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Comparative Advantages of Potato

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Foreword

The Syrian economy has been gradually going through in-depth transformations for the last decade, and is subject to increasing exposure to international competition. The agriculture sector has a critical role in the social and economic development in Syria because it generates more than quarter of the income and employs a quarter of labour force. This sector contributes substantially to food security, supports the development of the other economic sectors and enhances Syria's position in terms of international trade. Accordingly, the agro-industry plays a very important role in this transformation due to its contribution to the GDP, employment and diversification of the sources of foreign currency earnings through exportation increase.

However, these changes pose a number of challenges for several agricultural products, including potato, due to the competition they generates with other countries exporting the same product. Therefore, policy makers need to make comprehensive assessments of the potential impact of possible policy changes on the economic viability of these commodities. This assessment will assist policy makers to formulate the most pertinent policies required to facilitate the adjustment of the agro-industrial sector and to anticipate and control any potential drawbacks on population welfare.

To this end the National Agricultural Policy Centre (NAPC) has conducted a comparative advantage (The concept of comparative advantages basically considers if a country should produce a good with its own domestic resources (labor, capital, land) to supply its population, and possibly to export, or if it is more economically efficient to import this good and to allocate the spared domestic resources to the production of other goods for which the country has a comparative advantages. This conceptual framework implies that the best allocation of domestic resources is the one achieved in an open trade and competitive environment; for more information see chapter4) study of selected agricultural commodities; including potato, pistachio, and sheep meat in order to provide the necessary information base for decision making.

This report presents the results obtained for the potato crop, while the results for the other commodities have been published in separate similar commodity reports that are available from the NAPC. Accordingly a synthesis has been produced putting in perspective the status of each commodity and the detailed description of the methodology applied.

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Executive Summary

The scarcity of natural resources and the ongoing opening of Syrian economy to the world markets outline the urgent need for Syria to reallocate its domestic resources and tradable inputs within the agricultural sector towards the objective of increasing 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 potato, which is one of the most important vegetable crops in Syria, in terms of production and productivity. It includes the most important agricultural policies related to the potato crop (seeds and product) in terms of price, credit, export, import, policy and legislation. It focuses also on the performance of the potato sector, which is assessed at the aggregate level, in terms of production value and value added of farming, marketing and processing in order to evaluate the efficiency and sustainability of the use of the available domestic resources and tradable inputs, and to identify the potential opportunities for Syrian exports of potato.

This study focuses on irrigated potato, due to the high share of its area (98% of the total potato cropped area) and the productivity of this type of production compared to rainfed potato. In Syria, irrigated potato is grown in three seasons: summer, autumn and spring.

The commodity chain of potato consists of four agents. The first agent is the farmer who produces the raw product and sometimes sells it directly in the market; the second agent is the middleman who collects the production from the farmers and sells it to the local market (wholesale market, traders, and processors); the processor treats the product and packs it to be mainly exported. 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 harvesting season of potato (spring, autumn, and summer).
- The type of the main output produced (packed or unpacked potato).
- The market destination (Arab, Gulf and European markets).

Spring and autumn productions of potato are concentrated in three governorates namely: Hama, Aleppo, and Idlib. Therefore the data at farm level was collected from these regions. The data of summer potato was collected from Rural Damascus because its production is concentrated in this governorate. On the other hand, the data of processors, middlemen, and traders was collected from the governorates of Hama, Aleppo and Idlib.

The private and social profitability of potato has been assessed by using the Policy Analysis Matrix (PAM). Nine PAMs have been constructed as follows:

- 1) The spring packaged potato exported to Germany and Dubai and the unpackaged potato exported to Iraq.

- 2) The autumn packaged potato exported to Germany and Dubai and the unpackaged potato exported to Iraq.
- 3) The summer packaged potato exported to Germany and Dubai and the unpackaged potato exported to Iraq.

However, the report focuses on the packed spring potato exported to Dubai and the unpackaged fall potato exported to Iraq. The same methodology can be used for the analysis of the other representative systems.

The methodology relies on the construction of an aggregated budget evaluated at both private and social prices for each agent. The private price, the 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 policies or market induced distortions and reflects the scarcity of any resource within the studied system¹. These budgets can then be used to assess revenues, costs and profits. Costs are disaggregated into three main groups: fixed costs, intermediate inputs, and direct labor. Also, with reference to the budgets, a distinction is made, within each cost category, between tradable goods and domestic resources. 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. Domestic factors are those that cannot be traded internationally, such as labor, land and capital. This concept of "domestic factor" is central to the theory of the comparative advantages as they correspond to the resources available from which goods can be produced within the national economy. Since there is a limited quantity of domestic factors available, their optimal allocation and combination are crucial to ensure the maximum level of efficiency.

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

By using the aforementioned method, a set of indicators of comparative advantages emerges. Accordingly, the results indicate that the Syrian potato sector has comparative advantage for the nine representative systems analyzed. With reference to the DRC indicator, potato has comparative advantage for all nine systems because the DRC is less than one.

Finally, an analysis was carried out to evaluate the sensitivity of the PAM's indicators with reference to the following parameters: interest rate, exchange rate, yield, seed price, and parity price of the main output. The results of this analysis indicate that the parity price of the main output, yield, and seed price are the most crucial parameters among those that significantly influence the value of the DRC.

¹ Policy Analysis Matrix, (Irek monek) 1989.

Chapter 1 -Background and Justification

Potatoes in Syria have demonstrated increasing export volumes in recent years, and it is considered as a growth export product. Its share of the total agricultural exports is about 0.3%. In 2005, the planted area of potato was 29 thousand hectares amounting to 0.7% of the planted area of summer and winter vegetables.

With the gradual shift from a state led to a market driven economy, combined with an increasing opening to the world trade and the corresponding competition with foreign suppliers, the comparative advantage of Syrian agriculture represents a crucial issue for policy formulation. It enables policy makers to consider to what extent the production of certain agricultural products is possible using domestic resources efficiently or if it is advisable to substitute local production with imports.

A comparative advantages analysis aims at identifying if a country ought 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 assumed to be limited, to the production of another good enjoying comparative advantage. Similarly, policy makers can identify which products might be promoted to supply the local and international market and to make the best use of domestic resources, responding to new international trade opportunities.

As mentioned before, potato has shown an increase in export volume; moreover, it plays a substantial role in both income generation and job creation. Therefore, it is crucial to assess to which range Syrian potato has comparative advantage considering both the needs of local market and the opportunity of entering new international markets.

Accordingly, this chapter presents the applied policies and the importance of the Syrian potato sector.

1.1. Policy issues of the potato sector

Price policies of potato seeds

Based on the production plan, the General Establishment for Seed Multiplication (GESM) determines the seed requirements of the farmers and the specifications as well. So, it imports about 5,000-6,000 tons of Elet Seeds each year. After that it contracts the farmers to plant the seeds. Farmers in turn deliver to the GESM their production of seeds that have the correct specifications (size and diameter) named class A. After treatment (bolting, cleaning and sterilization), the GESM resells the seeds to farmers directly. In case of lack of seeds, it imports some seeds by these characteristics. The imported seeds of potato are taxed by 3% according to the table of custom tariff which modified by decision no. /494/ date 4/2/2005. The Syrian Government determines the price of seeds of class A according to the cost study and it adds a profit margin of 25% and a reward of 20% (total

of 45%) for each 1 kg². The Minister of Agriculture and Agrarian Reform has legislated the Decision No. 230 dated 24/7/2006 which determines the prices of potato seeds as follows:

- The purchasing price of local potato seeds degree (A) produced from the summer season of the National Project 2006, is determined to be 10,500 SP/ton delivered to the storehouses of the GESM or the places announced by the governorates.
- The purchasing price of local potato seeds degree (E) produced from the open fields of the summer season 2006 is determined at 11,700 SP/ton delivered to the storehouses of the GESM or the places announced by the governorates.
- The selling price of potato seeds degree (A) produced from the spring season of the National Project 2006 and imported for planting in the autumn season is determined at 13,000 SP/ton at the storehouses of the GESM or the branches of the Agricultural Cooperative Bank (ACB) in the governorates.
- The selling price of potato seeds degree (A) in 2006 produced from the autumn season of the National Project 2005 is determined at 16,500 SP/ton at the storehouses of the GESM or the branches of the ACB in the governorates.
- The selling price of potato seeds degree (E) in 2006 produced from the autumn season of the National Project 2005 is determined at 22,500 SP/ton at the storehouses of the GESM or the branches of the ACB in the governorates.
- The selling price of potato seeds degree (SE) in 2006 produced from the autumn season 2005 is determined at 25,000 SP/ton at the storehouses of the GESM or the branches of the ACB in the governorates (Table 1.1).

Table 1.1. The cost of one ton of local potato seeds of the autumn season 2006 (SP/ton)

Item	2005	2006
Value of purchase	10,000	10,500
Value of bags	420	420
Research	18	18
Storage fee	846	926
Total cost of purchase	11,284	11,864
Bank interest	113	109
Loading and unloading	50	-
Transport and distribution cost	225	225
Production cost	321	321
Deterioration and drought	395	415
Cost of one ton	12,388	12,934
Commission of the ACB	50	50
Total cost	12,438	12,984
Suggested price	12,500	13,000

Source: Elaborated from MAAR- Directorate of Agricultural Economics

It is the first time in Rural Damascus that, the Union of Syrian Agricultural Houses imports potato seeds without coming back to the General Establishment of Producing Seeds which was responsible for importing seeds from abroad³.

Policies related to the potato crop

Since 1998, traders have had the permission to trade vegetables and fruits according to the Agriculture Calendar of the Great Arab Free Trade Area (GAFTA) with a tariff reduction of

² MAAR – Directorate of Agricultural Economics

³ The Agricultural Magazine 2006, Issue No. 6

5%, 10% and 20% in the last years before the full implementation of the GAFTA agreement. The full implementation has been early 2005.

Many official actions and facilities related to Syrian export promotion, which substantially impact potato, have been issued as follows:

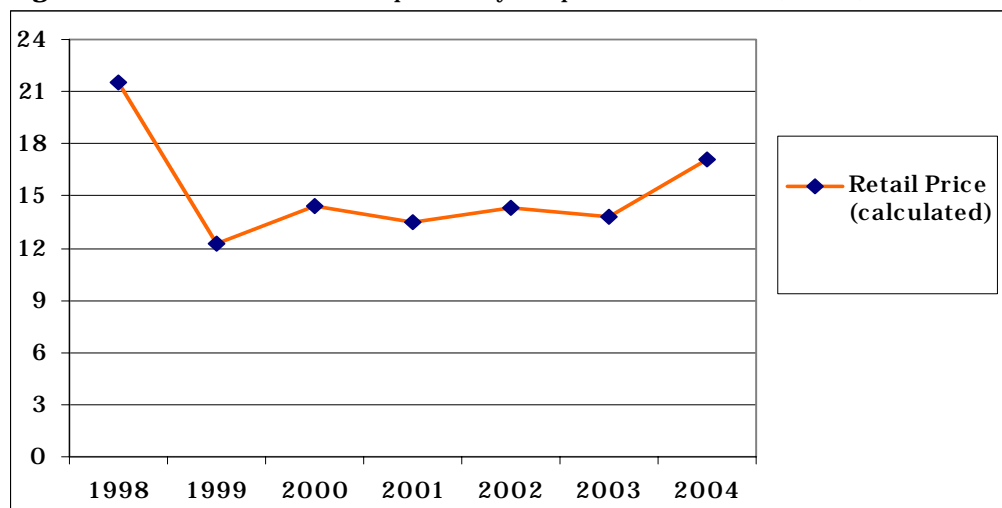
1. Legislative Decree no. 15 on the third of July 2001 declared that all kinds of agricultural exports are excluded from production and income tax.
2. Decree no. 1100 dated July 15, 2003 eliminated the obligation to finance imports through export earnings.
3. There are many facilities that are given to exporters for enhance and encourage the industrial sector and to reduce the transportation cost; such as legislative Decree no. 48 of August 4, 1998 that marks Syria's signature of the Transit International Agreement (TIR). As a result, fees on Syrian trucks and refrigerated carriers have been decreased leading to a reduction of the transportation cost of exported vegetables and fruits.
4. The Ministry of Transportation issued the General Decree no. 17854 on September 24, 2001, which dictates that Turkish trucks are permitted to enter Syria to ship Syrian vegetables and fruits to Europe.
5. The Ministry of Economy and Trade issued the Decision no. 672 on May 18, 2002, that all private importers are allowed to import using refrigerated carriers regardless of their origin. This allowance is however subject to several conditions, namely age of vehicle (less than 5 years old), the carrier must be a articulated unit (head of engine with its body), and the value of imported goods using refrigerating trailers has to be paid from hard currency earnings of vegetable and fruit exports.
6. Private exporters of vegetables and fruits are allowed to import using lines of packing and waxing provided the year of manufacture is not more than 4 years. Export is opened to private exporters; exported agricultural products, with their containers, are exempted from taxes; exporters are compelled to put labels on exported products explaining product characteristics, name of the company and the address of the factory. In addition, exporters are committed to declare that all the exported products are controlled according to the standards of destination countries.

