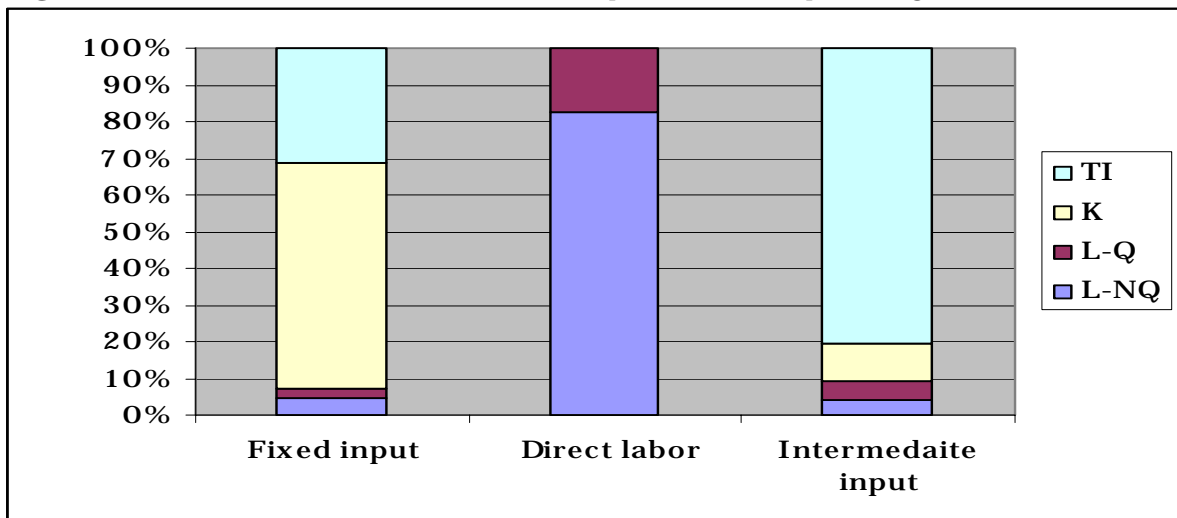
Figure 3.6. The major budget items of packed tomato at processing level, 2002 (%)



Source: NAPC elaboration.

Figure 3.7 shows that at processing level fixed costs are distributed as the following: 5% non-qualified labor, 3% qualified labor, 61% capital and 31% tradable. Direct labor is divided into 83% non-qualified, and 17% qualified. Intermediate inputs are distributed as the following: 4% non-qualified, 5% qualified, 10% capital and 81% tradable inputs.

Figure 3.7. Share of tradables and non - tradables of packed tomato at processing level, 2002 (SP)



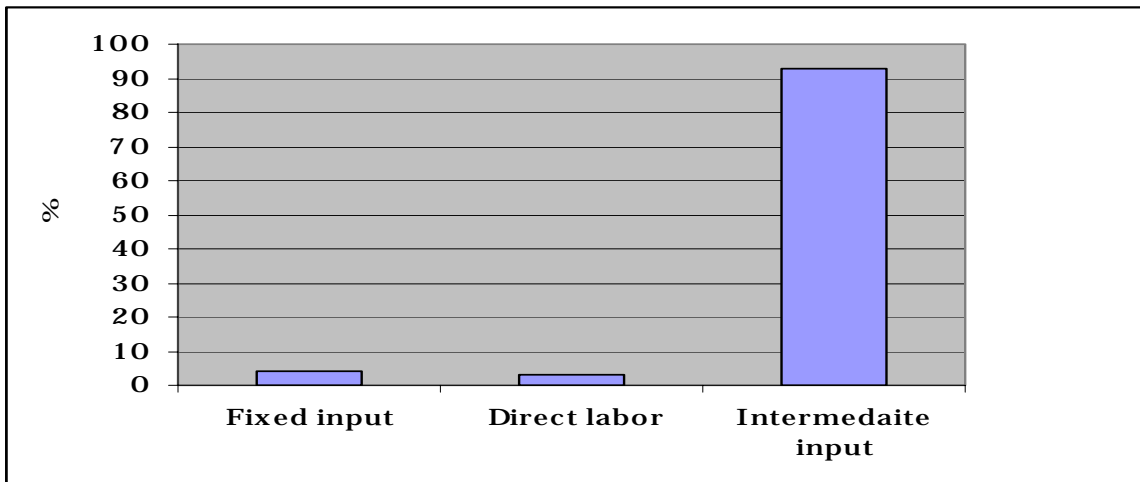
Source: NAPC elaboration.

Tomato paste budget

Table 3.3 presents the costs of producing one ton of tomato paste and figure 3.8 presents the share of each cost items. Noticeably, more than 90% of the total costs, at processing level, is due to intermediate inputs, mainly packing costs, accounting for more than 40% of the total costs.

Table 3.3. Tomato paste processor budget, 2002 (SP)

Fixed input	Total market price
Building	17
Land	128
Machine	215
Generator	75
Vehicle	129
Plastic barrel	10
Field box	13
Totals	586
Direct labor	
Permenant labor	225
Seasonal labor	240
Totals	465
Intermedaite Input	
chemical(salt)	60
chemical(concervative	40
bags	42
maintanance spaerpar	25
maintanance(fuel)	25
energy	360
phone	90
jars	12000
Interest: on Revolving	447
Totals	13089

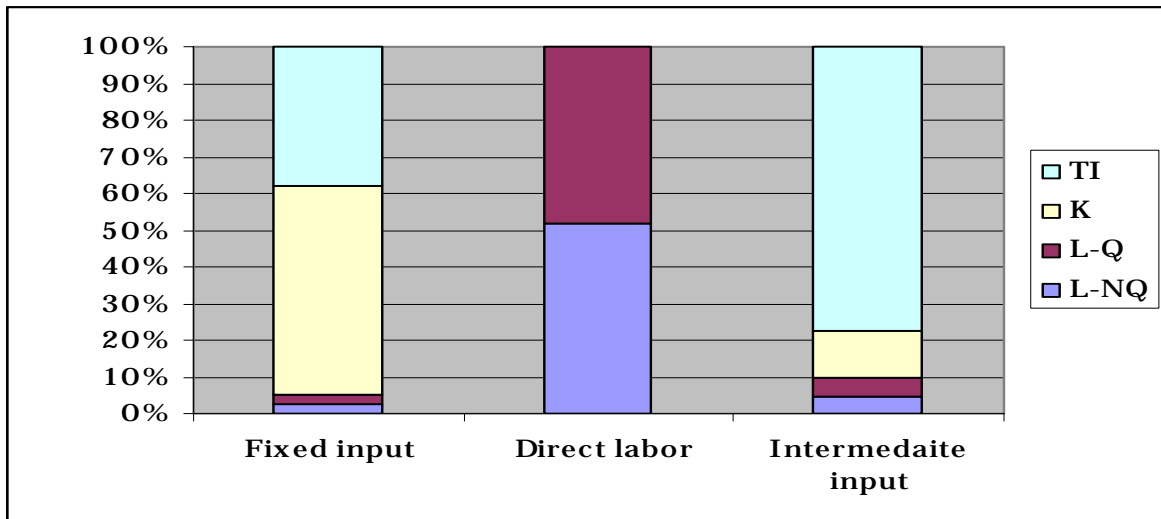
Figure 3.8. The major budget items of tomato paste open field at processing level, 2002 (SP)

Source: NAPC elaboration.

Figure 3.9 shows that tomato paste fixed costs are distributed as follows: 3% non-qualified, 3% qualified, 57% capital and 38% tradable. Labors are divided into 52% non-qualified and 48% qualified. Intermediate inputs are distributed as 5% labor non-qualified, 5% qualified, 13% capital, and 77% tradable inputs.

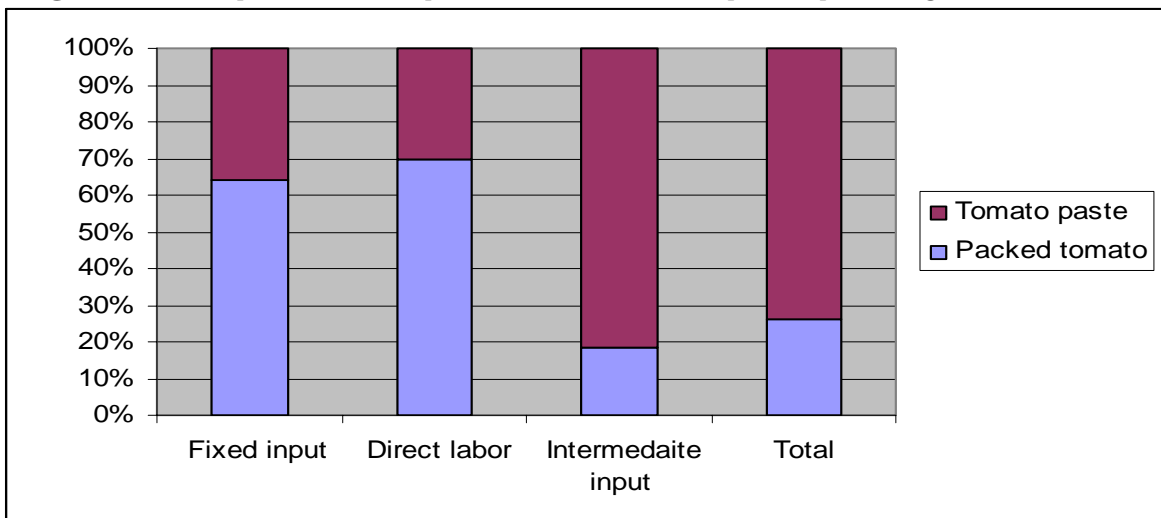
Furthermore, comparing between fresh packed open field tomato and tomato paste, it can be noticed that the total cost of tomato paste is more than 2.5 times of fresh packed open field (Figure 3.10).

