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Olive Oil Comparative Advantages

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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 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 for decision making. This report was edited by Samir Grad the chief of Agro-Food Division.

This report presents the result for olive oil Comparative Advantage Study, while the results for the other commodities have 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.

Table of contents

Executive summary

Structural changes in the Syrian economy, scarcity of natural resources, and the increased competition between local and foreign supply are the main factors of conducting this study. Recognizing the capacity of Syrian agriculture to maintain its competitiveness is a crucial issue for the policy formulation. In this regard, policy makers have to know commodity chains that can benefit from new market opportunities created by trade liberalization to increase their contribution to the economic growth of the country.

Olive and olive oil sector is very important in Syria. According to FAO statistics, Syria is the world fifth olive producer, with 941 thousand tons, and the fourth olive oil producer, with 180 thousand tons, in 2002. In the last decade the number of olive trees increased dramatically with an annual growth rate of 4%. This increase is a result of the agricultural policies that aim at encouraging the cultivation of olive trees such as selling olive seedling at subsidized prices for farmers in the reclaimed areas. A large share of olive fruits (80%) is milled to produce olive oil. The rainfed area under olive represented about 91% of the total area in 2003. It expanded by 23% in the period 1994-2003. Under these changes in the cropping patterns, policy assessment of producing olive and olive oil is an urgent issue. Therefore, NAPC has conducted comparative advantage study of olive oil commodity with the support of Food and Agriculture Organization project (FAO) GCP/SYR/006/ITA project.

The comparative advantages of a given system producing a given good or services, encompasses a broad range of conceptual work emanating from cost-benefit analysis and the theory of international trade. The concept of comparative advantage 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 advantage.

The comparative advantage is measured through the Policy Analysis Matrix (PAM). The PAM is a table consists of three columns and three rows containing values, at private and social prices, needed to calculate all required indicators namely: Financial Cost-Benefit Ratio, Domestic Resource Cost (DRC), Social Cost-Benefit Ratio (SCB), Effective Protection Coefficient (EPC), and Producers Subsidy Ratio (PSR).

This study assesses the comparative advantage of rainfed filtered and polished olive oil commodity chain. Accordingly, all agents contributing in this chain are included namely farmer, trader, and filterer (exporters). At the farm level, the study covered rainfed olive produced in the costal area and Idleb governorate, located in ecological zones 1 and 2. These data were collected by the Farming System study team. On the mill level, two milling systems were taken into account: hydraulic and centrifuge. The data on milling were mainly taken from Idleb. On filtering and polishing (exporting) level, two samples were studied one from Aleppo and the other from Lattakia. In this study 4 variables were chosen to examine their effects on the comparative advantage of olive oil, namely: yield, conversion ratio, divergence of exchange rate, and parity prices.

The study concluded that the olive oil system achieves profit at private prices and has a comparative advantage. The analysis showed that the profit and the comparative advantages are retained for olive oil even if its yield decreased to about 3 tons per hectare for both hydraulic and centrifuge systems. However, the centrifuge system is more profitable and its comparative advantage is stronger than that achieved by the hydraulic one due to its high extraction rate.

The sensitivity analysis showed that the yield and conversion ratio are the most elastic ones to DRC with elasticity value of -1.32 and -0.42 respectively for the hydraulic system and of -1.94, -0.43 for the centrifuge one.

Finally, in spite of the existence of comparative advantage for the olive oil the quantity exported is still under the level of pretensions. This means that the existence of comparative advantage does not mean that this commodity has access to the other markets. Therefore, Syria has to penetrate new markets for olive oil through bilateral and multilateral trade agreements and more effort have to be devoted to Syrian olive oil promotion in the targeted markets.

I-Introduction

The changes confronting the Syrian economy moving from a state planned to a more liberalized economy are a challenging task. The agricultural sector is one of the most affected sectors by these changes. Expected changes on the sector can be traced through assessing the comparative advantages of its components. Comparative advantages analysis provides basic information for policy making to know: a) how efficiently the agricultural and related activities use the domestic resources; b) how agricultural policies affect the use of these resources. Moreover, many interested people (researchers, donors, etc.) need to asses the economic profitability of the agricultural and agro-industrial systems.