Price and Credit of Potato

Vegetables and fruits are marketed freely in the local or central wholesale markets. Farmers deliver their productions to traders directly or ask traders to sell their outputs for a commission of 5% of the total value.

The price of potato differs form season to season according to supply, demand, export and import. The price of one kg of potato reached 17 SP in 2004 while it was 14 SP in 2003. Figure 1.1 illustrates the fluctuations of the retail price of potato during 1998-2004.

Figure 1.1. Evolution of the retail price of Syrian potato, 1998-2004 (SP/KG)



Source: NAPC Database

The retail price of potato for one kg reached 30 SP in September 2006, so the Ministry of Economy and Trade issued the Decision No.2305 dated September 9, 2006 to stop potato export until further notice.

Agricultural activities are financed by the ACB, which provides short, medium and long-term loans to public, cooperative and private agents.

Short-term loans are provided in-kind -seeds and fertilizer- and in-cash to finance agricultural operations. The interest rate varies according to the volume of the loan and differs between cooperative members and individuals: 4% for cooperative members and 5.5% for individuals, when the loan is less than SP 50 thousands, and 6% (members) and 7.5% (individuals), for the loans exceeding SP 50 thousands.

Medium term loans (maximum duration of 5 years) are used for the construction of irrigation channels, land reclamation and other such uses. These loans bear an interest rate of 5.5%.

Long-term loans have a duration not exceeding 10 years. They are granted for land development and improvement, storage buildings and fruit trees crops. These loans are subject to an interest rate of 5.5%.

Figure 1.2 traces the evolution of the in-kind and in-cash credits devoted to the potato crop over the period 2000-2004.

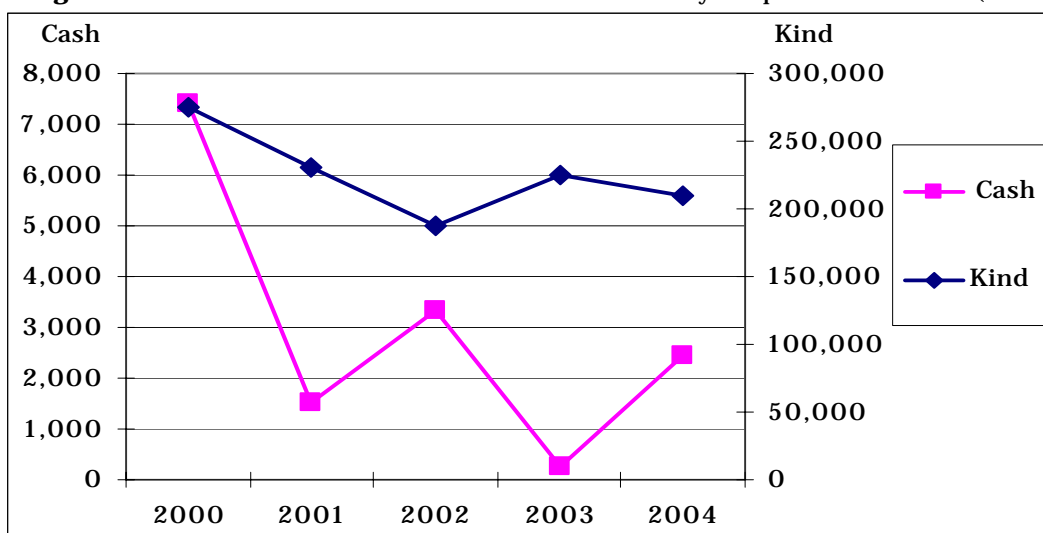
At the beginning of 2007, a new decision published to modify the interest rate of the agricultural cooperative bank (Table 1.2).

Table 1.2. The interest rate of the Cooperative Agricultural Bank at the first of 2007.

Item	Private and Common Sector	Cooperative Members	Public and Cooperative Sector
Short and mid – term loans	%8	%7	%5
Long-term loan	%9	%8	%5

Source: outlook of orange in Syria

Figure 1.2. Evolution of the in-kind and in-cash credits of Syrian potato 2000-2004 (000 SP)



Source: NAPC Database

1.2. Importance of potato in Syrian agriculture

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

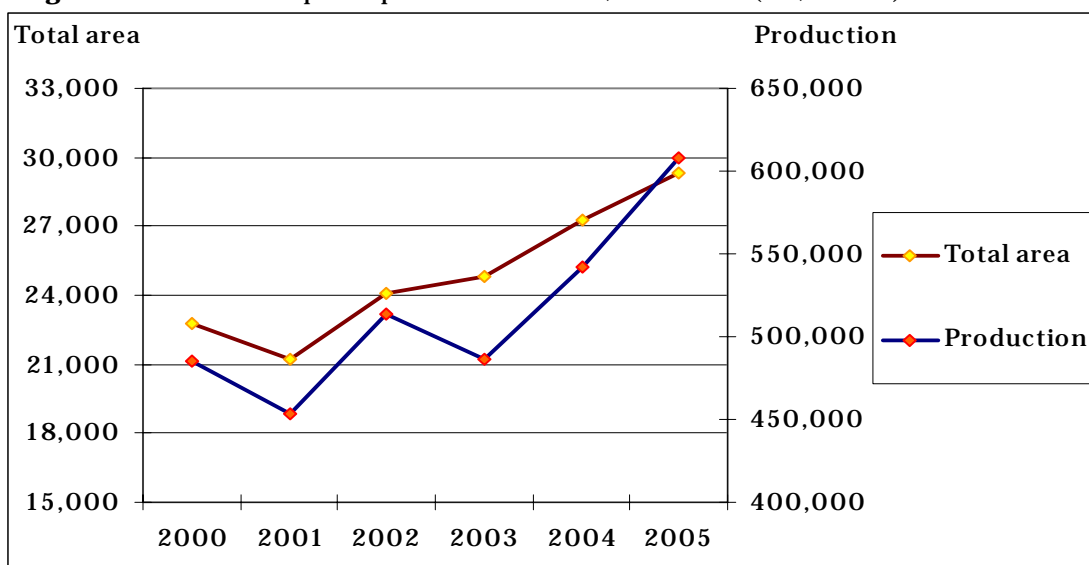
Agriculture has an important role in the economic and social development because of its contribution not only to GDP and employment but also to the development of nonagricultural activities like marketing and processing. In 2005, the agricultural sector contributed to 24% of the total GDP (at constant price) ranking first among the sectors of the economy. In this regard, the vegetable and fruit sectors increasingly play a crucial role. During the last three decades, vegetable and fruit production has significantly improved due to the expansion of the cropped area and the intensification of cropping practices. Therefore, in 2004 the vegetable sector recorded a good share amounting to 7% of the value of total agricultural production and 10.8% of the value of plant production at current prices responding to a consumption increase and population growth⁴.

Potato is one of the major vegetables. The value of potato production decreased by 1.4% considering the averages of 1998-2000 and 2001-2003. For the same period, its share in the total value of vegetable production declined from 45% to 36%⁵. Figure 1.3 illustrates the evolution of potato production and area over the period 2000 through 2005. It shows a substantial increase for both measures.

⁴ Estimated at 2.45% per year

⁵ NAPC – The State of Food and Agriculture 2005

Figure 1.3. Evolution of potato production and area, 2000-2005 (ton, hectare)



Source: NAPC Database- 2005

The main vegetable crops are potato, watermelon, tomato and cucumbers (Table 1.3) forming 47% of the total area of vegetables. In 2006, the cultivated area of potato occupied 17% of the total area of vegetables having the first order; therefore it forms an important income source for farmers.

Table 1.3. Area and share of the main Syrian vegetables, 2006

Item	Area (000 hectare)	Share %
Potato	29.5	17
Watermelon	23.5	14
Tomato	14.6	9
Cucumbers	12.9	8
Other vegetables	90	53
Total vegetables	170	100

Source: NAPC Database and Central Bureau of Statistics, The Annual Statistical Abstract (2006)

1.2.2. Nutritional value of potato

The chemical analysis of potato shows that it contains important nutritional components and fewer calories than bread (Box 1.1).

Box 1.1. Nutritional value of potato

Each 100 g of peeled potato includes 79 g water, 2.1 g protein, 17 g carbohydrate, 0.5 g fibers, 0.9 g ash, calcium, phosphorus, iron, sodium, potassium, and magnesium. Moreover, it provides the body with 80 kilo calories of energy. Comparing potato with wheat weight to weight wherefrom nutritious value it can be shown the following:

- Potato contains a third of calories of bread.
- Potato has the same amount as bread regarding protein, and vitamin B.
- Both of them are poor source of vitamin A.
- Fresh harvested potato is richer in vitamin C than bread.
- Potato exceeds bread in Iron and both of them are poor in phosphorus and calcium.

Starch and sugar percentage in potato is about 12-20% and 0.2-7% respectively. Therefore, potato is considered a good substitute for bread and plays an important role in the consumption patterns of the countries.

Source: Agricultural Magazine (2006)

Potato plays a crucial role in the nutritional programs of the countries. The annual per capita consumption of potato amounts to 14 kg in Egypt, 4 kg in Iraq, 47 kg in USA, 52 kg in Italy, 88 kg in England, 90 kg in Holland, 100 kg in France, 124 kg in Spain, 131 kg in Germany, and 250 kg in Poland⁶. In Syria, the annual per capita consumption of potato increased in urban and rural population between 1996-1997 and 2003-2004 from 19.32 and 25.56 kg respectively to 26.4 and 36.36 kg respectively (Table 1.4).⁷

Table 1.4. Annual per capita consumption of selected Vegetables, 96-97 and 2003-2004 (kg)

Item	1996-1997		2003-2004	
	Urban	Rural	Urban	Rural
Potato	19.32	25.56	16.4	36.36
Tomato	47.52	50.88	48.36	55.44
Eggplant	17.52	15.69	18.96	21.96
Cucumber	15.72	14.28	23.28	25.56
Dry Onion	7.32	9.36	8.52	9.48

Source: NAPC, SOFAS 2002, and Central Bureau of Statistics (CBS), Household Survey 2003-2004.

1.2.3. Place of potato and its derived products in Syrian trade

Total agricultural exports of potato in 2002 were valued at \$1333.3 million and decreased to \$1137.2 in 2003 and \$1127.4 million in 2004. Potato exports in Syria in 2002 reached \$6.0 million and declined to \$3.1 in 2003 and \$3.2 million in 2004 amounting to 0.3% of total agricultural exports.

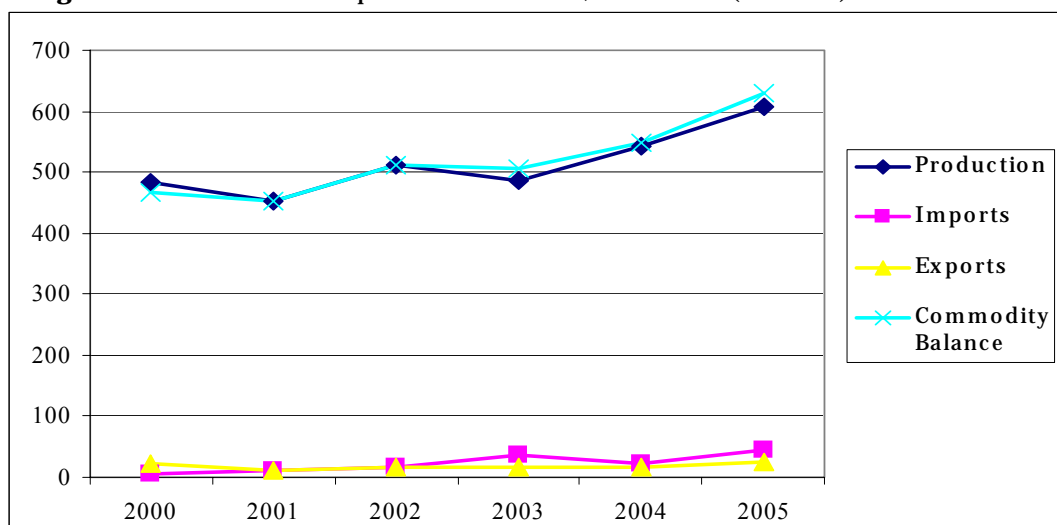
Figure 1.4 illustrates the development of production, imports, exports, and total supply (commodity balance) of potato during 2000-2005. It shows an increasing trend of all items of the commodity balance sheet from 2004 to 2005.