Figure 3.9 Share of tradable and non tradable of tomato Paste at processing level, 2002 (SP)



Source: NAPC elaboration.

Figure 3.10. Comparison between packed tomato and tomato paste at processing level, 2002 (SP)



Source: NAPC elaboration.

Chapter 4- Comparative Advantages of the Representative Systems

4.1. Methodology

Comparative advantage analysis is the framework which allows the analyst to determine the financial and economic profitability of an activity. It allows the estimation of revenue independent of all market distortions. In other words, it permits the analyst to compare between the costs of production at local prices and the costs at international prices in order to determine what the probability of the activity would be in the absence of policies which cause local prices to be different from international prices

The comparative advantage of a productive system is measured relying on an analytical framework, named the Policy Analysis Matrix (PAM). A PAM (table 4.1) can be considered as a way of organizing budget data on representative commodity systems. The way, in which budget data are gathered, processed and organized, allows for evaluation of the impact of the government interventions and market distortions (current policies) on a given representative system. This method enables the computation of social prices and derives a set of indicators of comparative advantages.

Table 4.1. The Policy Analysis Matrix

Item	REVENUES	COSTS TRADABLES INPUTS	DOMESTIC FACTORS	PROFITS
PRIVATE PRICES	A	B	C	D
SOCIAL PRICES	E	F	G	H
DIVERGENCES	I	J	K	L

The PAM is the tool used in this report to analyze market failure and policy intervention by measuring the impact on the vertical commodity system from the farm gate until the wholesale market or parity point. The PAM consists of three rows and three columns. Accordingly, this methodology establishes an aggregated budget for a representative system using private prices (observed market prices) at the first row, and a budget calculated at social prices, by adjusting private prices for any known distortions, at the second row. The third row of the matrix (referring to as “divergences”) indicates the value of the distortions, which are equal to the value at private prices minus the value at social prices.

These budgets distinguish between tradable goods, which include the good produced by the system (the output) and intermediate inputs that are used to produce the output. Domestic resources that cannot be internationally traded such as labor, land, capital are identified separately. Sales represent the revenue. Profit is computed by subtracting the value of the tradable inputs and

domestic factors from the revenues. The previous costs and values are estimated at market prices. In order to estimate the economic profitability, all the costs at social prices should be calculated. The applied methodology is to estimate the divergences and then calculate the social prices. So, all tradable input subsidies are added to the PAM as negative values, while tradable input taxes are added as positive values. Finally, if the system generates a positive profit at private prices, the system is said to be competitive, while if it generates a positive profit at social prices the system has comparative advantage and is said to be economically efficient.

In order to evaluate the performance of the agents a set of indicators of policy analysis matrix has been calculated (table 4.2).

Table 4.2. PAM indicators

Indicators	Formula	Manning
1. Financial Profitability (FP)	$[D = A - B - C]$	Absolute value of the profit generated by the system at private price
2. Financial Cost-Benefit Ratio (FCB)	$[C / (A - B)]$	Indicator of the competitiveness of the system. If $FCB < 1$, the system is competitive, if $FCB > 1$ the system is not competitive, FP is negative.
3. Social Profitability (SP)	$[H = E - F - G]$	Absolute value of the profit generated by the system at social price.
4. Domestic Resource Cost (DRC)	$[G / (E - F)]$	Indicator of the comparative advantage of the system. If $DRC < 1$, the system has comparative advantage, meaning that we use less value of Domestic Factors (labor, capital...) than the added value generated ($VA = E - F$), if $DRC > 1$ the system has no comparative advantage, SP is negative
5. Social Cost-Benefit Ratio (SCB)	$[(F + G) / E]$	Another indicator for measuring the comparative advantage of the system. It takes into account the full cost of production ($F + G$) instead of the Domestic factors only. It is a more appropriate ratio to rank the relative position of different systems when they have a different cost structure (i.e. tradable and non-tradable), because the DRC is biased in favor of the system that has a high content in tradables.
6. Transfers	$[L = I + J + K]$	Absolute value of the transfer between the economy and the system
7. Nominal Protection Coefficient (NPC)	$[A / E]$	Indicates the level of protection for the main output, if $NPC > 1$, the system benefits from a protection, if $NPC < 1$, the system is taxed.
8. Effective Protection Coefficient (EPC)	$[(A - B) / (E - F)]$	Indicates the total level of protection taking into account the effect of the policy on the private value of the tradable outputs and tradable inputs.
9. Profitability Coefficient (PC)	$[D / H]$	Measures the impact of the policy on the profitability of the system. If $PC > 1$, the system benefits from a net transfer from the economy, if $PC < 1$, the economy benefits from a net transfer from the system.
10. Producers Subsidy Ratio (PSR)	$[L / E]$	Indicator of the impact of the policy/market distortion on the increase (+) or reduction (-) of the total revenue of the system at social price; i.e. magnitude of the divergence from the reference situation at social price to the current situation at market price
11. Equiv. Producer Subsidy (EPS)	$[L / A]$	Indicator of the impact of the policy/market distortion on the increase (+) or reduction (-) of the total revenue of the system at market price. Equivalent to the Producer Subsidy Equivalent (PSE) as defined by OECD for trade negotiation. If +, it is producer subsidy, if -, it's consumer subsidy.

4.2. Macro economic environment

The PAMs are computed in Syrian Pound. Therefore, the exchange rate is an important determinant of the value of tradable input on the world market because it has to be converted in SP. No distortion was observed between the current and social exchange rate: Lebanon border exchange rate is 51.5 SP/US\$. Given the relative stability of this rate in the past years, it was applied to estimate the private and the social value of the tradable.

For the capital market, the private rate of return is 5.5% representing the official interest rate offered by the Commercial Bank of Syria, while the social one is 3% (equivalent to the weighted rate computed by the International Monetary Fund (IMF) for the newly industrialized Asian economies) and equal to the interest rate in neighboring countries.

For labor market it is assumed that there is no distortion and that the current wages reported for various tasks reflect the true opportunity cost of labor. The contribution of the formal and informal workers is calculated in order to measure the taxes imposed on workers in the formal sector, which is equal to the labor cost paid by the owner of the firm divided by the real salary of the worker (3% social insurance paid by owner , 14% retire insurance, paid by owner, 7% paid by worker)

4.3. Parity prices

The selection of the parity price that is used to determine the value of the revenue at social price refers to a specific location in the GAFTA and EU market (based on destination). For main outputs targeting the domestic market the parity price is computed on the basis of the CIF price at border plus the transportation costs to reach the point where the final output is produced in the domestic market. In the case of main outputs targeting foreign market the parity price has to incorporate the transport cost up to the foreign markets' borders where the Syrian product will actually compete with the output produced in the targeted market and with outputs coming from other exporting countries and targeting the same foreign market.

Parity prices are calculated FOB (after deducting all fees and transportation costs from CIF price at Saudi Arabia border). For packed fresh open field tomato and green house tomato marketed in the region, the cost computed has been collected from the packaging houses targeting the Saudi Arabia market. The FOB price at the Syrian border for packed fresh open field tomato equals 195 US\$/ton (table 4.2). While the FOB price at the Syrian border for packed fresh green house tomato equals 283 US\$/ton(table 4.3).

Noticeably, the difference in the above parity prices is only due to the difference in the price of the main output. With reference to the EU market, the parity price is calculated for packed green house tomato and equals 775 US\$/ton (table 4.4).

Table 4.2. Computation of packed fresh open field tomato parity prices, 2002

Item	Unit	Source of information	Value at market price	Value at social price
CIF to FOB				
CIF price Saudi (SA) border	USD/t	Data	260.0	260.0
Fee custom at SA	USD/t		-3.9	-3.9
Unloading at the SA	USD/t		-1.4	-1.4
Fee Jordan border	USD/t		-13.9	-13.9
Transportation cost	USD/t		-45.8	-45.8
FOB price at Syrian border	USD/t	Data or comp	195.0	195.0
Exchange rate US\$ - > SP	SP	Data	51.5	51.5
Parity price at the packager gate	SP/t	Computed	10042.5	10042.5

Source: NAPC elaboration.