Due to governmental interventions, prices may not reflect the scarcity value of inputs, goods, and services in the economy. Furthermore, agricultural policy decisions are often made on the basis of limited practical knowledge of how agricultural sectors actually function and how they are likely to respond under changed policy conditions. Comparative advantage analysis allows estimating revenues independent from all market distortions. In other words, it allows the analyst to compare the real or economic costs of production to international price (assumed as reference of non distorted values) in order to determine what the activity's profitability would be in the absence of policies which cause local prices to be different from international prices. The analysis also permits distinguish the direct effects of a policy from the indirect, and often unintended, effects that this same policy may engender. Comparative advantages analyses also allow the integration of the effect of the macroeconomic environment on sector-level incentives. Comparative advantages analyses do not look only at on-farm production, but also on processing, and wholesaling activities. It thus can provide an analysis of the entire commodity chain (B. Lynn Salinger).

The comparative advantage of a commodity chain can be measured using a so called Policy Analysis Matrix. This matrix consists of two accounting entities. The first one calculates values at private prices and the other calculates values at social prices. From these values set of indicators of the comparative advantage can be produced.

Olive and olive oil sector is an important part of the Syrian agriculture. Statistics show that 60% of the area under trees is olive (90% of olive production is milled), and more than 377 000 families work in this field (Malevolti, 1999). In this regard, studying the comparative advantage of olive oil commodity gives a clear picture on to what extent the sector is affected by the economic changes, are the domestic factors used efficiently and which way should be followed to maximize the benefit of the olive oil comparative advantage.

The comparative advantages of two representative systems are studied in this research. The first is rainfed olive milled in hydraulic mills and the second is rainfed olive milled in centrifuge mills.

Policy issues

Olive is one of the most important crops in Syrian agriculture. According to the orientation for the agriculture development strategy (2oo1-2010), olive production is 568 thousand tons, average 2005- 2006, at an annual growth rate of about 8%, showing the attention given by the Government to this crop. In fact, Syria looks at olive and olive oil as promising commodities with a high export potential to foster the income of all agents operating in the commodity chain.

In order to improve olive and olive oil sector, various policies have been implemented concerning olive cultivation, investment, trade, technical, and quality aspects.

Regarding olive cultivation, the government reclaims land, distributes olive seedlings at subsidized prices, provides extension services free of charge and applies Integrated Pest Management (IPM) on olive trees in order to get an olive production free from pesticides[1].

Regarding investment, many of the new olive mills have been established under the Investment Law no. 10 of 1991, amended as per Legislative Decree 7 of 2000. Under this law, a new investment project is allowed to import all the equipment and goods needed for its implementation, development and expansion without being subject to import restrictions. These imports are also exempted from taxes, fiscal fees and municipal rates, custom duties and other taxes, provided they are for the exclusive use of the project. Moreover, the project can import all products and inputs for its operational activities (raw materials as well as processed and semi-processed goods).

Regarding trade policies, Syria joined the International Olive Oil Council in 1998 and adjusted its olive oil standards to comply with those adopted by the Council. In the framework of trade liberalization, the Syrian Government has been taking concrete measures for the expansion of agricultural trade and the enhancement of its role in agricultural development. In this context, all exports of agricultural products are exempted from income tax and agricultural production tax[2]. The exchange rate applied to the part of export earnings to be converted in Syrian Pound at the Commercial Bank of Syria has been replaced with the exchange rate of the neighboring countries[3]. In addition, instructions have been given to the Export Committee[4] to ensure that quality standards are strictly respected and that the control of quality of exports is effective. Exporters of agricultural processed products are asked to label the export packages indicating the nature of the product, its components, name and address of the factory, and the mention "for export"[5]. Moreover, exporters have the obligation to comply with the standards and specifications required by the country of destination.