Figure 5.1 depicts the destinations of fresh and frozen potato exports in 2005 to Arab countries. The highest share was to Iraq (32%), Kuwait (16%), Jordan (12%), and United Arab Emirates (11%).

⁶ Agriculture Magazine- issue No.19-2006.

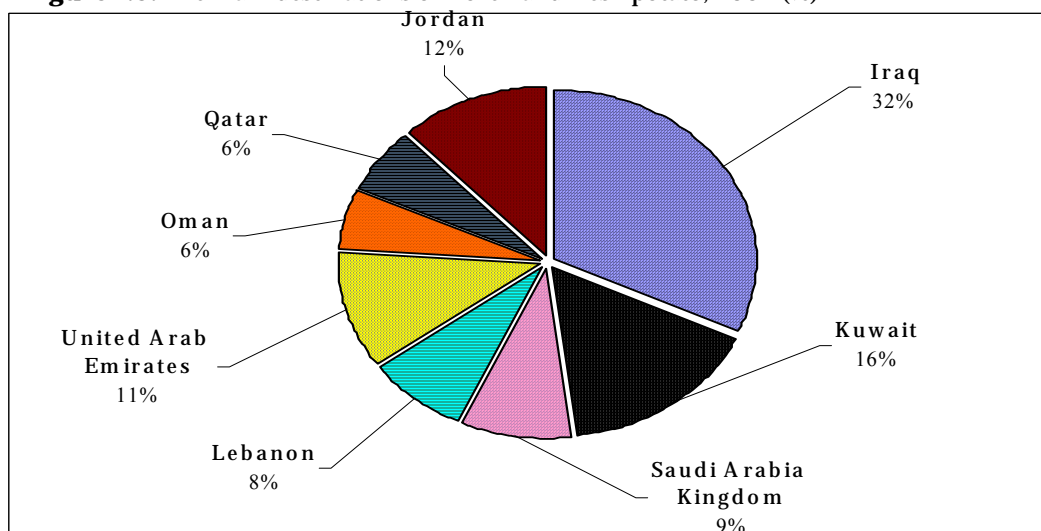
⁷ Comparative Advantage of Tomato- NAPC.

Figure 1.4. Evolution of the potato balance sheet, 2000-2005 (000 tons)



Source: NAPC Database.
Commodity balance = Total supply

Figure 1.5. The main destinations of frozen and fresh potato, 2004 (%)



Source: Syrian Agriculture Trade 2005

1.3. Objectives of the study

Potato has been selected to be covered in this study because it is considered as a promising crop which may have new international market opportunities. The report aims to assess the performance, efficiency, government intervention and market distortions of this crop through:

- Determining the applied agricultural policies (price, credit, export, and import) on the potato crop;
- Describing the potato commodity chain from primary production to final consumption to determine the internal relationships among the agents and to

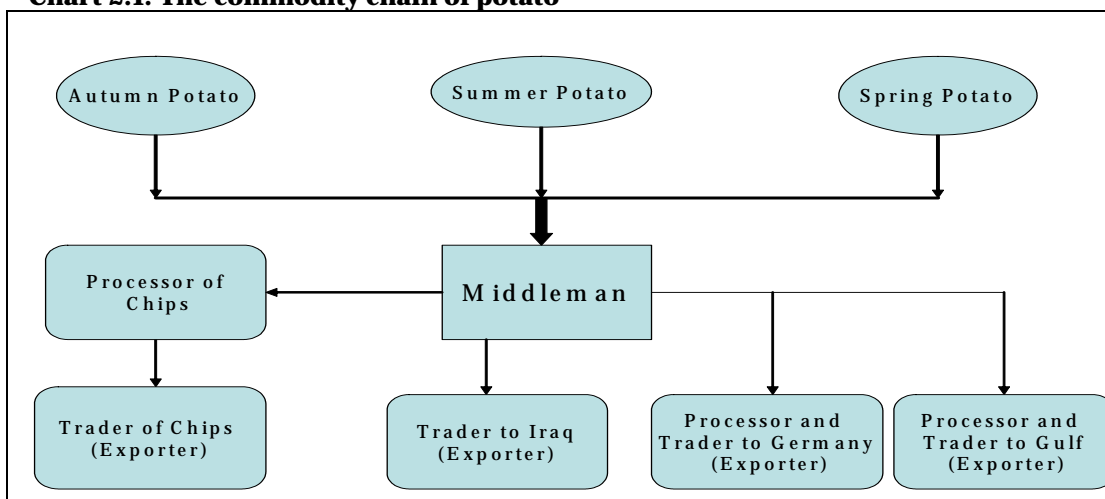
- select the representative systems taking into account the major cropping systems, marketing and processing;
- Identifying the agents' characteristics, constructing an aggregated budget and decomposing the budget's items into tradable and domestic factors in order to calculate the policy analysis matrix;
 - Computing the policy analysis matrix and its indicators of comparative advantages to evaluate 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;
 - Setting adequate recommendations to improve the efficiency of the commodity system of potato.

Chapter 2 – Description of the Commodity System

The commodity chain of potato describes the various paths the potato follows from its origin as raw product, undergoing several transformations, up until its final form (final product or final consumption). This chain comprises four agents. The first agent is the farmer who produces the raw material of potato along three production seasons namely: spring, summer and fall potato. The second agent is the middleman who sells the farm product for a commission. The third agent is the packer who sorts, grades and packages the product to be ready for export. The fourth agent is the trader or exporter who markets the potato product.

Chart 2.1 illustrates the supply chain of potato. Accordingly, it can be distinguished between the operators in the local market such as farmers (spring, summer and fall), middlemen and processors and the agents operating in both local and foreign markets like packers and traders.

Chart 2.1. The commodity chain of potato



Source: Author elaboration

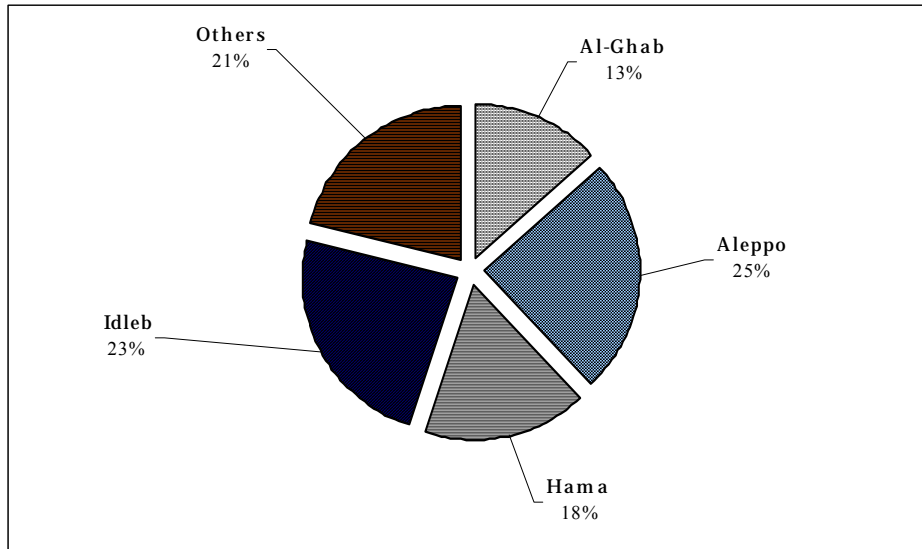
2.1. Description of the major cropping system

In 2005 the cultivated area and production of Syrian potato amounted to 29 thousand hectares and 608 thousand tons, respectively. The area and production of potato differs among governorates. The average area (2000-2005) indicates that the share in total area of potato can be disaggregated at governorate level as follows: 25% Aleppo, 23% Idleb and 18% Hama (Figure 2.2). Most of these areas are irrigated (98%), whereas the rain-fed area

is 2% concentrating mostly in Lattakia (37%) and Tartous (12%). The share in total production of potato attained 26% in Aleppo, 24% in Idleb and 18% in Hama (Figure 2.3).

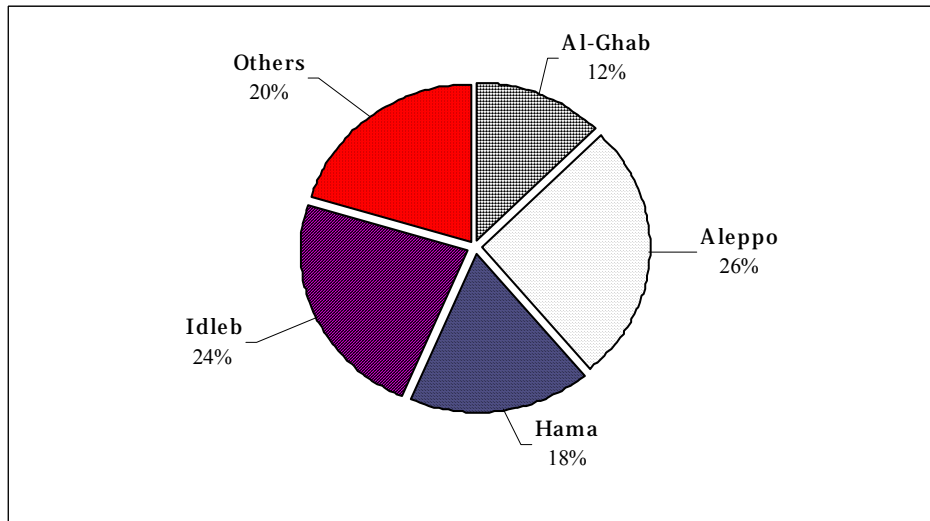
The area and production of potato differs among seasons and governorates. The respective share of the seasons in total potato area is 51% in the autumn, 46% in spring and 3% in summer taken as an average in the period 2000-2005. With reference to production, however, the share is 56% for spring potato, 40% for fall potato and 4% for summer potato.

Figure 2.2. Average Area distribution of potato in Syria by Governorates, 2000-2005 (%)



Source: Elaborated from NAPC Database

Figure 2.3. Average production distribution of potato in Syria by Governorates, 2000-2005 (%)

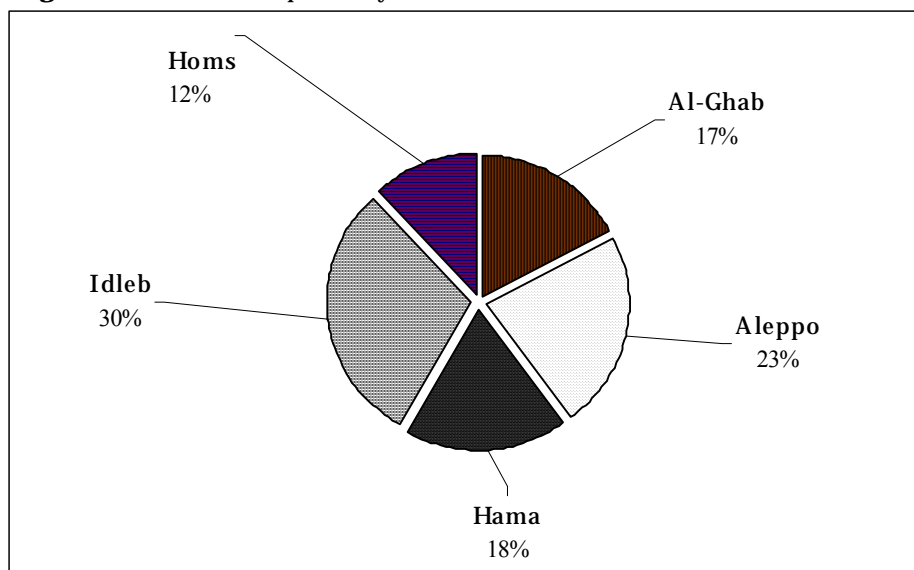


Source: Elaborated from NAPC Database

Concerning governorates, the area and production of the seasons vary due to crop rotation and water availability. Idleb occupies 30% of the cropped area of autumn potato in Syria, followed by Aleppo (23%), then Hama by (18%), and Al-Ghab by (17%); see Figure 2.4.