Table 4.3. Computation of packed green house tomato parity prices with reference to regional market, 2002

Item	Unit	Source of information	Value at market Price	Value at social price
CIF to FOB	USD/t			
CIF price Saudi border	USD/t	Data	350	350
Fee custom at SA	USD/t	Data	5.6	5.6
Unloading at the SA	USD/t	Data or comp	1.4	1.4
Fee Jordan border	USD/t	Data	13.9	13.9
Transportation cost	USD/t		45.8	45.8
FOB price at Syrian border	USD/t		283.3	283.3
Exchange rate US\$ > SP	SP		51.5	51.5
Price at farm gate	SP/t		14591.7	14591.7

Source: NAPC elaboration.

Table 4.4. Computation of packed green house tomato parity prices with reference to Eu market, 2002

Item	Unit	Source of information	Value at market price	Value at social price
CIF to FOB	USD/t			
CIF price EU	USD/t	Data	870	870
Transportation cost	USD/t		95	95
FOB price at Syrian border	USD/t		775	775
Exchange rate US\$ - > SP	SP		51.5	51.5
FOB price at Syrian border	SP/t		39926	39926
Port charge, handling and transport	SP/t		1000	1000
Price at the packer gate	SP/t		38926	38926

Source: NAPC elaboration.

Concerning tomato paste the targeted market is Lebanon and table 4.5 shows the computation of tomato paste parity prices to the regional market.

Table 4.5. Computation of tomato paste parity prices with reference to the regional market, 2002

Item	Unit	Source of information	Value at market Price	Value at social price
CIF to FOB				
Landed price in Lebanon	USD/t	Data	1000	1000
Fee custom in Lebanon	USD/t		15	15
CIF price Lebanon	USD/t		985	985
Transport cost from Syria to Lebanon	USD/t		20	20
FOB price at Syrian border	USD/t		965	965
Transit fee and certificate of origin	USD/t		15	15
Price at ex-factory gate	USD/t		950	950
Exchange rate US\$ - > SP		Data	51.5	51.5
Price at ex-factory gate	SP	Computed	48925	48925

Source: NAPC elaboration

4.4. PAMs for tomato

4.2.1 Budgets of the representative systems

The figures needed to compose the PAM are derived from the budgets of the representative systems at private price (local market) and social price (parity price) .

With reference to packed fresh open field tomato, Table 4.6 reports the budget summary of the commodity chain at private prices.

Table 4.6. Budget summary of packed open field tomato at private price, 2002 (SP)

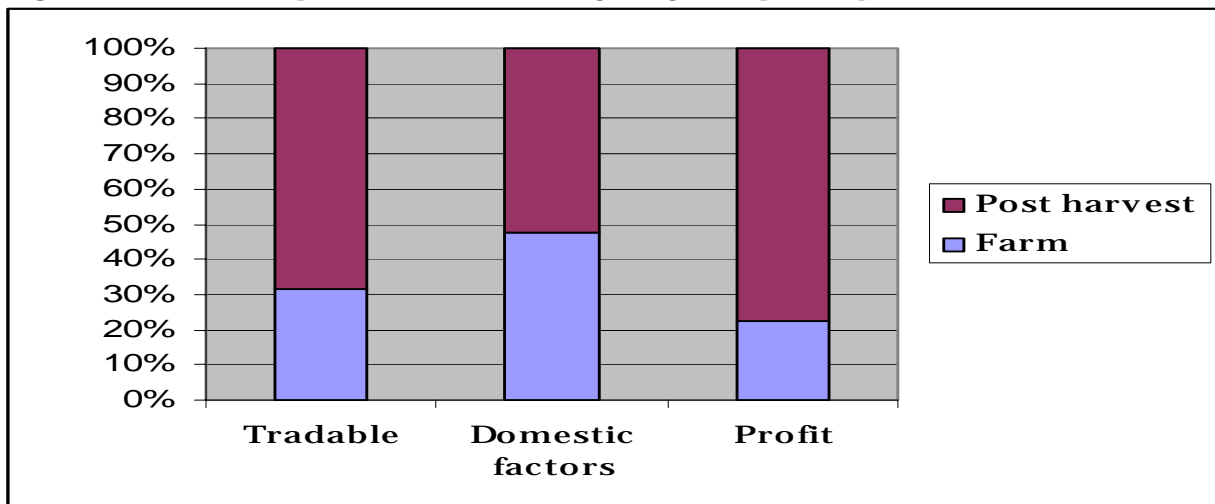
Item	Farm	Trader budget	Processor budget	Market budget	Post farm	System
1. Total revenue	5333	7333	15133	13000	15133	15133
Main final output	5333	7333	13000	13000	13000	13000
By-products	0	0	2133	0	2133	2133
2. Total cost	4333	6668	12372	13000	11706	10706
A. Commodity in process (tax+, subsidy-)		5333	7333	13000	5333	
B. Tradable	1497	600	2683	0	3283	4781
C. Domestic factors	2835	734	2355	0	3090	5925
Unskilled labor	474	440	1057	0	1497	1972
Skilled labor	74	67	357	0	424	498
Capital	2287	228	941	0	1168	3455
3. Profit before taxes	1000	666	2762	0	3427	4428
4. Direct taxes	0	0	0	0	0	0
5. Profit after taxes	1000	666	2762	0	3427	4428

Source: NAPC Database.

Noticeably, the budget of packed fresh open field tomato shows that the biggest shares of revenue and cost are for processing (packaging). The profit share accounts for 23% at farm level. It accounts for 62% at processing level and 15% at trader level.

Figure 4.1 illustrates the cost (tradable and domestic factors) and profit distribution, between farm and post harvest levels.

Figure 4.1. Allocation of profit and cost items among the agents of packed open field tomato, 2002 (%)



Source: NAPC Database.

The cost structure of packed fresh open field tomato at farm level is almost 1/3 of the cost at post harvest level for tradable inputs; whereas domestic factor costs are almost evenly distributed; post harvest activities perceive most of the profit.

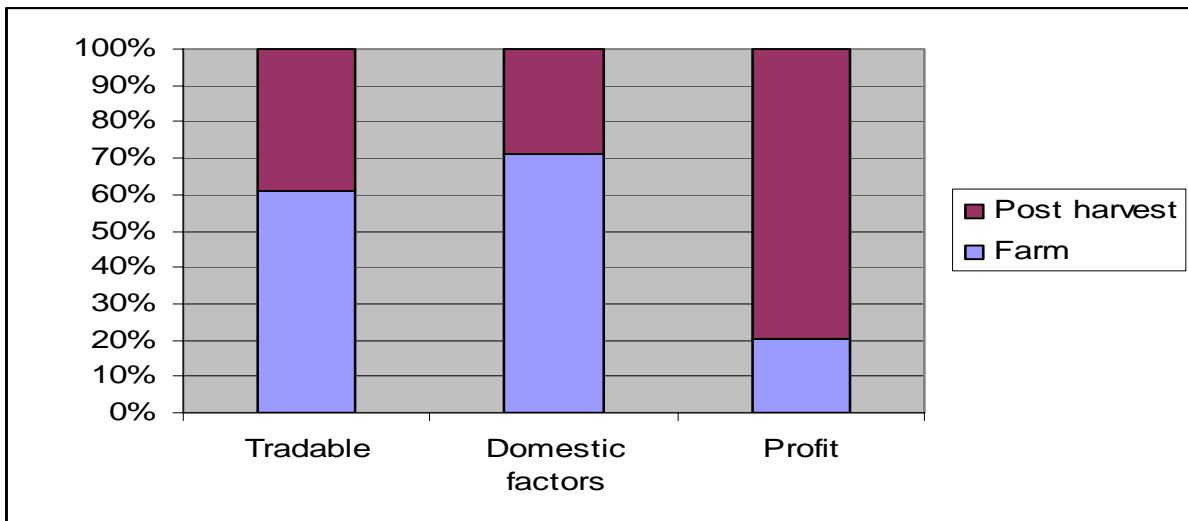
The same analysis has been done on packed green house tomato then compared with packed fresh open field tomato (Table 4.7). Figure 4.2 illustrates the cost (tradable and domestic factors) and profit distribution, between farm and post harvest levels in 2002.

Table 4.7. Budget Summary of packed green house tomato, 2002 (SP/Ton)

Item	Farm	Budget #2	Budget #3	Budget #4	Post farm	System
1.Total revenues	11455	11455	25182	17000	25182	25182
Main final output	11455	11455	17000	17000	17000	17000
By-products	0	0	8182	0	8182	8182
2. total cost	10023	11455	19581	17000	16490	15058
A. Commodity in process (tax+ ,subsidy-)		11455	11455	17000	11455	
B. Tradable	4168	0	2683	0	2683	6851
C. Domestic factors	5855	0	2352	0	2352	8208
Unskilled labor	1501	0	1057	0	1057	2559
Skilled labor	422	0	357	0	357	779
Capital	3933	0	938	0	938	4870
3. Profit before taxes	1431	0	5601	0	8692	10123
4. Direct taxes:	0	0	0	0	0	0
5. Profit after taxes	1431	0	5601	0	5601	10123

Source: NAPC Database.