As a part of its efforts to promote the participation of the private sector in foreign trade, the Government has reduced, since 2001, taxes and other fees imposed on olive oil exporting companies[6]. In addition, all taxes and fees levied on olive oil processing companies that produce less than 2 tons per day have been eliminated and long term loans have been made available to modernize old olive oil mills. Moreover, olive oil processing establishments are allowed to import empty bottles, cans and other tools used in olive oil packaging, provided that they are purchased by export earnings in foreign currency. Furthermore, the olive oil local market is protected and olive oil imports are operated only by the General Establishment for

[1] Currently, Syria produces organic olive in 80% of the total olive area by applying Integrated Pest Management (IPM) (Coque, 2003)
[2] Legislative decree no. 15 dated 3/7/2001
[3] Decree no. 4667 dated 21/8/2001 (Prime ministers office)
[4] Instructions no. 5536 dated 2001.
[5] Exporters of textile are exempted from the provision of writing the name and address of the factory as a concession and an export enhancement procedure.
[6] Decree no. 69 dated 19/11/2001

Consumption. Nevertheless, it has been already established that in case of protection lifting,, imports would be subject to an import tax of 29%[7].

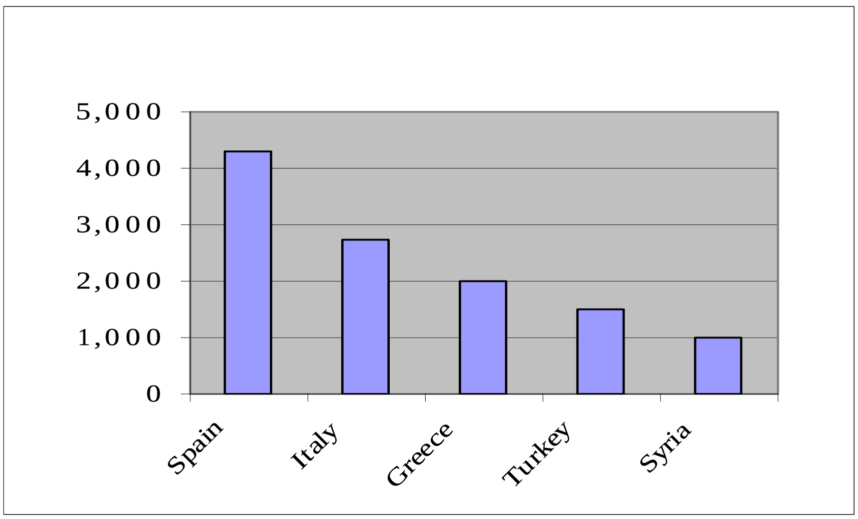
All agents of the olive oil commodity chain are affected by the aforementioned polices. In order to produce a better olive oil quality, farmers have adopted appropriate measures, as picking olives at proper time and cleaning them before milling. Mills owners have started to look for new equipment, such as centrifuge system, to get high extraction rates.

As a result of the above mentioned policies, olive oil exports to traditional markets have increased and new markets have been explored. In fact, exports reached up to 23 thousand tons in 2003, while they had been less than 5 thousand tons in 2001.

Olive oil importance in agriculture

Syria is considered as an important olive oil producing country. According to FAO statistics, Syria is the world fifth olive producer, with 941 thousand tons, and the fourth olive oil producer, with 180 thousand tons, in 2002 (see figure i.1).

Figure i.1. The first five countries of olive production, 2002 (thousand tons)