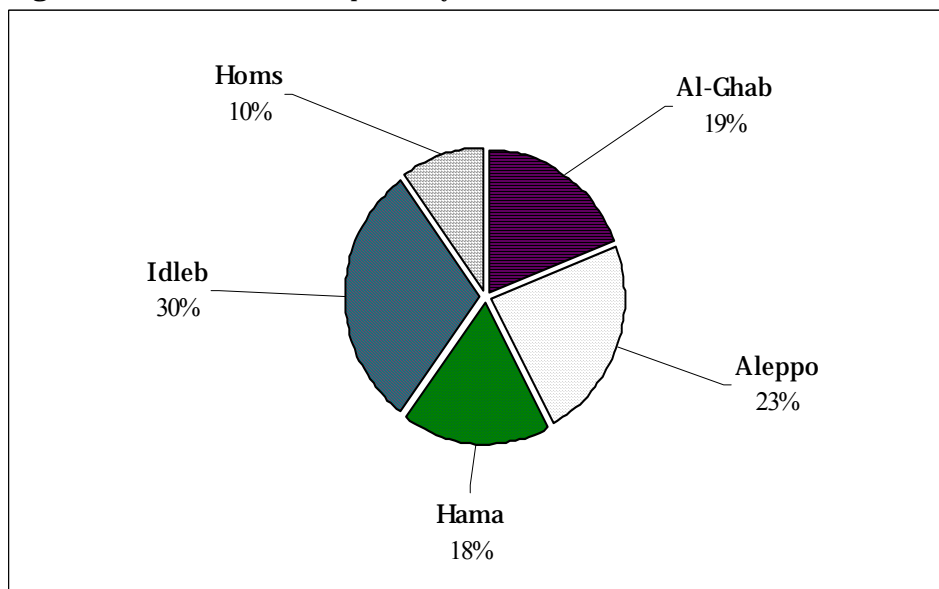
Regarding production, these shares are 30% for Idleb, 23% for Aleppo, 19% for Al-Ghab and 18% for Hama (Figure 2.5).

Figure 2.4. Area of fall potato by Governorates, 2000-2005 (%)



Source: Elaborated from NAPC Database

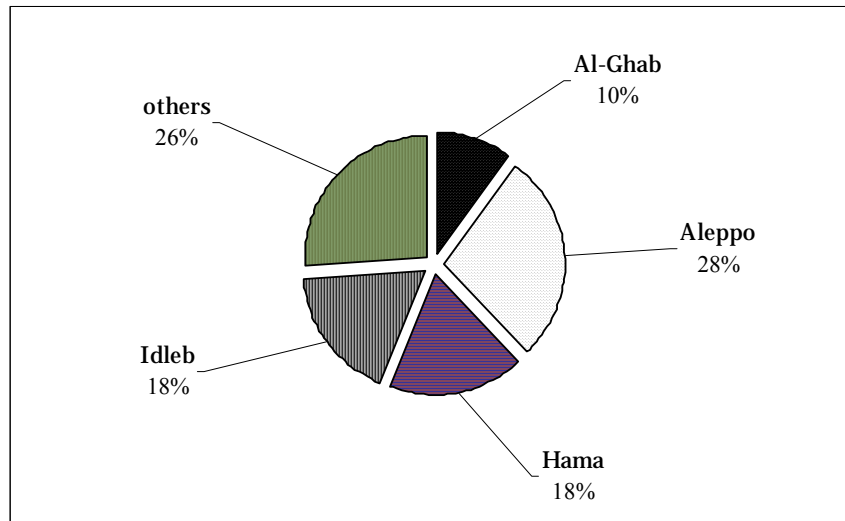
Figure 2.5. Production of fall potato by Governorates, 2000-2005 (%)



Source: Elaborated from NAPC Database

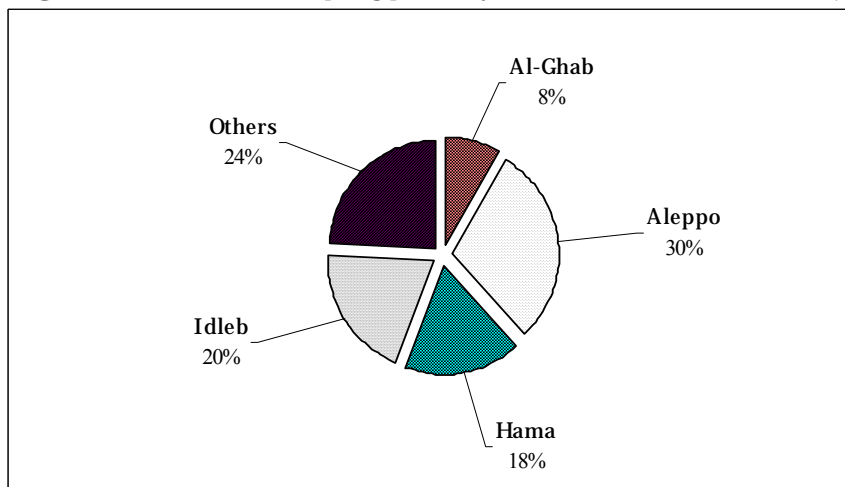
Spring potato area concentrates in Aleppo (28% of total), Idleb (18% of total) and Hama (18% of total), see Figure 2.6. Production concentrates also in the same governorates (Figure 2.7).

Figure 2.6. Area of spring potato by Governorates, 2000-2005 (%)



Source: Elaborated from NAPC Database

Figure 2.7. Production of spring potato by Governorates, 2000-2005 (%)



Source: Elaborated from NAPC Database

2.2. Marketing and processing

The cooperatives market the products of their members especially to processing companies. The cooperatives seldom transport the products directly to the market. Therefore, the farmers sell their products individually at the market.

The Agricultural Cooperative Bank (ACB) is the major but not the unique supplier of production requirements. Potato seeds are imported by the General Establishment of Seed Multiplication (GESM) of the Ministry of Agriculture and Agrarian Reform (MAAR). The other inputs are either produced locally, such as fuel and fertilizer, or imported, like fertilizer and control materials. The import of these production requirements occurs by the General Establishment of Chemical and Food Products of the Ministry of Economy and Trade, which doesn't deal with farmers directly but through the ACB⁸.

⁸ Rama 2000. Agricultural Marketing and Processing. NAPC

In Souk Alhal (wholesale market), farmers sell their products including potato to the middleman or wholesaler or retailer. Sometimes the traders meet the farmers at their farms to purchase their products directly relying on contracts, trust and the assistance of the trader.

The middleman sells the potato of the farmer at Souk Alhal for a commission of 5%. This commission can amount to 20-30% in case of the provision of credits to farmers. These credits can be in-cash or in-kind (fertilizer, seeds, etc) or both. A deduction of 3% of the product weight to account for foreign matters. The middleman sells the products to wholesalers or to other unspecialized middlemen.

Exporters clean, sort and grade the potato to be exported or stored. The stored potato is marketed when there are small quantities of the product in the market. Some exporters operate out of the market. They purchase the product directly from farmers to be exported. The remaining quantities are sold to the local market.

The consumers purchase the potato either from the public sector (very limited quantities) or from the private sector.

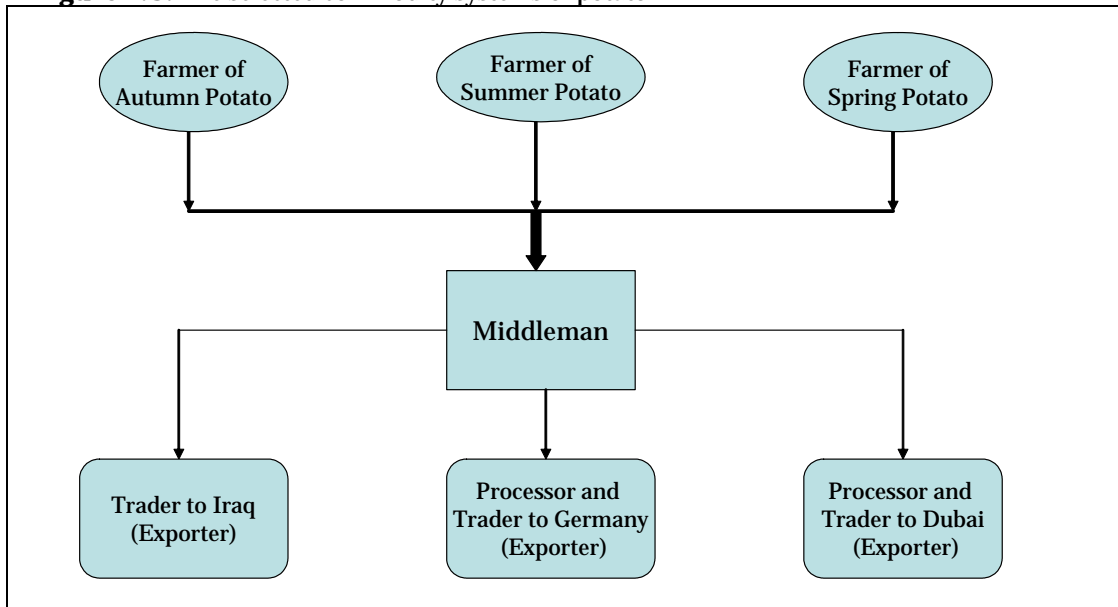
In addition to its importance as seed and food, potato is considered crucial as both processing and fodder input.

The processing firms (that produce chips) purchase potato from traders. These potatoes then undergo to manual sorting, four stages of cleaning, mechanical peeling, manual controlling, slicing, oil frying, manual controlling, flavoring, mechanical filling, manual packaging and storage. The processed product is shipped locally to all governorates or exported (mostly to Arab countries like Saudi Arabia, Iraq and Jordan).

2.3. The selected commodity systems

Figure 2.8 shows the selected commodity systems of potato.

Figure 2.8. The selected commodity systems of potato



Source: Author elaboration

2.3.1 Potato production at farm level

The production of potato occurs through out the year given three production seasons and various governorates. This gives opportunity for export.

Spring potato

Planting of spring potato occurs from January to February, harvesting starts in June. The area and production of this product are estimated to be 13 thousand hectares and 250 thousand tons respectively and distributed in most governorates. The major spring potato producing governorates are Aleppo, Idleb, Hama, Homs and Al-Ghab where the suitable soil and climatic conditions are available resulting in a high yield (3.5 ton/dunm). The average yield is 2.5 ton/dunm making the spring potato the main season from production point of view. 30% of the production of this season is devoted to seeds. The GESM imports annually about 5000 tons of potato seeds (Elet type) to be distributed to farmers via contract of high quality standards and conditions. After sorting and grading, the remaining potato seeds are sold in the market.

Autumn potato

Autumn potato is planted from mid July to mid August, harvesting starts early November and continues until the end of February. Autumn potatoes are considered the main potato type in terms of area. In terms of area autumn potatoes are planted on 14 thousand hectares and produce 240 thousand tons. The yield of this season is subject to extreme climatic conditions such as high temperature and frost. The seeds have to be treated with disinfection material. Autumn potato consumes more water than spring potato. The final product is sold in the local market or exported. The production of autumn potato concentrates in Aleppo, Idleb, Hama, Homs and Al-Ghab.

Summer potato

The area of summer potato is very limited, and does not exceed one thousand hectares. The production concentrates in Rural Damascus. Planting occurs from April to mid May. The production of this product amounts to about 25 thousand tons.

2.3.2. Middleman

The middleman has a shop at the market, from where they purchase and sell the products. He/she is unspecialized.

2.3.3. Processor – packer – trader (exporter)

These are places at the wholesale market where the potatoes are cleaned, sorted and graded. This process causes a loss of 5% in the product (foreign matters and evaporation). The good quality potato is then packed in boxes for export. The remaining potatoes, i.e. those that don't reach the export specifications, are sold in the local market. Potatoes exported to Iraq, however, are sold directly from the local market without any need for cleaning, sorting and grading.

Chapter 3 – Agents' Characteristics of the Commodity Chain

3.1. Information sources

The basic information and the relating to the potato crop were collected from the governorates where potato production concentrates: Hama, Aleppo and Idleb. In addition to farmers, the questionnaires investigated the other agents of the commodity chain such as middlemen, processors and traders.

The collection of farm data in the proposed governorates relied on the investigation of the agricultural directorates and their sub-directorates, extension units and the leaders of local communities. In this regard the questionnaire includes information about fixed costs (well digging, buildings, irrigation nets and other equipment) and variable costs (labour wages, land rent, maintenance, seeds, chemical and manure fertilizers, control materials, mechanical hours, water and others).

At farm level the budget was calculated for the three potato seasons incorporating the revenues, costs (fixed cost, labour cost and cost of intermediate inputs) and profit. The items of revenues and costs were divided into tradable and non-tradable components. The number of estimated budgets was 7 for fall potato, 4 for summer potato and 9 for spring potato. In addition the budgets collected were used in the supply and demand study, the estimated budgets of the agricultural directorates and their sub-directorate and the assessed budget of the Ministry of Agriculture and Agrarian Reform (MAAR).