Figure 4.2. Allocation of profit and cost items among the agents of packed green house tomato, 2002 (%)



Source: NAPC elaboration.

The biggest share of revenue comes from the processor with 25182 SP/ ton, while the revenue at farm level is 11455SP/ton (processor revenue is almost the double of farm revenue). The processor has also a share of 40% concerning tradable inputs (4168 SP/ton at farm level and 2683 SP/ton at processing level). However, domestic factor costs are 5855SP/ton at farm level and 2352 SP/ ton at post harvest level (more than doubled).

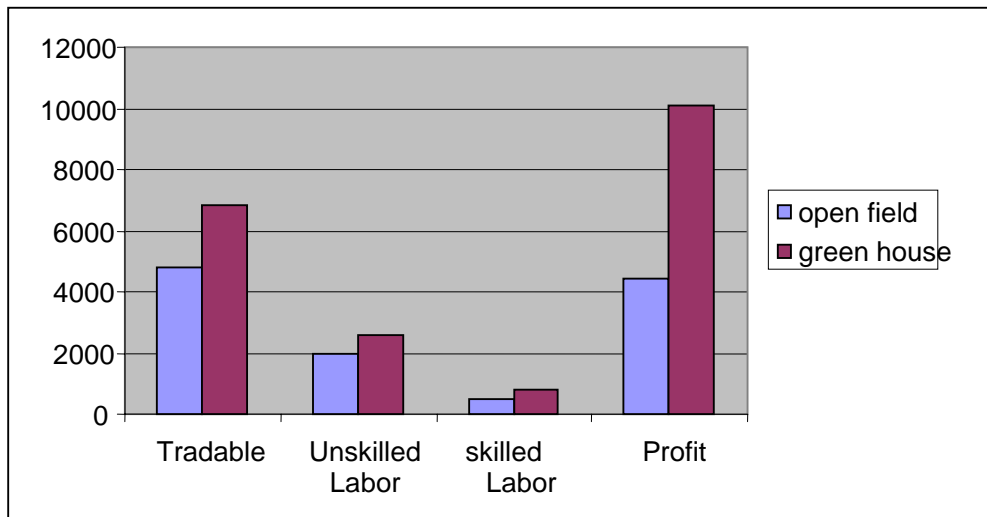
As a result, packed green house tomato achieves the double profit compared to open field tomato due to the high yield and higher price of green house tomato. Moreover, the costs of tomato in green house are almost higher by 30% for all items (figure 4.3 and 4.4).

Table 4.8 summarizes the budget of tomato paste. The highest revenue comes from the processor with 40 thousand SP/ton and the costs are 34,144 thousand SP/ ton. The profit is evenly distributed among farmers and processors. It accounts for 48% and 52% respectively (figure 4.5).

4.4.2 PAM for fresh tomato open field

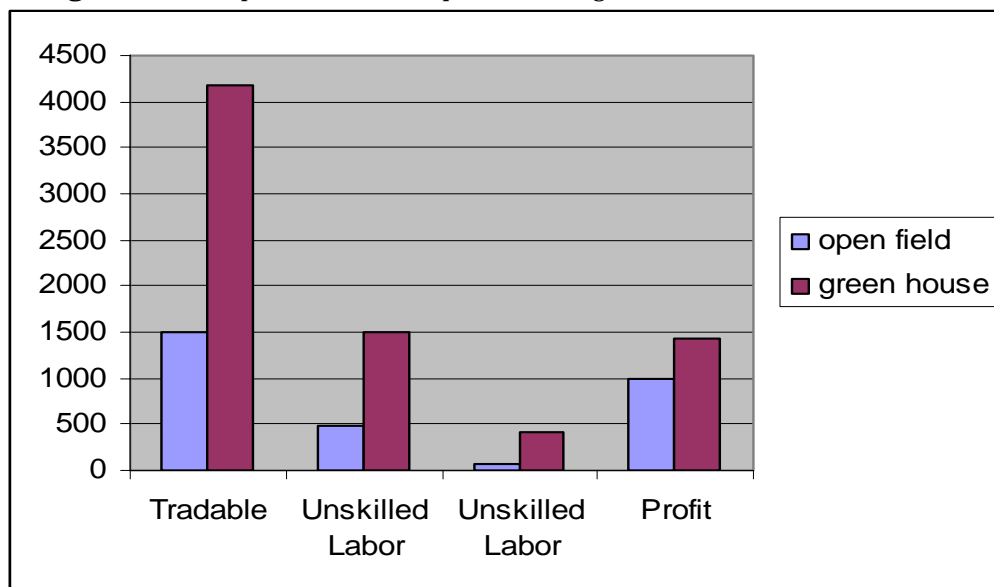
Table 4.9 clarifies the Policy Analysis Matrix of packed open field tomato in 2002 at market and social prices.

Figure 4.3. Comparison between open field and green house systems, 2002 (%)



Source: NAPC elaboration.

Figure 4.4. Comparison between open field and green house at farm level, 2002 (%)

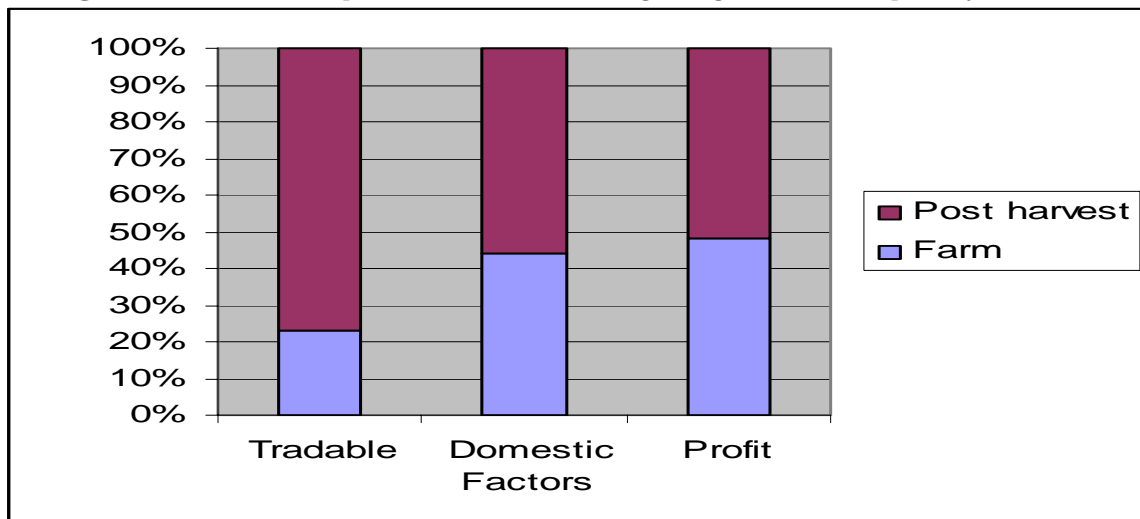


Source: NAPC elaboration.

Table 4.8. Budget Summary of tomato paste at market price, 2002 (SP/Ton)

Item	Farm	Budget #2	Budget #3	Budget #4	Post farm	System
1. Total revenues	15000	20000	40000	40000	40000	40000
Main final output	15000	20000	40000	40000	40000	40000
By-products	0	0	0	0	0	0
2. Total cost	9513	20003	34140	40000	34144	28656
A. Commodity in process		15000	20000	40000	15000	
(tax+ ,subsidy-)				0	0	0
B. Tradable	3394	1125	10342	0	11467	14861
C. Domestic factors	6118	3878	3799	0	7677	13795
Unskilled labor	1274	3325	875	0	4200	5474
Skilled labor	139	125	872	0	997	1137
Capital	4705	428	2052	0	2480	7185
3. Profit before taxes	5487	-3	5860	0	5856	11344
4. Direct taxes	0	0	0	0	0	0
5. Profit after taxes	5487	-3	5860	0	5856	11344

Source: NAPC elaboration.

Figure 4.5. Allocation of profit and cost items among the agents of tomato paste system, 2002 (%)

Source: NAPC elaboration.

Table 4.9. The policy analysis matrix of packed open field tomato, 2002 (SP)

Item	Revenues	Costs of tradable inputs	Domestic factors	Profits
Private prices	A 15,133	B 4,781	C 5,925	D 4,428
Social prices	E 12,176	F 4,621	G 5,621	H 1,933
Divergence	I 2,958	J 159	K 304	L 2,495

Source: NAPC elaboration

Concerning private prices, cell A represents the total revenues, accounting for the revenue of the main final output, packed fresh open field tomato (13000 SP/ton), and the revenue of the by-product, rejected fresh open field tomato (2133 SP/ton). Costs are accounted as tradable inputs (cell B) and domestic factors (cell C).