Source: FAO statistics

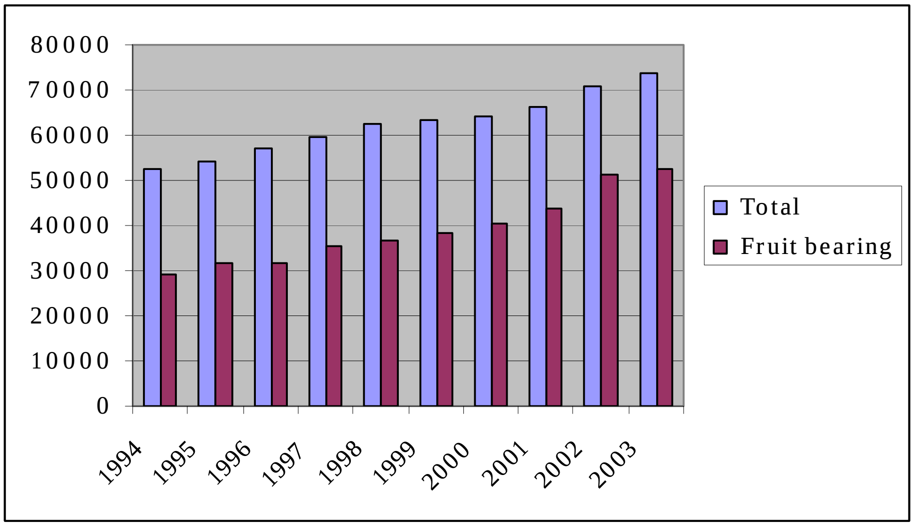
The attention that the Syrian Government pays to the olive sector is also dictated by the Syrian environmental conditions that are very suitable for olive trees cultivation. Olive trees occupy about 60% of the total fruit trees area and are mostly grown rainfed over the hilly plains playing a positive role in the ecological balance. Furthermore, olive and olive oil production provide income and job opportunities to a large number of people in the rural areas. They contribute to the industrial development of the country as well as to its agricultural exports (SOFAS 2005). Actually, a large number of Syrian farmers (377,000 families) are involved in olive trees cultivation and olive oil production and selling (Malevolti, 1999).

The total area under olive increased rapidly and steadily by about 100 thousand hectare over 10 years. The share of olive productive trees increased from 55.3% in 1994 to 71.2% in 2003 (see figure i.2). The expected olive production of the annual average of 2009-2010 is 1076.5 thousand tons[8].

[7] General customs department, 2003, Customs Tariff Spread Sheet by Harmonics System, Damascus
[8] MAAR, 2001,the Orientation of Agricultural Development Strategy 2001-2010

Olive production has significantly increased from 518 thousand tons in 1994 to 940 thousand tons (181%) in 2002. In contrast, the slow growth of domestic market has led to structural surplus (Malevolti, I. 1999).

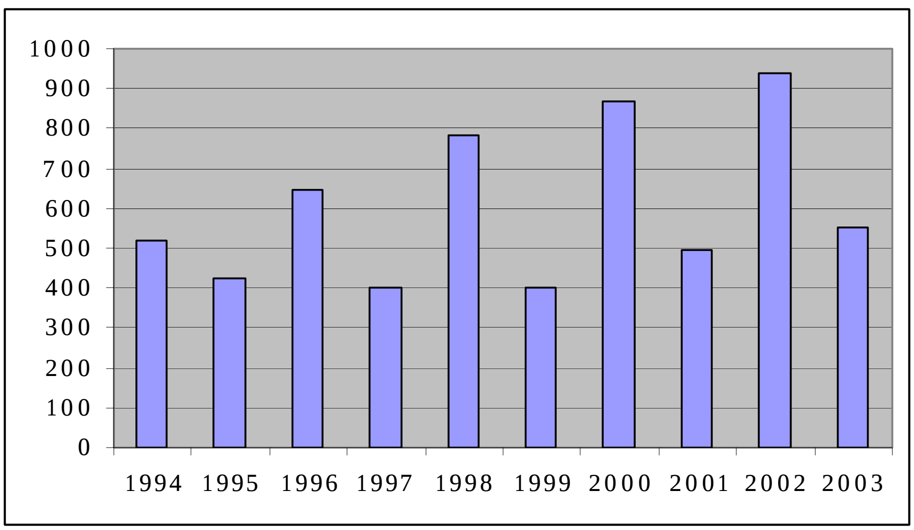
Figure i.2. Number of olive trees 1994- 2003 (thousand)



Source: NAPC data base

However, total olive production varies from year to year due to the alternate bearing phenomena[9]. For example, in 2003 the productivity per tree was 10.4 Kg, against 18.3 Kg per tree in 2002. This is also reflected in the total production of olive (see figure i.3).