Post harvest data including fixed and variable costs, technology, real and theoretical capacities and marketing channels was collected by interviewing private processors and traders. At the wholesale markets of the designated governorates 2 middlemen were interviewed. Accordingly, data was collected about the fixed costs (costs of building and establishment of cool storage places), variable costs (labour, electricity, water, communications, fuel, maintenance and duties), products traded, commissions and the share of potato trade. This information was used to calculate the potato budget for each agent. Furthermore, 2 traders to Iraq and 2 traders to Europe and Gulf, were met to collect the same information mentioned, before taking into consideration the specific export services such as cleaning, sorting and grading.

3.2. Farm budget

The farm budget consists of the price, quantity and the value of inputs and outputs per hectare (ha) of land. These costs are then divided into fixed costs, labour costs and intermediate inputs. With regard to labour costs, it is worth mentioning that a great part of agricultural operations are performed by family labour. In 2005, the total cost of investing one hectare amounted to 134 thousand SP for autumn potato, 145 thousand SP for summer potato and 201 thousand SP for spring potato.

3.2.1. Fixed costs

Fixed costs are the type of costs that are paid independent of production volume. In this study, they comprise the costs of well establishment, irrigation net, building, and equipment. The establishment value of the well was estimated to be based on the irrigation capacity of this well and the utilization of one hectare of potato of this capacity, assuming a life value of 50 years for the well and building, 8 years for the irrigation net and 15 years for the car and tractor. A salvage value of zero is assumed and the system is assumed to use drip irrigation technology. Thus, the current value of one fixed unit can be calculated. Furthermore, it is considered that the retention period of the potato crop on land is 5 months for spring potato, 4.5 months for summer potato and 4 months for fall potato.

In 2005 the fixed cost of one hectare of potato amounted to 5,162 SP (3.9% of total cost) for fall potato, 92,412 SP (1.4% of total cost) for summer potato and 5,931 SP (3% of total cost) for spring potato.

3.2.2. Direct labour

Labour is considered as domestic resource (non-tradable). It was separated into permanent and temporary labour. It is permanent when it benefits from social insurance, e.g. retirement, due to signing of a permanent contract. It is temporary when it is seasonal (with seasonal contract or without contract). Labour cost is calculated for each operation by multiplying the number of hours needed for one hectare with the hour wage of each operation. In 2005, the share of labour cost in total cost amounted to 17% for fall potato, 15.8% for summer potato and 12.2% for spring potato. Table 3.1 illustrates the various kinds of labour costs and their shares for the three types of potatoes.

Table 3.1. Labour costs of potato in 2005 (SP/ha and %)

Item	Fall potato		Summer potato		Spring potato	
	Cost (SP/ha)	Share %	Cost (SP/ha)	Share %	Cost (SP/ha)	Share %
Weeding and others	2,692	11.9	6,688	29.2	2,621	10.7
Sowing	830	3.7	306	1.3	1,813	7.4
Fertilization	101	0.4	470	2.1	694	2.8
Harvesting, filling, loading and sorting	18,953	84.0	15,411	67.4	19,369	79.1
Total labour	22,575	100.0	22,875	100.0	24,497	100.0

Source: Author elaboration

3.2.3. Intermediate inputs

Intermediate inputs such as land rent, maintenance, seeds, fertilizer, control materials and mechanical hours are considered variable costs. Table 3.2 illustrates the intermediate inputs and their share in total cost of intermediate inputs for the three types of potato farming in 2005. In 2005 the share of the cost of intermediate inputs in total farming costs was 79.2% for autumn potato, 82.8% for summer potato, and 84.9% for spring potato.

The cost of one cubic meter of water was calculated relying on the hourly consumption of fuel and oil, hourly water pumping capacity, deepness of the well (most of the wells were considered deep (about 200 meter)) and water requirements of the crop. Autumn potato consumes water more than spring and summer potato.

⁹ Fixed cost of summer potato decreased because most lands in Rural Damascus (area study of summer potato) without building since its near population homes. Moreover, the deep well is less than 100m (it depends on the snow on the mountains). Also, the rotation of potato is 4.5 months while the spring 5 months.

Within intermediate inputs a distinction was made between tradable goods and domestic factors to compute the domestic resource cost along the commodity chain. In this regard, a use was made of the Farming System Study of the National Agricultural Policy Center.

3.2.4. Distribution of the cost components

Spring potato

Spring potato is considered the major season because it has the major share of potato area and production. Therefore, the study gives more attention to this production. The cost components related to spring potato were mentioned before. Thus, Figure 3.1 focuses on the distribution of the cost components of spring potato into tradable and non-tradable items.

Table 3.2. Intermediate inputs of potato by season in 2005 (SP/ha and %)

Item	Fall potato		Summer potato		Spring potato	
	Cost SP/ha	%	Cost SP/ha	%	Cost SP/ha	%
Land rent	7,827	7.4	10,352	8.6	10,576	6.2
Maintenance	917	0.9	1,438	1.2	245	0.1
Seeds/ seedlings	48,000	45.3	50,781	42.3	98,394 ¹⁰	57.7
Manure	2,173	2.1	3,294	2.7	4,798	2.8
Chemical fertilizers	9,721	9.2	9,235	7.7	11,414	6.7
Control material	2,959	2.8	6,339	5.3	6,262	3.7
Packaging	4,500	4.2	6,297	5.2	4977 ¹¹	2.9
Water	14,862	14.0	7,252	6.0	10,099	5.9
Mechanical hours	14, ¹² 964	14.1	25,107	20.9	23,879	14.0
Land preparation and leveling	3,361	3.2	4,540	3.8	3,997	2.3
Sowing	1,433	1.4	966	0.8	1,699	1.0
Fertilization	186	0.2	1,212	1.0	594	0.3
Controlling	757	0.7	1,180	1.0	718	0.4
Harvesting	550	0.5	6,995	5.8	680	0.4
Transportation	8,285	7.8	9,600	8.0	15947 ¹³	9.3
Incubation	392	0.4	614	0.5	244	0.1
Total intermediate inputs	105,923	100*	120,096	100*	170, ¹⁴ 644	100.0*

Source: Author elaboration

* Totaling 100 until mechanical hours

¹⁰ The high price of seed in summer related to using foreign imported seeds (42.5 SP/Kg), local seeds (17 SP/Kg), and smuggled seeds.

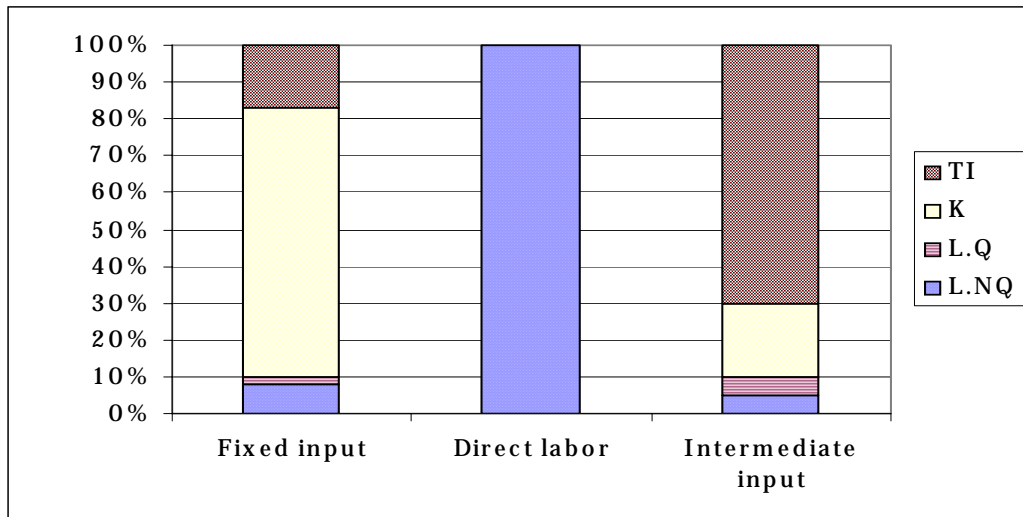
¹¹ 30% from the spring potato production is delivered to General Establishment of Multiplication and value of boxes is retrieved.

¹² The mechanical hours decreased in fall potato because land preparation does not need deep cultivation. In addition, the fertilizers are less and the harvesting is manual.

¹³ The transporting cost is high because high yield in this season, so it requires transport production to central market in the governorates or to other governorate.

¹⁴ The total intermediate inputs are high in spring potato because the seed and transporting cost are high.

Figure 3.1. Distribution of the cost components of spring potato in 2005 (%)



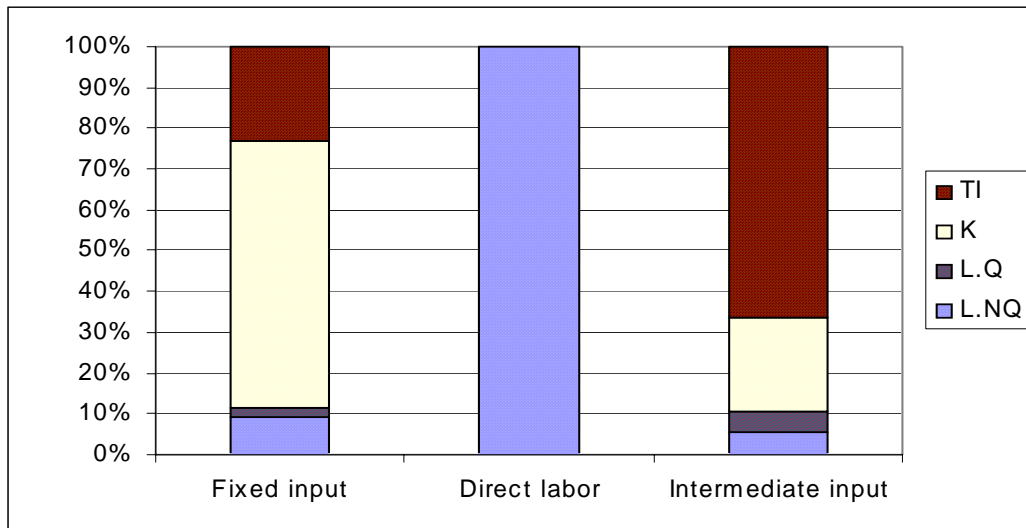
Source: Author elaboration

TI = Tradable inputs, K = Capital, L.Q = Qualified labour, L.NQ = Non-qualified labour

Autumn potato

Autumn potato ranks second after spring potato regarding potato area. Figure 3.2 illustrates the distribution of the various costs of fall potato into tradable and non-tradable items.

Figure 3.2. Distribution of the cost components of fall potato in 2005 (%)



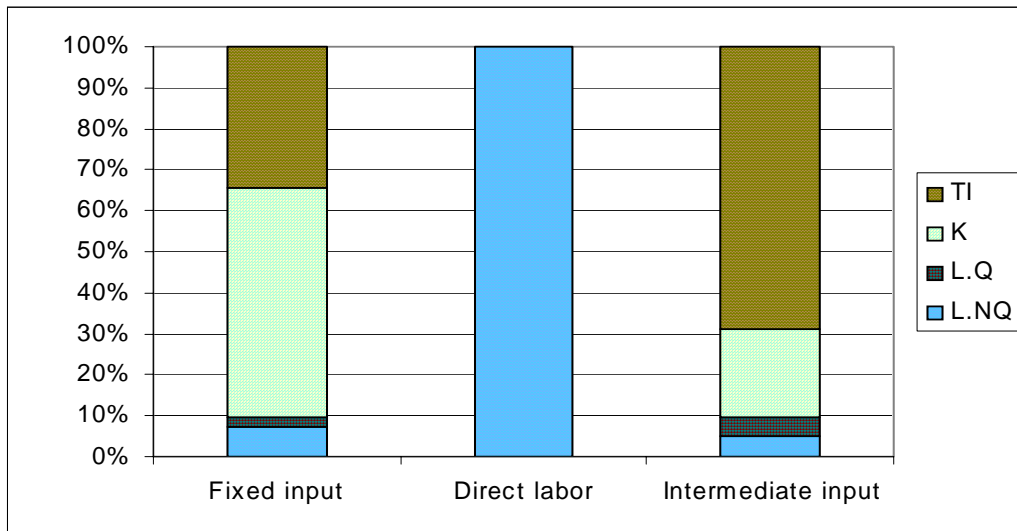
Source: Author elaboration

TI = Tradable inputs, K = Capital, L.Q = Qualified labour, L.NQ = Non-qualified labour

Summer potato

Summer potato ranks third regarding potato area and production and concentrates in Rural Damascus. Figure 3.3 shows the distribution of the cost components of summer potato into tradable and non-tradable items.