Noticeably, at private prices the system shows a positive profit of 4,428 SP/ton (cell D).

At social prices cell E accounts for the sum of the revenues of the main product (10043 SP/ton) and by-product (2133 SP/ton). The costs are SP 4621 for tradable inputs and SP5621 for domestic factors. Thus, the system is profitable (1,933 SP/ton).

The third row of the matrix indicates that in the output market higher revenues at private prices are achieved, meaning that the sector presents a transfer from the economy to the packed open field tomato commodity chain. In other words, according to our framework of analysis, the system is subsidized.

At the input market, instead, the system presents a transfer from the commodity chain to the economy. Indeed, the system is taxed and tradable input and domestic factors present positive divergence between private and social prices, because of the taxes paid on tradable goods and equipment (the ad-valorem taxes of imported tradable inputs is 1.7%) and the distortions in the labor market (i.e. insurance costs).

Overall, cell L indicates a total transfer of 2495 SP/ton from the economy to the packed open field tomato commodity chain.

Accordingly, our framework allows deriving the indicators reported in table 4.10.

Table 4.10. Indicators of packed open field tomato integrated system, 2002

1. FINANCIAL PROFITABILITY	$[D = A - B - C]$	4,427.65
2. FINANCIAL COST-BENEFIT RATIO	$[C / (A - B)]$	0.57
3. SOCIAL PROFITABILITY	$[H = E - F - G]$	1,933.14
4. DOMESTIC RESOURCE COST	$[G / (E - F)]$	0.74
5. SOCIAL COST-BENEFIT RATIO	$[(F + G) / E]$	0.84
6. TRANSFERS	$[L = I + J + K]$	2,494.51
7. NOMINAL PROTECTION COEFFICIENT (Including by-product)	$[A / E]$	1.24
7A. NOMINAL PROTECTION COEFFICIENT (R) (Main final output only)	$[A^* / E^*]$	1.29
8. EFFECTIVE PROTECTION COEFFICIENT	$[(A - B) / (E - F)]$	1.37
9. PROFITABILITY COEFFICIENT	$[D / H]$	2.29
10. PRODUCERS SUBSIDY RATIO	$[L / E]$	0.20
11. EQUIV. PRODUCER SUBSIDY	$[L / A]$	0.16

Source: NAPC elaboration

DRC is less than one (0.744), indicating that the economy has a comparative advantage in producing packed fresh open field tomato.

NPC implies that the packed open field tomato system is subsidized at a level of 24% of the social price, meaning that the price in the local market is higher than the international market by 24%.

EPC being higher (although slightly) than the NPC indicates that most of the distortion on tradable comes from the output market.

The producer subsidy ratio of 0.165 indicates that the open field tomato is supported by the economy at a level of 16.5% of the social price value.

4.4.3 PAM for green house tomato

From the PAM table 4.11 we can observe that both price assessments show a positive profit.

Table 4.11. The policy analysis matrix of green house tomato, 2002 (SP)

Item	Revenues	Costs of tradable inputs	Domestic factors	Profits
Private prices	A 25,182	B 6,851	C 8,208	D 10,123
Social prices	E 22,773	F 7,588	G 9,884	H 5,301
Divergence	I 2,408	J -737	K -1,677	L 4,822

Source: NAPC elaboration.

The third line of the matrix indicates a positive divergence of 2408 SP/ton related to a transfer from the economy to the tomato green house, means that the producers are subsidized by 2408 SP per each ton. On the tradable input market however, there is a negative divergence of 737 SP/ton which means that there is a subsidy to the tradable input, so a transfer from the economy to the green house is in place. Actually, this transfer is due to the fuel subsidy because green house uses more warming (7% of the total cost). Domestic factors have a negative divergence of 1677 SP/ton induced by the distortion of labor market. So, there is a transfer from the rest of the economy to the tomato commodity chain (CC). The cell L indicates a net transfer of 4822 SP/ton from the economy to the tomato CC. Table 4.12 depicts the indicators of packed green house tomato in 2002.

Table 4.12. Indicators of packed green house tomato integrated system, 2002

1. FINANCIAL PROFITABILITY	$[D = A - B - C]$	10,123.45
2. FINANCIAL COST-BENEFIT RATIO	$[C / (A - B)]$	0.45
3. SOCIAL PROFITABILITY	$[H = E - F - G]$	5,301.18
4. DOMESTIC RESOURCE COST	$[G / (E - F)]$	0.65
5. SOCIAL COST-BENEFIT RATIO	$[(F + G) / E]$	0.77
6. TRANSFERS	$[L = I + J + K]$	4,822.27
7. NOMINAL PROTECTION COEFFICIENT (Including by-product)	$[A / E]$	1.11
7A. NOMINAL PROTECTION COEFFICIENT (Main final output only)	$[A^* / E^*]$	1.17
8. EFFECTIVE PROTECTION COEFFICIENT	$[(A - B) / (E - F)]$	1.21
9. PROFITABILITY COEFFICIENT	$[D / H]$	1.91
10. PRODUCERS SUBSIDY RATIO	$[L / E]$	0.21
11. EQUIV. PRODUCER SUBSIDY	$[L / A]$	0.19

Source: NAPC elaboration.

The interpretation of the ratios is easier and more meaningful when it is done by comparing various commodity chains

The tomato green house system has a higher profitability than the open field system as shown by the private and social profit and is more efficient which compensates the extra costs. NPC is less in

green house system, EPC is lower also for the green house system, indicating the lower protection induced by the green house system.

4.4.4 PAM for open field tomato paste low concentrate

Table 4.13 shows that both price assessments indicate a positive profit.

Table 4.14. The policy analysis matrix of tomato paste, 2002

Item	Revenues	Costs of tradable inputs	Domestic factors	Profits
Private prices	A 40,000	B 14,861	C 13,795	D 11,344
Social prices	E 48,925	F 12,747	G 19,414	H 16,764
Divergence	I -8,925	J 2,114	K -5,619	L -5,420

Source: NAPC elaboration.

In this system both price assessments indicate a positive profit and pointing out to a social profit higher than the private one. The third line of the matrix indicates a negative divergence of 8925 SP/ton which means the prices are distorted and processors are taxed by 8925 for each ton of tomato paste. On the tradable input market a positive divergence of 2114 SP/ton is to observe which means that there is a tax on the tradable inputs induced by the high ad-valorem tax of the packing material. So, a transfer from the tomato paste CC to the economy is in place. Domestic factors have a negative divergence of 5619 SP/ton, so a transfer from the economy to the tomato CC is happened. The cell L indicates a total transfer of 5420 SP/ton from the tomato CC to the economy. Table 4.14 shows the indicators of tomato paste.

4.4.5 Comparison between open field tomato and tomato paste

It is adequate to conduct comparison between open field tomato and tomato paste. The tomato paste system has a higher profitability than the open field system and is more efficient as presented in table 4.15. Both NPC and EPC are lower for the tomato paste system, indicating the lower protection induced by the tomato paste system.

Table 4.14 Indicators of tomato paste integrated system, 2002

1. FINANCIAL PROFITABILITY	$[D = A - B - C]$	11,343.99
2. FINANCIAL COST-BENEFIT RATIO	$[C / (A - B)]$	0.55
3. SOCIAL PROFITABILITY	$[H = E - F - G]$	16,764.00
4. DOMESTIC RESOURCE COST	$[G / (E - F)]$	0.54
5. SOCIAL COST-BENEFIT RATIO	$[(F + G) / E]$	0.66
6. TRANSFERS	$[L = I + J + K]$	-5,420.01
7. NOMINAL PROTECTION COEFFICIENT (Including by-product)	$[A / E]$	0.82
7A. NOMINAL PROTECTION COEFFICIENT (Main final output only)	$[A^* / E^*]$	0.82
8. EFFECTIVE PROTECTION COEFFICIENT	$[(A - B) / (E - F)]$	0.69
9. PROFITABILITY COEFFICIENT	$[D / H]$	0.68
10. PRODUCERS SUBSIDY RATIO	$[L / E]$	-0.11
11. EQUIV. PRODUCER SUBSIDY	$[L / A]$	-0.14

Source: NAPC elaboration.