Figure i.3. Olive Production, 1994 – 2003 (000 tons)



Source: NAPC data base

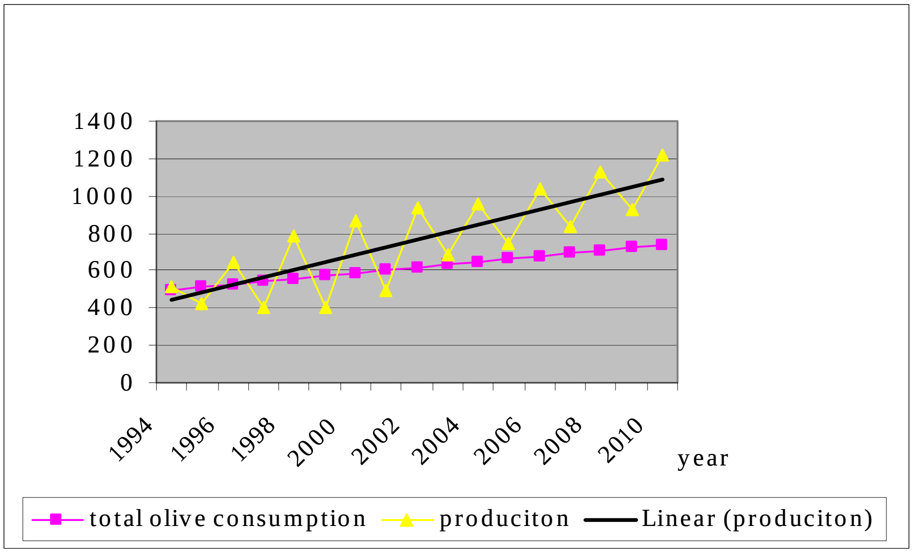
Olive oil availability

According to the expected increase in olive production, the produced quantity of olive oil will increase and, in spite of population growth, exceed local consumption, leading to further olive oil surpluses. It should be noted that the current level of olive oil consumption in Syria is

[9] Olive bears full production each other year.

estimated at 6 kg per capita per year (SOFA 2002). Olive surpluses already started in 1997 and are expected to reach some 200000 tons in 2010 (figure i.4).

Figure i.4. Total production and consumption of olive, 1994- 2010 (thousand tons)



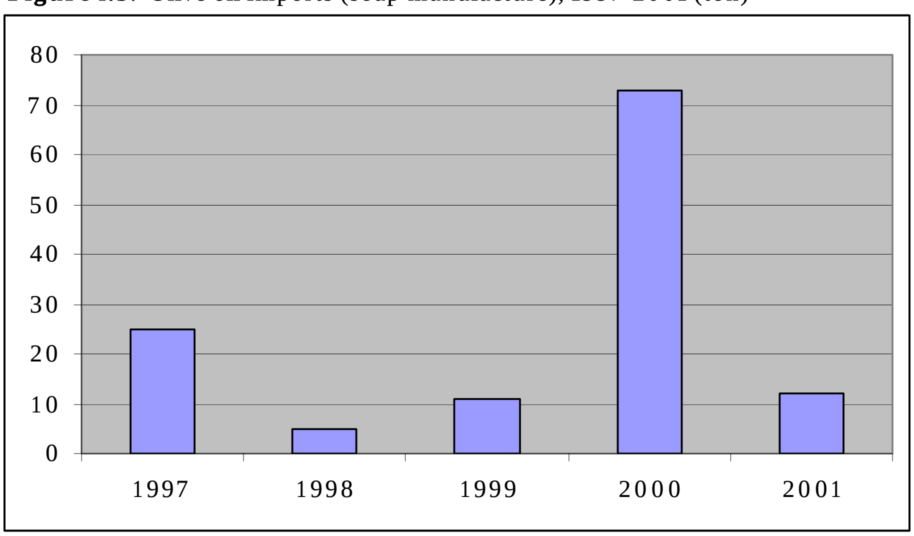
Source: MAAR statistics: olive production from 1994 to 2002, Orientation for Syrian agricultural strategy 2001- 2010: olive production from 2003-2010, Population estimated by the author.