Figure 3.3. Distribution of the cost components of summer potato in 2005 (%)



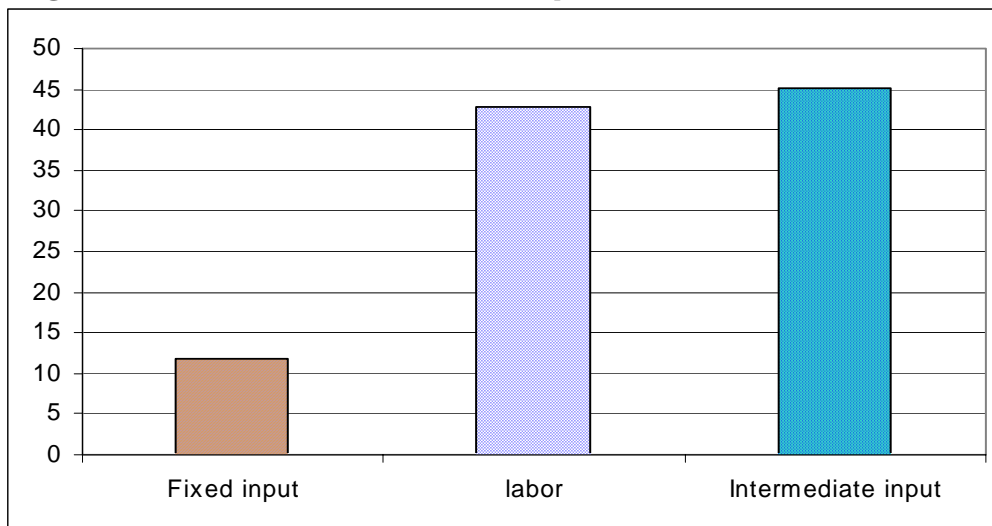
Source: Author elaboration

TI = Tradable inputs, K = Capital, L.Q = Qualified labour, L.NQ = Non-qualified labour

3.3. Middleman budget

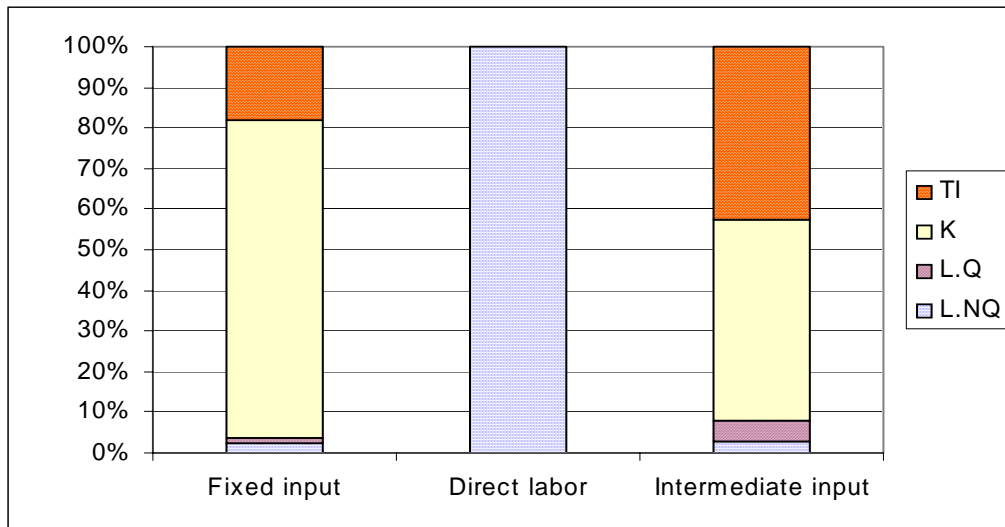
The middleman brings the farmer and trader together due to a commission. He/she owns a unit at the wholesale market and a place at the storage units. It is assumed that these buildings have a life of 50 years. He requires a lot of uneducated labour. The intermediate inputs are comprised of electricity, water, communications, maintenance and duties. Figure 3.4 illustrates the distribution of the costs of one ton of potato sold into fixed costs, intermediate inputs, and labour in 2005. Figure 3.5 shows the distribution of these costs into tradable and non-tradable items.

Figure 3.4. Distribution of the costs of one ton potato sold in 2005 (%)



Source: Author elaboration

Figure 3.5. Distribution of the cost components of one ton potato sold in 2005 (%)



Source: Author elaboration

TI = Tradable inputs, K = Capital, L.Q = Qualified labour, L.NQ = Non-qualified labour

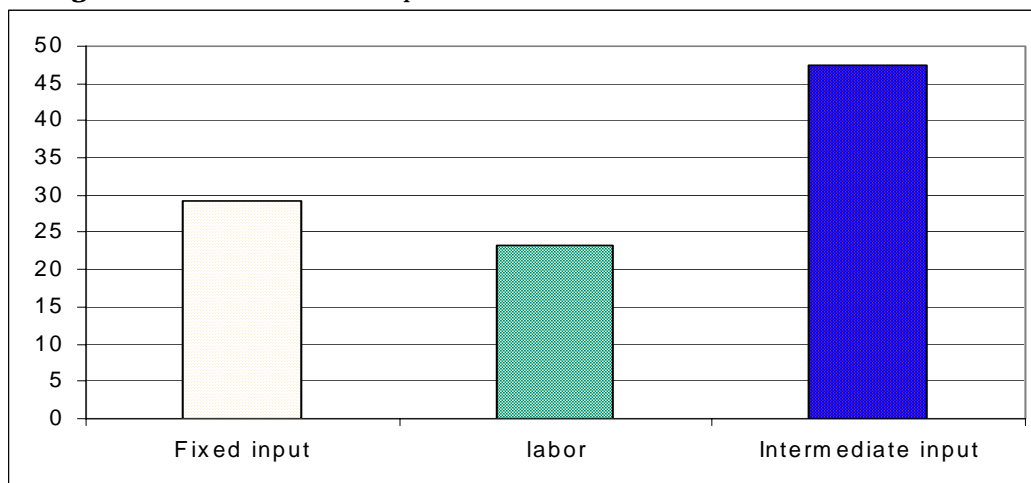
3.4. Packer budget

At the wholesale market, the potatoes are cleaned, sorted and graded after their purchase from farmers or middlemen. By calculating the packer budget several factors were taken into account namely the average price, price variations, quality (first grade, second grade, and by-product) and annual capacity of the packer.

The fixed costs of the packer include the costs of the packing and grading place, storage place and equipment. The variable costs incorporate labour, electricity, water, communication, fuel, maintenance, loading, transportation and others.

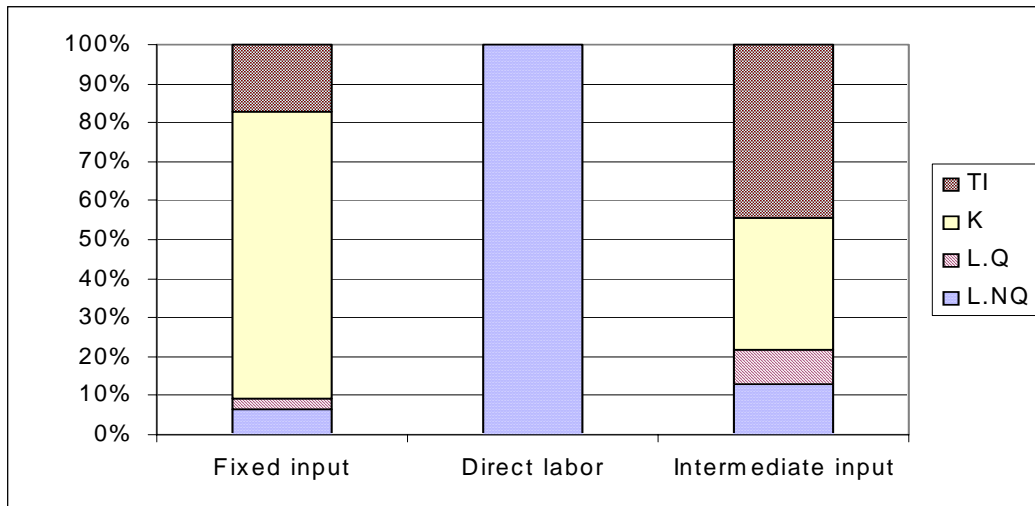
Figure 3.6 illustrates the distribution of the packer costs into fixed costs, labour costs and intermediate inputs. Figure 3.7 demonstrates the distribution of these costs into tradable and non-tradable items.

Figure 3.6. Distribution of the packer costs in 2005 (%)



Source: Author elaboration

Figure 3.7. Distribution of the components of the packer costs in 2005 (%)



Source: Author elaboration

TI = Tradable inputs, K = Capital, L.Q = Qualified labour, L.NQ = Non-qualified labour

Chapter 4 – Comparative Advantages of The Representative Systems

4.1. Methodological notes

Comparative advantage analysis is the framework by which the financial and economic profitability of any activity is determined via assessing the returns of this activity in the absence of market distortions. In other words, comparative advantage analysis focuses on the calculation of the real costs (economic costs), relying on the international prices, or the opportunity cost to determine the probability of the activity to be profitable when the policies causing the divergence between domestic and world prices are not present.

Comparative advantage of a production system is assessed through the Policy Analysis Matrix (PAM) by which the impact of governmental interventions (current policies) and market distortions is evaluated considering the social prices (Table 4.1). The PAM is the tool used to analyze market failures and policy interventions by studying the impact of these policies considering all the agents of the commodity chain from the farm gate until the wholesale market or where the foreign and local products are unified.

Table 4.1. The Policy Analysis Matrix

Item	Revenues	Costs of tradable inputs	Costs of domestic factors	Profit
Private prices	A	B	C	D
Social prices	E	F	G	H
Divergence	I	J	K	L

Source: Author elaboration

According to Table 4.1, the PAM consists of three rows and 4 columns. The first row of the matrix computes the aggregate budget of the system at market prices. The second row assesses this budget at social prices by considering the distortions, either by adding them to or subtracting them from the first row. The social budget is assessed by using the world prices as reference for outputs, eliminating the taxes from the value of tradable inputs and adding the subsidy to the value of the latter. The third row estimates the divergences between social and private prices. The columns discriminate between tradable goods (final and intermediate) and domestic resources. By definition domestic resources are items that are not traded internationally such as labour, land and capital. The measures (revenues, costs, profit) of the PAM are calculated at both private and social prices. The revenues represent the sales. The profit is calculated by subtracting the costs (tradable goods and domestic resources) from the revenues.

To assess the performance of the agents and to compare between their efficiencies, several indicators derived from the PAM are used as illustrated in Table 4.2.

Table 4.2. Indicators of the PAM

Indicators	Formula	Meaning
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)	$[(C+B) / A]$	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 less value of domestic factors (labor, capital...) is used 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 different cost structures (i.e. tradable and non-tradable), because the DRC is biased in favour of the system that has a high share of tradable.
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 output and tradable input.
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 Equivalent Subsidy (PSE) as defined by OECD for trade negotiations. If + it is producer subsidy, if - its consumer subsidy.

Source: Author elaboration

4.2. Macroeconomic environment

Since the Syrian pound is used to evaluate the various budgets of the PAM, it is crucial to determine the exchange rate between the different foreign currencies and Syrian currency, in order to convert the values of the tradable items at the world market into Syrian pound. With reference to the mechanisms of setting up the exchange rate during the last 10 years, there were no distortions noticed between the current exchange rate and the social exchange rate, so the unified exchange rate (51.5 SP per 1 US dollar) was adopted, which is the exchange rate at the Lebanese borders. Furthermore, the exchange rate is 14.5 SP/dirham (UAE) and 28.5 Dinar/SP (Iraq).

For the capital market, the interest rate for the deposits in the Commercial Bank of Syria (CBS) reached 7% per annum. This rate is used to calculate the opportunity cost for the capital used in production at private prices. However, to calculate the opportunity costs for capital at social prices, the weighted interest rate (3%) that is calculated by the IMF for the Asian modern industrialized economies was applied.

For the labour market, it is assumed that there are no distortions present and that the current wages reflect the true opportunity costs of labour. Nevertheless, a distinction is made between temporary and permanent labour. This distinction is made to calculate the levied tax on permanent labour¹⁵.

4.3. Parity prices

The parity prices are used to calculate the returns at social prices with reference to the export destination and world price. Parity prices of imported goods are assessed by calculating the import parity price (CIF) at the border and adding all costs (except the custom duty) up until the product reaches the local market, this cost is then compared with the local good. Parity prices of exported goods, however, are calculated by subtracting all due costs including transportation and freight from the price of the import destination until the product reaches the Syrian borders.