Table 4.15. Summary sheet of indicators for the selected systems of tomato 2002

Indicators	Fresh open field regional market	Fresh green house regional market	Fresh green house EU market	Tomato paste open field low concentrate
1. Financial profitability	4,428	10,123	14,779	11,344
2. Financial cost benefit ratio	0.572	0.448	0.459	0.549
3. Social profitability	1,933	5,301	26,285	16,764
4. Domestic resource cost	0.744	0.651	0.450	0.537
5. Social cost benefit ratio	0.841	0.767	0.543	0.657
6. Transfers	2,495	4,822	-(11,505)	-(5,420)
7. Nominal protection coefficient including by product	1.243	1.106	0.619	0.818
7A. Nominal protection coefficient (Main final output only)	1.294	1.165	0.437	0.818
8. Effective protection coefficient	1.370	1.207	0.572	0.695
9. Profitability coefficient	2.290	1.910	0.562	0.677
10. Producer subsidy ratio	0.205	0.212	-0.200	-0.111
11. Equiv. producer subsidy	0.165	0.191	-0.323	-0.136

Source: NAPC elaboration.

4.5 Sensitivity analysis

The figures obtained to compose the PAM and calculate the related indicators depend on variables that, as presented above, have been assumed to take given values, under certain assumptions and/or given policy options. These variables are:

- Yield.
- Conversion rate.
- Exchange rate.
- Parity price.

A sensitivity analysis is carried out in order to assess to what extent different values of the variables mentioned above affect the values of the PAM indicators. The indicators whose sensitivity is better to be observed to argument on the comparative advantages of the commodity chain are the following:

- Financial cost-benefit ratio (FCB);
- Domestic resource cost (DRC);
- Social cost-benefit ratio (SCB);
- Effective protection coefficient (EPC);
- Producers' subsidy ratio (PSR).

By using the concept of elasticity, which is the ratio of the incremental percentage change in one variable with respect to the percentage change in another variable, it is possible to measure the sensitivity of the indicators with respect to the variables.

4.5.1 Yield sensitivity

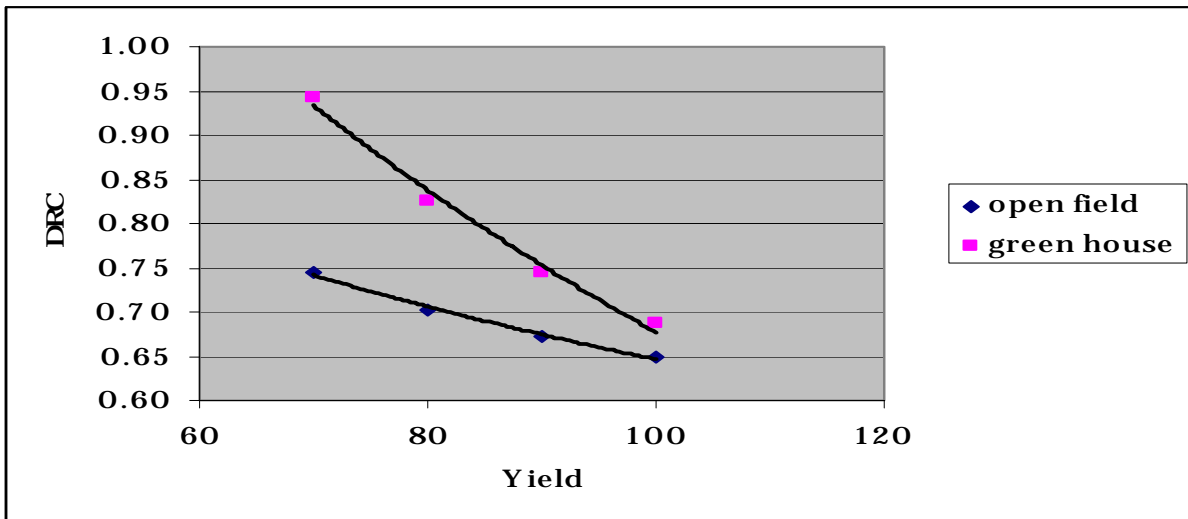
Table 4.16 presents the elasticity of yield for both systems (green house (GH) and open field tomato (OF)). Yield has a negative relationship with all indicators, meaning that when the yield increases, the reference indicators decrease, making the system more competitive with higher comparative advantages. Furthermore, it can be noticed that, in both systems, the comparative advantages indicator is the most affected by yield changes, while the indicators of protection (EPC, PSR) are the less affected.

Table 4.16. Yield sensitivity of packed tomato, 2002

Item	FCB	DRC	SCB	EPC	PSR
GH	-1.06	-1.34	-0.75	-0.24	-0.46
OF	-0.20	-0.23	-0.15	-0.05	0.00

Source: NAPC elaboration.

Figure 4.5 shows a negative relationship of yield with respect to DRC in both open field and green house systems. Comparing the two systems, it can be noticed that green house system is more sensitive to yield variations than open field system. Therefore, the representative line is steeper in the case of green house than open field. In fact, the sensitivity of DRC and other indicators, in absolute values, is always higher in the case of green house system.

Figure 4.5. Yield changes and corresponding changes of DRC, 2002 (ton/ha)

Source: NAPC elaboration.

4.5.2 Conversion rate sensitivity

Table 4.17 presents the conversion rate elasticity as a measure of the sensitivity of the indicators to conversion rate variations.

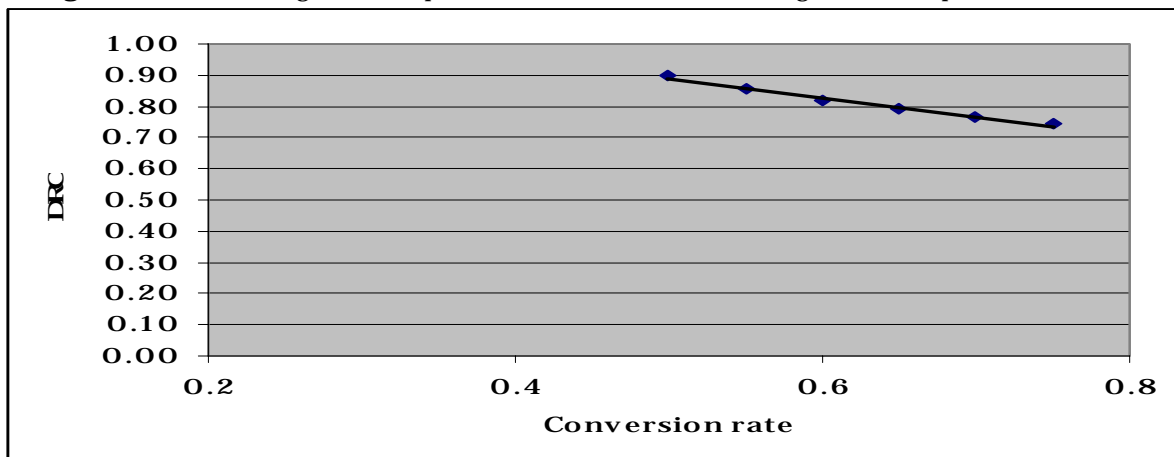
Table 4.17. Conversion rate sensitivity of packed tomato

Item	FCB	DRC	SCB	EPC	PSR
GH	-0.93	-0.69	-0.39	-0.05	0.44
OF	-0.46	-0.35	-0.22	-0.02	0.85

Source: NAPC elaboration.

The elasticity of conversion rate for both systems has a negative relationship with all indicators except producer subsidy ratio meaning that when the conversion rate increases, the reference indicators decrease making the system more competitive with higher comparative advantages.

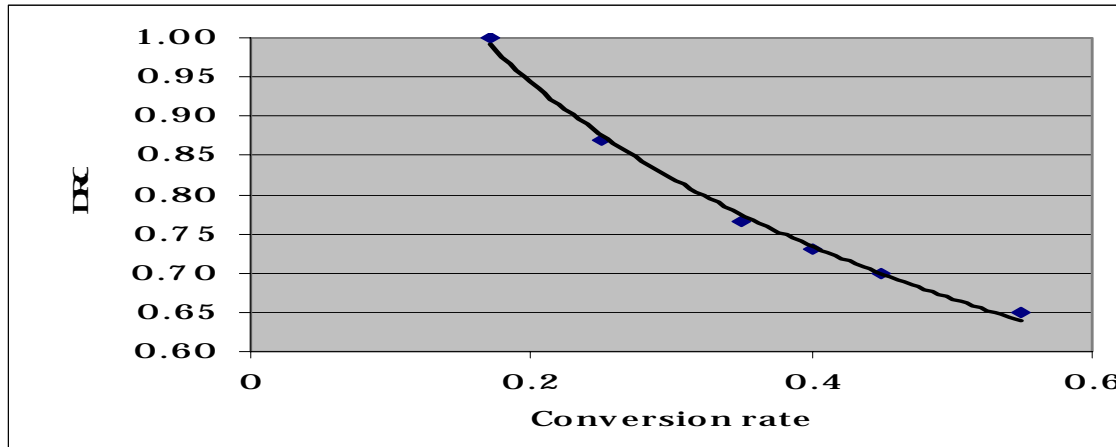
Comparing the two systems, it can be noticed that green house system is more sensitive to conversion rate variations than open field system. Figure 4.6 illustrates that the conversion ratio of open field does not affect significantly the DRC since the elasticity, although still negative, is very low (about 0.35).

Figure 4.6. DRC change in correspondence to conversion rate changes of fresh open field tomato, 2002

Source: NAPC elaboration.

While in the case of green house the conversion ratio has a significant impact on the comparative advantage indicator which can be recognized in figure 4.5 by a very steep line of elasticity making this system more sensitive to the conversion ratio.

Figure 4.7. DRC change in correspondence to conversion rate changes of fresh green house tomato, 2002



Source: NAPC elaboration.

4.5.3 Exchange rate sensitivity

Table 4.18 presents the Exchange rate elasticity as a measure of the sensitivity of the indicators to Exchange rate variations.

Table 4.18. Exchange rate sensitivity of packed tomato, 2002

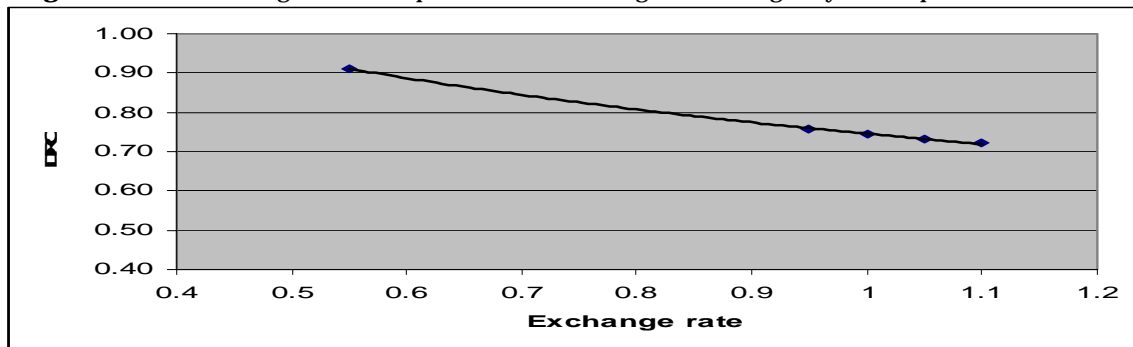
Item	FCB	DRC	SCB	EPC	PSR
GH	0.00	-0.20	-0.04	-0.69	-2.73
OF	0.00	-0.21	-0.12	-0.36	-0.68

Source: NAPC elaboration.

It is clear that the macro economic policy (exchange rate) has no affect on (FCB); but, it has more impact on the other indicators especially on PSR.

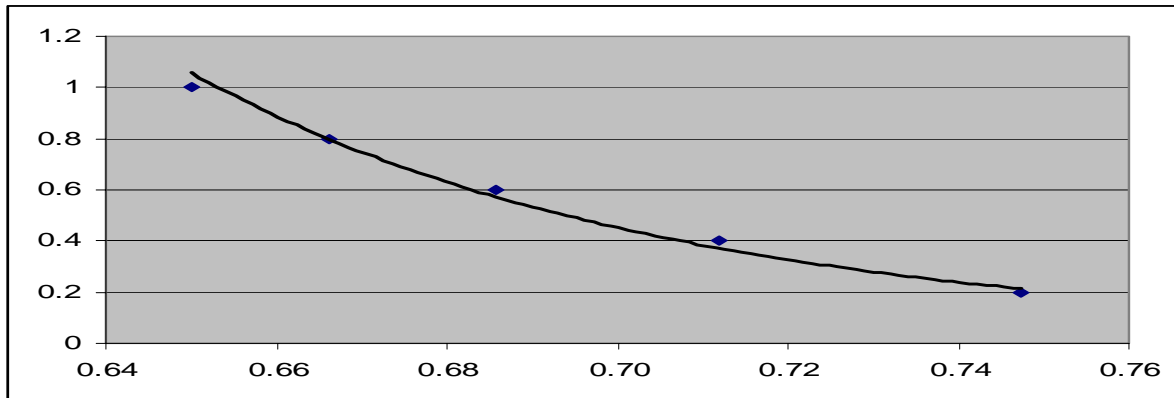
Figure 4.8 and 4.9 illustrate that the exchange rate by open field tomato does not affect significantly the DRC since the elasticity, although still negative, is very low (about 0.20) for both systems. This means that the variation in the exchange rate equally affects the comparative advantage at both systems.

Figure 4.8. DRC changes in correspondence to exchange rate changes by fresh open field tomato, 2002



Source: NAPC elaboration.

Figure 4.9. DRC changes in correspondence to exchange rate changes by fresh green house tomato, 2002



Source: NAPC elaboration.

4.5.4 Parity price sensitivity

Table 4.19 shows the parity price sensitivity of packed tomato in 2002.

Table 4.19 Parity price sensitivity of packed tomato, 2002

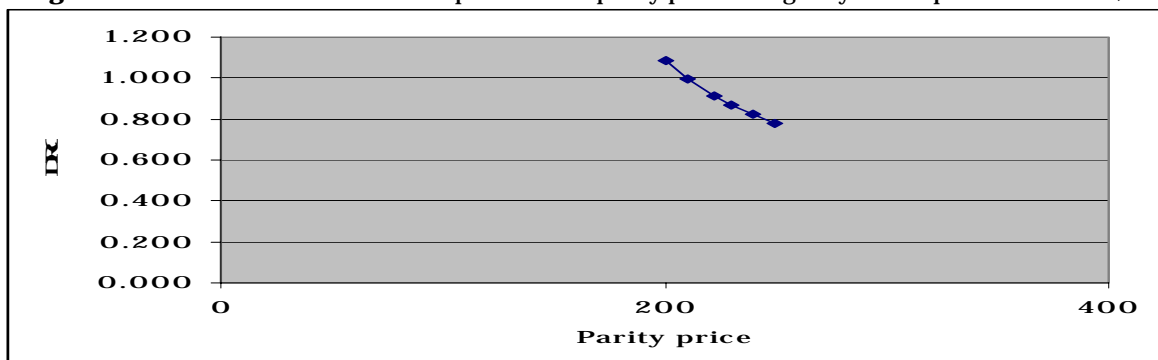
Item	FCB	DRC	SCB	EPC	PSR
GH	0.00	-1.29	-0.72	-2.04	-4.00
OF	0.00	-1.95	-1.00	-2.88	-5.70

Source: NAPC elaboration.

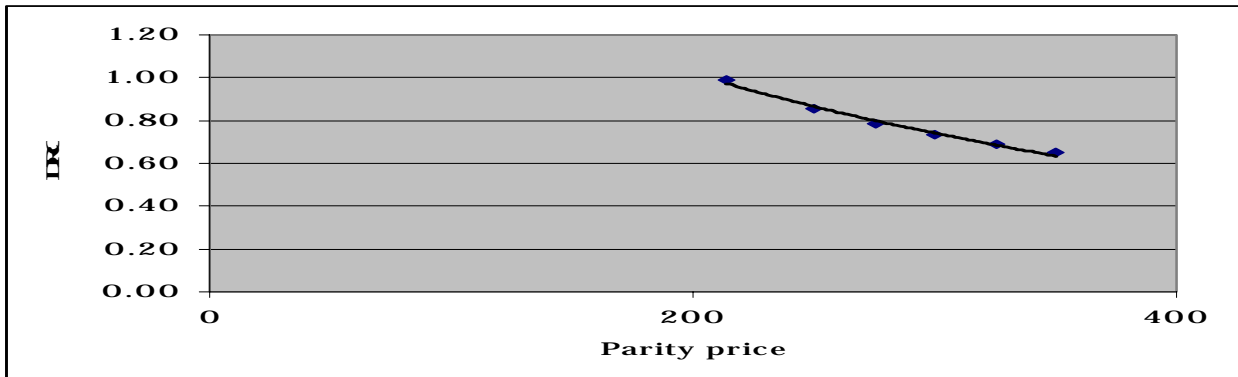
Since the exchange rate has a crucial impact on parity price, the same trend for the elasticity of the parity price on the addressed indicators is prevailing. Thus, the parity price has no relationship with FCB of the open field and green house systems meaning that the parity price doesn't affect the competitiveness of both systems, whereas it does affect other indicators.

Figures 4.10 and 4.11 show that comparative advantage is more sensitive to parity price variations and this impact is more effective in the open field system. Both systems will lose Comparative advantage if the parity price is more than 222 US\$ and 214 US\$ for open field and green house respectively.

Figure 4.10. DRC variations in correspondence to parity price changes by fresh open field tomato, 2002



Source: NAPC elaboration.

Figure 4.11. DRC variations in correspondence to parity price changes by fresh green house tomato, 2002

Source: NAPC elaboration.

Break even point analysis

It shows that the open field system will not loss comparative advantage even if the farm yield decreases to 81% of the current yield at the market prices and 71% at social prices. However, by the green house system this range expands to rich 88% at market prices and 71% at social one. Concerning the prices of the main final output, the open field system will keep profitability if the current market price decreases to 66% and the social price to 81%, while the break even point of the green house system of the packed tomato is 40% at market price and 64% at social price.