The export parity prices used in this report were calculated as follows:

- The export parity price of packed potatoes exported to Gulf and Europe was estimated by deducting all relevant costs - including transportation and freight - from the import parity price (CIF) in Gulf and Europe until the product reaches the gate of the Syrian packing house (Table 4.3 and 4.4).

Table 4.3. Parity price of packed open field potato exported to Germany (2005)

Item	Unit	Data sources	Private price	Social price
CIF (Germany)	\$/ton	Data	669	669
Transport and freight to Germany	\$/ton		194-	194-
FOB (Syrian borders)	\$/ton	Data or calc.	475	475
Exchange rate	SP/\$	Data	51.5	51.5
FOB (Syrian borders)	SP/ton	Data or calc.	24,463	24,463
Custom duties	SP/ton	Data	250	
Transportation and procedures	SP/ton	Calculation	250	250
FOB (packing house gate)	SP/ton	Calculation	23,963	24,213

Source: Author elaboration, Calc.: Calculation

¹⁵ This tax is composed of 3% as health insurance by the state, 14% is paid by the employer, and 7% is paid by the laborer. It is equal to the laborer's wages divided by the correction factor (26%).

Table 4.4. Parity price of packed open field potato exported to Dubai (2005)

Item	Unit	Data sources	Private price	Social price
CIF (Dubai)	Dirham/ton	Data	2,300	2,300
Transport and fright to Dubai	Dirham/ton		-609	-609
FOB (Syrian borders)	Dirham/ton	Data or calc.	1,691	1,691
Exchange rate	Dirham/SP	Data	14.5	14.5
FOB (Syrian borders)	SP/ton	Data or calc.	24,520	24,520
Export duties	SP/ton	Data	202	
Transportation and procedures	SP/ton	Calculation	250	250
FOB (packing house gate)	SP/ton	Calculation	24,068	24,270

Source: Author elaboration

- The export parity price of normal potato (unpacked) exported to Iraq was assessed by eliminating all relevant costs from the import parity price (CIF) in Iraq until the product arrives at the Syrian local market (Table 4.5).

Table 4.5. Parity price of normal open field potato exported to Iraq (2005)

Item	Unit	Data sources	Private price	Social price
CIF (Iraq)	Dinar/ton	Data	300,000	300,000
Custom duties of Iraq	Dinar/ton		-4,678	-4,678
FOB (Syrian borders)	Dinar/ton	Data and calc.	295,322	295,322
Exchange rate	SP/Dinar	Data	28.5	28.5
FOB (Syrian borders)	SP/ton	Data and calc.	10,362	10,362
Custom duties of Syria	SP/ton	Data	250	
Transport and fright	SP/ton	Calculation	1590	1590
FOB at Syrian market gate	SP/ton	Calculation	8,522	8,772

Source: Author elaboration

4.4. PAMs of potato

4.4.1. Budgets of the representative systems

The budget of spring potato exported to Gulf (Dubai) indicates that the highest share of profit is achieved at farm level, then at middleman and processor level (indicators: profit/return and cost/return); see Tables 4.6, Table 4.7 and Figure 4.1. Accordingly, the tradable inputs concentrate at farm level, whereas domestic resources are highest at farm and processor level.

The budget of normal autumn potato (unpacked) exported to Iraq (Table 4.8, Table 4.9 and Figure 4.2) shows that the highest share of profit comes out at post farm level and the highest share of costs is found at the farm level.

Table 4.6. Budget summary of packed spring potato exported to Dubai at 2005 current prices (SP/ton)

Item	Farmer	Middleman	Packer	Total	
				Post farm	System
Revenues	20442	21053	24474	24474	24474
Main product	20442	21053	15000	15000	15000
By-product	0	0	9474	9474	9474
Total cost	14303	20621	24335	23904	17764
Commodity in process		20442	21053	20442	
Tax and subsidy	0	0	0	0	0
Tradable inputs	8677	38	837	875	9552
Domestic resources	5626	140	2446	2586	8212
Temporary labour	2346	78	1010	1089	3435
Permanent labour	599	4	156	161	760
Capital	2681	57	1279	1336	4017
Profit before tax	6139	432	138	570	6709
Direct tax	0	12	16	28	28
Profit after tax	6139	420	122	542	6682

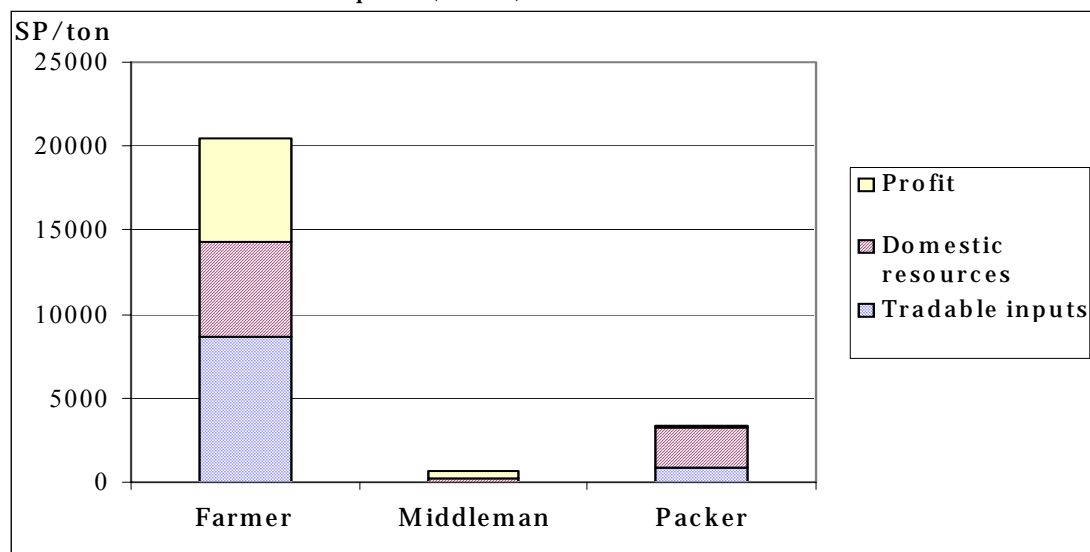
Source: Author elaboration

Table 4.7. Relative distribution and indicators of the budget of packed spring potato exported to Dubai at 2005 current prices (%)

Item	Farmer	Middleman	Packer	Post farm	System
Cost/revenue	70.0	97.0	99.4	97.7	72.6
Share of tradable inputs	90.8	0.4	8.8	9.2	100.0
Share of domestic resources	68.5	1.7	29.8	31.5	100.0
Share of labour	70.2	2.0	27.8	29.8	100.0
Labour/domestic resources	52.3	58.6	47.7	48.3	51.1

Source: Author elaboration

Figure 4.1. Distribution of the major budget components of spring potato exported to Dubai at 2005 current prices (SP/ton)



Source: Author elaboration

Table 4.8. Budget summary of normal fall potato exported to Iraq at 2005 current prices (SP/ton)

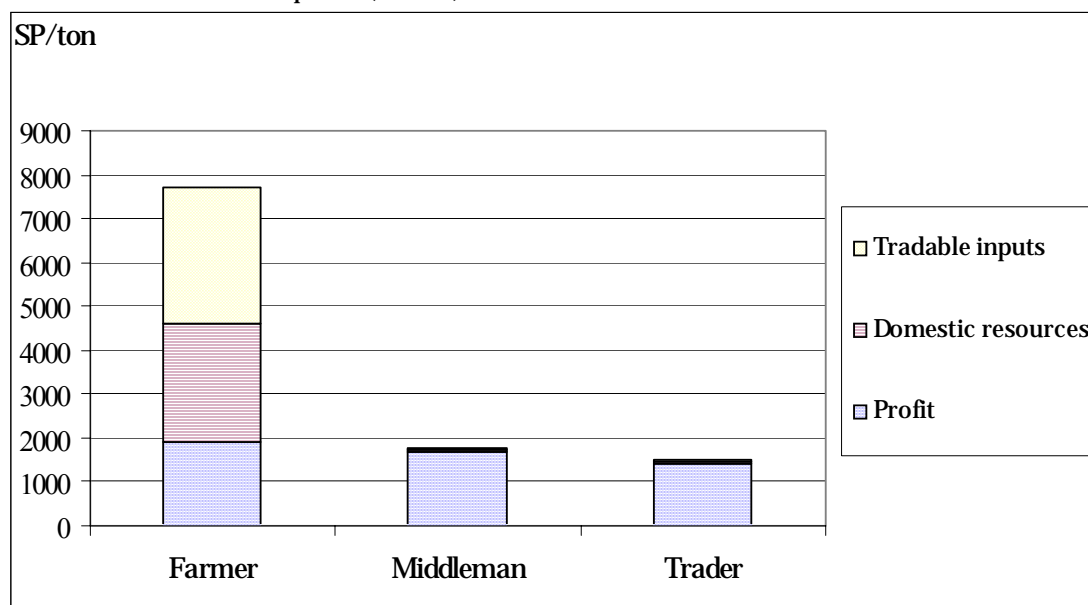
Item	Farmer	Middleman	Packer	Total	
				Post farm	System
Revenue	7735	9500	11000	11000	11000
Main product	7735	9500	11000	11000	11000
By-product	0	0	0	0	0
Total cost	5823	7814	9576	7890	5978
Commodity in process		7735	9500	7735	
Tax and subsidy	0	0	0	0	0
Tradable inputs	3129	18	26	44	3173
Domestic resources	2695	62	49	111	2805
Temporary labour	1248	37	15	52	1300
Permanent labour	245	2	5	7	252
Capital	1201	22	30	52	1253
Profit before tax	1911	1686	1424	3110	5022
Direct tax	0	6	0	6	6
Profit after tax	1911	1680	1424	3105	5016

Source: Author elaboration

Table 4.9. Relative distribution and indicators of the budget of normal fall potato exported to Iraq at 2005 current prices (%)

Item	Farmer	Middleman	Packer	Post farm	System
Cost/return	75.3	82.3	87.1	71.7	54.3
Share of tradable inputs	98.6	0.6	0.8	1.4	100.0
Share of domestic resources	96.1	2.2	1.7	4.0	100.0
Share of labour	96.2	2.5	1.3	3.8	100.0
Labour/domestic resources	55.4	62.9	40.8	53.2	55.3

Source: Author elaboration

Figure 4.2. Distribution of the major budget components of fall potato exported to Iraq at 2005 current prices (SP/ton)

Source: Author elaboration

4.4.2. PAM of packed spring potato exported to Dubai

Table 4.10 illustrates the PAM of packed spring potato exported to Dubai in 2005 at private and social prices.

Table 4.10. The PAM of packed spring potato exported to Dubai in 2005 (SP/ton)

Item	Revenue	Cost		Profit
		Tradable inputs	Domestic resources	
Market price	A 24,474	B 9,552	C 8,212	D 6,709
Social price	E 33,743	F 9,491	G 7,259	H 16,993
Divergence	I (9,270)	J 61	K 953	L (10,284)

Source: Author elaboration

According to Table 4.10 "A" represents the total revenue (main and by-product) at market price (private price), which amounted to 24,474 SP/ton (15000 SP/ton from main output) in 2005. It is notable that the system has a profit by value "D" (6,709 SP/ton) at market price, and a gain by value "H" (16,993 SP/ton) at social price. The revenue at social prices is higher than that at private price resulting in a negative divergence of 9,270 SP/ton. The tradable inputs and domestic factors recorded a positive difference of 61 SP/ton and 953 SP/ton respectively between private and social values. The positive divergence of tradable inputs is indicating that its cost at market price is higher than that at social price because the tax applied on seeds and a tariff to some inputs (spare parts). The positive divergence of domestic factors is indicating a distortion in the interest rate and labour market of qualified and non qualified. . As a result, the transfer value (cell "L") is negative indicating a movement from the spring potato sector to the other sectors of the economy.

. Table 4.11 shows the derived indicators of the PAM of spring potato which are interpreted as follows:

Table 4.11. Indicators of the PAM of spring potato exported to Dubai in 2005 (for one ton)

Financial profitability (FP)	$[D = A - B - C]$	6,709
Financial cost-benefit ratio (FCB)	$[(C + B) / A]$	0.55
Social profitability (SP)	$[H = E - F - G]$	16,993
Domestic resource cost ratio (DRC)	$[G / (E - F)]$	0.29
Social cost-benefit ratio (SCB)	$[(F + G) / E]$	0.49
Transfers (L)	$[L = I + J + K]$	(10,284)
Nominal protection coefficient including by-product (NPC)	$[A / E]$	0.72
Nominal protection coefficient of the main product (NPC*)	$[A^* / E^*]$	0.61
Effective protection coefficient (EPC)	$[(A - B) / (E - F)]$	0.61
Profitability coefficient (PC)	$[D / H]$	0.39
Producers subsidy ratio (PSR)	$[L / E]$	-0.30
Equivalent producer subsidy (EPS)	$[L / A]$	-0.42

Source: Author elaboration

- The DRC is less than one (0.29) indicating that this sector has comparative advantage in the packed spring potato exported to Dubai.
- The NPC is less than one (0.72) meaning that the price of spring potato at local market is less by 28% of the social price.
- The EPS is negative (-0.42) pointing out that this chain is not supported and the rate of this transfer from this chain to other sectors is 42%.