On the input market, open field system is still working if the post harvest costs increase by 1.16 at market price and 1.34 at social price , while in the green house system is still working if the costs of the total inputs increase by 1.23 at market price and 1.54 at social costs.

4.5.5 Tomato paste sensitivity analysis

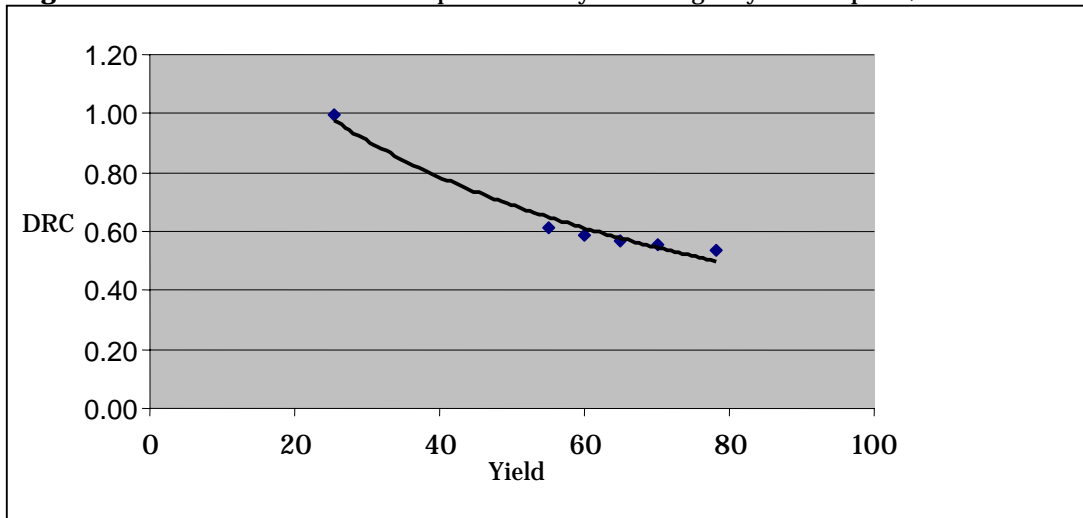
Table 4.19 presents the yield, conversion ratio, exchange rate, and parity price elasticity of the main indicators.

Table 4.19 Yield, exchange rate, conversion ratio and parity price sensitivity of tomato paste, 2002

	FCB	DRC	SCB	EPC	PSR
Yield	-1.27	-1.24	-0.75	0.08	1.39
Exchange rate	0.00	-1.21	-0.75	-2.48	30.25
Conversion ratio	-2.76	-1.43	-0.86	0.08	-1.20
Parity price	0.00	-1.95	-1.16	-3.62	16.40

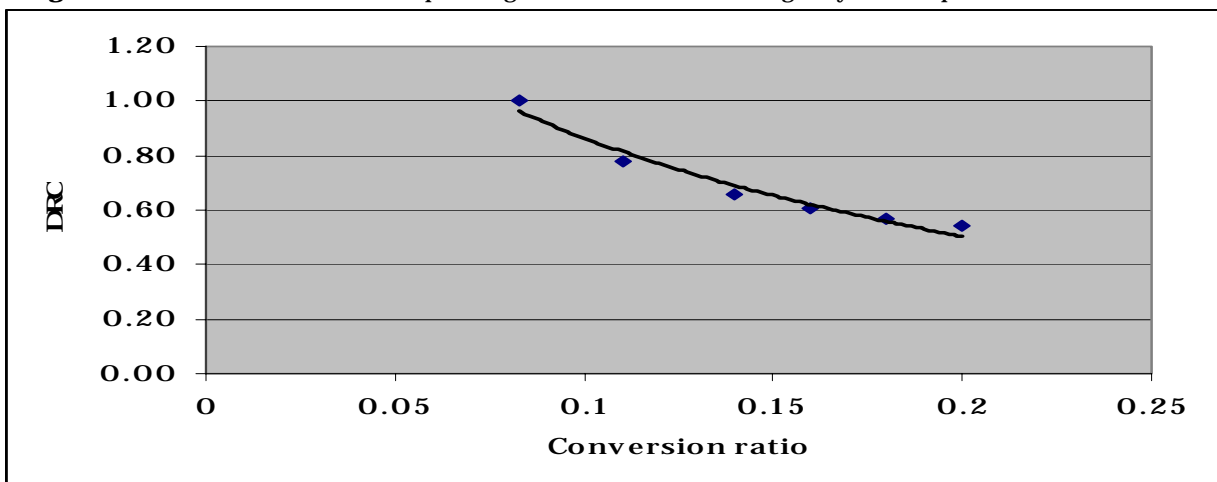
The same as the pervious two systems (open field and green house), the comparative advantage of tomato paste system is more sensitive to the variation of the yield, conversion rate and the parity price. Moreover, conversion rate has relatively a large impact on the financial cost benefit ratio while the exchange rate and parity price have large impact on DRC (table 4.19, figure 4.12, 4.13, 4.14).

Figure 4.12 DRC variations in correspondence to yield changes by tomato paste, 2002



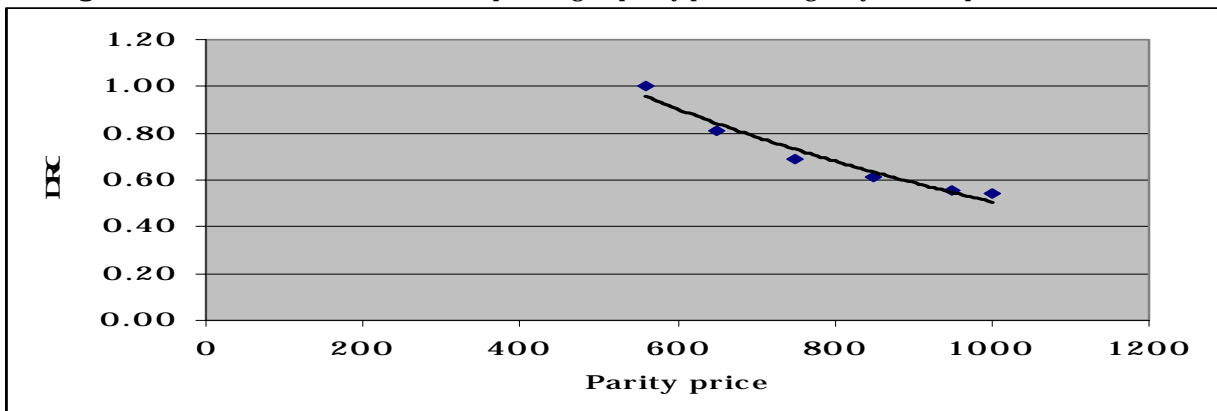
Source: NAPC elaboration.

Figure 4.13. DRC variations corresponding to conversion rate changes by tomato paste, 2002



Source: NAPC elaboration.

Figure 4.14. DRC variation and corresponding to parity price changes by tomato paste, 2002



Source: NAPC elaboration.

Chapter 5 - Conclusion and Recommendations

Results

- Syria has comparative advantage in producing tomato, due to a series of conditions which contribute to making export possible:
 - 1) Availability of tomato.
 - 2) Extended harvesting season during the whole year.
 - 3) Farm price advantage (Syrian farm prices undercut EU farm prices).
 - 4) Favorable climatic conditions.
 - 5) Saturation of Syrian tomato markets.
 - 6) Quality of raw material.
- As tomato price fluctuates according to the production season, exporters try to exploit the months when the average Syrian farm price undercuts the targeted country price, the production in some countries is very low, and there are market opportunities.
- Tomato sector is fairly protected and this sector has got benefit from the subsidies concerning irrigation, and the protection of the local production by imposing high tariff quota on tomato import according to the agricultural calendar. However, this sector has also an implicit tax especially for packaging. Since the tax levied on packing material is very high the share of these costs is very significant (about 10-15% for fresh tomato and more than 40% for tomato paste).
- To penetrate international markets Syrian tomato products should be compatible with the international standards.

Recommendations

- Producing high quality raw material to cope with consumer preferences at local and international markets, as well as to comply with the required specifications in foreign markets.
- Adopting high technology for processed tomato in order to improve conversion rate and enhance the feature of final products in terms of consumption and processing by reducing raw material costs and increasing the yield per area unit.
- Complying to the competitive prices by reducing raw material costs and increasing the yield per area unit.
- Selecting a special variety that has a high share of the solid material either by improving researches or by imports.

- Improving the policies concerning quality policy to comply with the required specifications in foreign markets.
- Strengthening international trade cooperation that aim to reduce fees and facilitate tomato products flows.
- Improving market information and transparency to comply with international challenges and to improve the elasticity and market efficiency of tomato sector.
- Reducing the applied fees related to tomato sector.

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