4.4.3. The PAM of normal autumn potato exported to Iraq

Table 4.12 indicates a profit at both private and social prices.

Table 4.12. The PAM of normal fall potato exported to Iraq in 2005 (SP/ton)

Item	Revenues	Costs		Profit
		Tradable inputs	Domestic resources	
Market price	A 11,000	B 3,173	C 2,805	D 5,022
Social price	E 8,772	F 3,074	G 2,634	H 3,064
Divergence	I 2,228	J 99	K 171	L 1,958

Source: Author elaboration

Table 4.12 points to a positive difference of 2,228 SP/ton (third row) in revenues because of the transfers from the economy to the commodity chain of normal autumn potato exported to Iraq. This means that the producers of autumn potato are supported by 2,228 SP for every ton produced. The divergence of tradable inputs is also positive because of the tax imposed on some of these inputs, such as spare parts. This demonstrates a transfer of 99 SP/ton from the potato sector to the other sectors of the economy. In addition, domestic resources showed a positive divergence and demonstrated a transfer of 171 SP/ton from the potato sector to the other sectors of the economy because distortion in market labour and capital. As a result, the PAM indicates a net transfer of 1,958 SP/ton from the economy to the commodity chain of potato. Table 4.13 illustrates the derived indicators of the potato PAM, which mean the following:

Table 4.13. PAM indicators of normal fall potato exported to Iraq in 2005 (for one ton)

Financial profitability (FP)	$[D = A - B - C]$	5,022
Financial cost-benefit ratio (FCB)	$[(C + B) / A]$	0.35
Social profitability (SP)	$[H = E - F - G]$	3,064
Domestic resource cost ratio (DRC)	$[G / (E - F)]$	0.46
Social cost-benefit ratio (SCB)	$[(F + G) / E]$	0.65
Transfers (L)	$[L = I + J + K]$	1,958
Nominal protection coefficient including by-product (NPC)	$[A / E]$	1.25
Nominal protection coefficient of the main product (NPC*)	$[A^* / E^*]$	1.25
Effective protection coefficient (EPC)	$[(A - B) / (E - F)]$	1.37
Profitability coefficient (PC)	$[D / H]$	1.63
Producers subsidy ratio (PSR)	$[L / E]$	0.22
Equivalent producer subsidy (EPS)	$[L / A]$	0.17

Source: Author elaboration

- The DRC is less than one (0.46) indicating that this sector has comparative advantage.
- The NPC is 1.25 pointing out to a subsidy to this sector by 25% of the social price leading to a price increase of domestic potato prices by 25% above the world price.
- EPC is 1.37, slightly above the NPC, meaning that most of the distortions are related to the tradable materials because of the distortion of the final output.
- EPS is 0.17 demonstrating a support of 17% above the social price for the potato sector because supporting fuel.

Comparing the two aforementioned potato PAMs, the following results are obtained:

Comparing the two aforementioned potato PAMs, the system of packaged and exported spring potato to Dubai has a higher social profitability than the system of unpackaged exported fall potato to Iraq. This is because of the profit attained by fall potato (3064 SP/ton of main output) and spring potato (16993 SP/ton of main output and by product) at social prices.

4.5. Sensitivity analysis

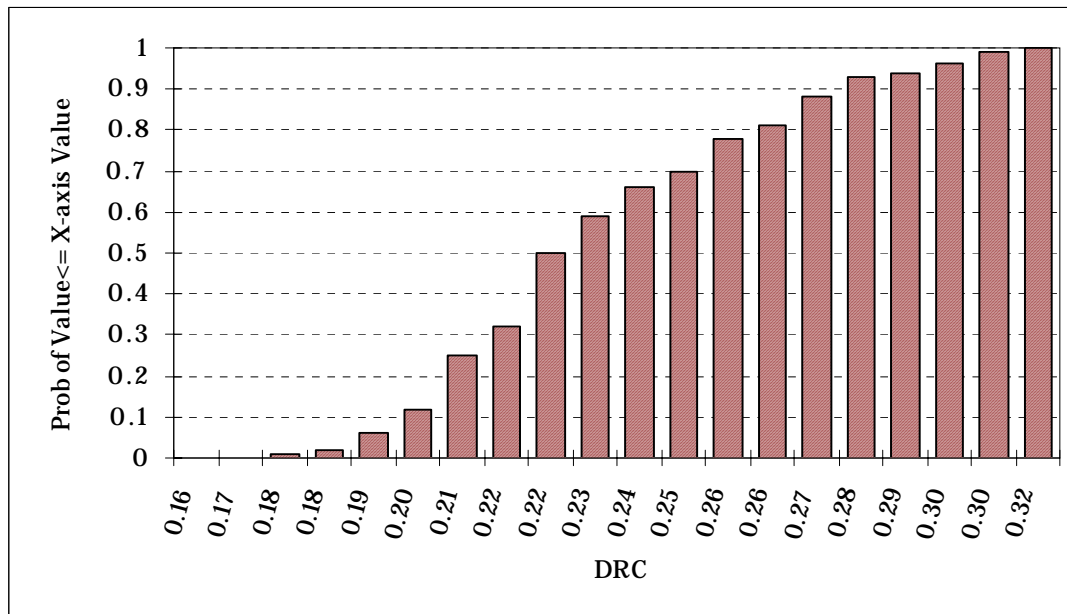
The main objective of the sensitivity analysis is to determine the relationship between the calculated indicators (FCB, DRC, EPS, PSR) and the major variables that impact these indicators the most taking into consideration the various policies and assumptions during the period of study. Such variables are parity price, seed price, yield, exchange rate and interest rate.

The sensitivity analysis is conducted by using the concept of linear elasticity, which is assessed through dividing the change of the indicator by the change of the selected variable.

4.5.1. The probability distribution of DRC values for packed spring potato

Figure 4.3 shows the probability distribution of DRC values assuming a change of the variables by 20% (plus, minus) where the highest value of DRC is 0.32 and lowest value is 0.16. Accordingly, there is comparative advantage in packed and exported spring potato to Dubai at changing variables by mentioned ratio.

Figure 4.3. The probability distribution of DRC for the packed spring potato exported to Dubai

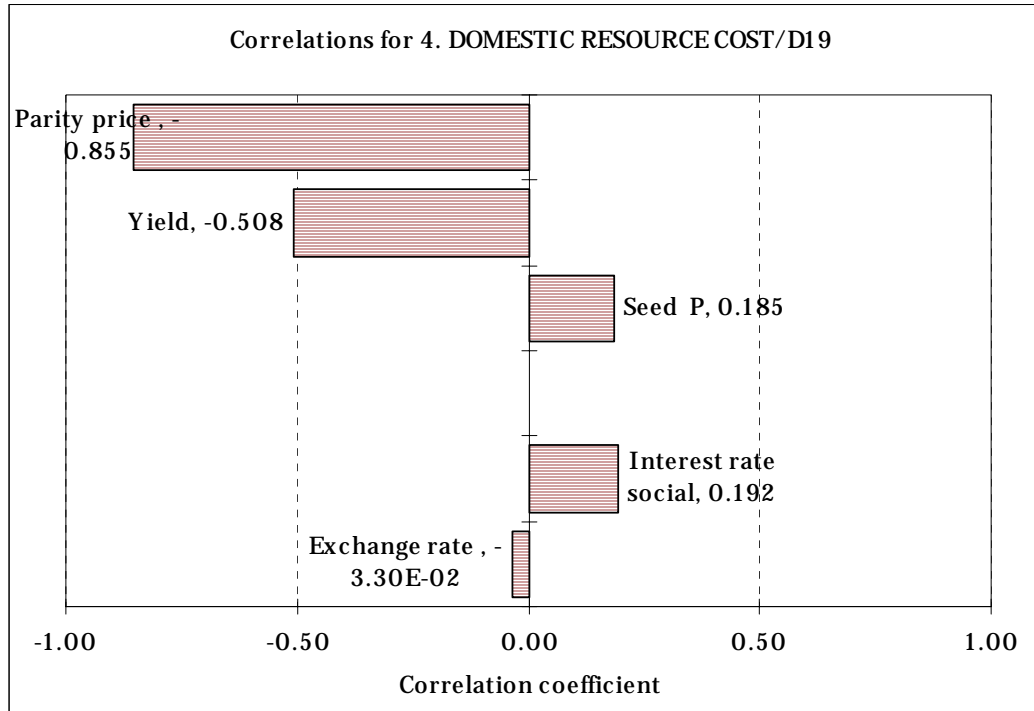


Source: Author elaboration

4.5.2. Sensitivity analysis of the DRC for the packed spring potato exported to Dubai

Figure 4.4 illustrates the sensitivity analysis of the DRC when the factors having the greatest impact on the commodity chain of spring potato exported to Dubai change. Accordingly, there is an inverse relationship between the DRC and the parity price, yield and, exchange rate. A proportional relationship is present, however, between the DRC and the seeds' price, and social interest rate. For example, doubling the parity price will lead to a reduction of the DRC by 0.85 resulting in an increase of the comparative advantage of the system, whereas the DRC is less sensitive to seeds' price with a direct relationship of 0.18 (Figure 4.4).

Figure 4.4. Sensitivity analysis of the DRC



Source: Author elaboration

Chapter 5 – Conclusions and Recommendations

Results

- Syria has comparative advantage in packed and graded potato exported to Dubai and in normal potato exported to Iraq. This comparative advantage is present for the three seasons of potato namely: spring, fall and summer potatoes because of:
 - ❖ High yield.
 - ❖ Availability of the product all the year round because of the suitable climatic conditions to plant three seasons.
 - ❖ High world price compared to the domestic one.
 - ❖ The quality of seeds.
- There are fluctuations in potato prices at farm gate due to seasonality that induce variations in production quantities. This is subject to both climatic conditions and the quality of services.
- The system of packaged and exported spring potato to Dubai has a higher social profitability than the system of unpackaged exported fall potato to Iraq. This is because of the profit attained by fall potato (3064 SP/ton of main output) and spring potato (16993 SP/ton of main output and by product) at social prices.
- The system of packed and graded summer potato exported to Dubai and Germany, and normal autumn potato exported to Iraq have strong comparative advantage more than other systems (autumn and spring) because high yield.
- The probability distribution of DRC values of packed and exported spring potato to Dubai assuming a change of the variables by 20% (plus, minus) where the highest value of DRC is 0.32 and lowest value is 0.16. Accordingly Syria has comparative advantage at changing variables by mentioned ratios
- With reference to spring potato packed and exported to Dubai, there is an inverse relationship between the DRC and the parity price, yield, and exchange rate. A proportional relationship, however, is present between the DRC and the price of seeds, and social interest rate.

Recommendations

- To develop of policies, which maintain the stability of potato prices all the year round and to attain reasonable profit at farm level, such as:
 - Improve the trade flows with Arab and European countries.
 - Study the requirements of foreign market from all potato species to produce potato according to the demand of markets and on time need. For instances, the preparing for furnishing the requirements of European market whereas the European and Syrian Association secure share 35 thousand per ton without custom.
 - Enhance the efficiency of water resources.
 - Facilitate the supply of improved seeds with the required quantity and quality.
 - Improve market information and marketing environment along the entire commodity chain of potato.
- Study the efficiency of different species of potato especially that have high revenues and comparing them with foreign markets requirements especially European whereas the shares will start instant signature the agreement and before certifying.
- Expand the area of summer potato in other governorates instead of crops that need high quantity of water and did not have comparative advantage.
- Improve the quality of the produced potato to comply with the needs of both local and foreign consumers, processors and quality standards such as:
 - Unification of size and quality.
 - Production of disease free potato.
- Supply the improved seeds of potato both on time and at competitive prices.
- Produce at competitive prices, this necessitates procedures both to reduce production costs and to increase yield such as:
 - Introduction of improved technologies.
 - Enhancement of marketing efficiency.
 - Improvement of potato research.
- Enhance international trade cooperation to decrease duties and to boost the movement of potato products.

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