Furthermore, olive oil has a promising future in the light of the progresses in the Syrian international trade negotiations and signed agreements. In these days, the issue at stake in this sense is the Syrian-EU Association Agreement, including quotas of packaged olive oil (10 thousand tons) exempted from custom duties in the EU market.

Olive oil imports

Syria imports very little quantities of olive oil and fats only for soap industry (see figure i.5).

Figure i.5. Olive oil imports (soap manufacture), 1997-2001 (ton)

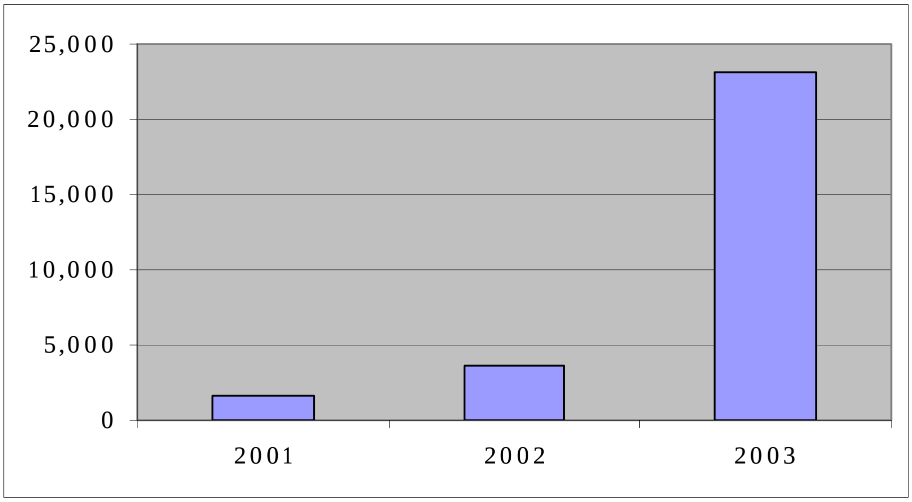


Source: NAPC Data base

Olive oil exports

Olive oil exports are promoted by current trade policies and are influenced by local and international prices. Moreover, the low cost of producing olive oil in Syria as well as its good quality contribute to increase exports, especially to the regional market. Olive oil exports fluctuated in the period 1996- 1998 then took an increasing trend to reach 23 thousand tons in 2003 (figure i.6).

Figure i.6. Olive oil exports, 2001- 2003 (ton)



Source: NAPC database

Table i.1 shows that, in 2003, the major olive oil exports were to Italy (about 52%) and to Switzerland (18%).

Table i.1. Olive oil export, 2003 (tons)

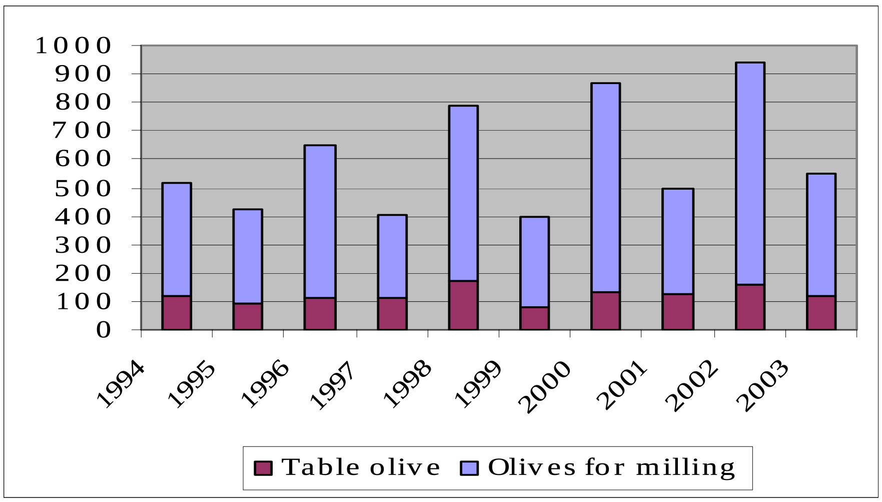
Country	Export quantity	%
Italy	15306	52
Switzerland	5459	18
Spain	2522	8
Saudi Arabia	1668	6
Turkey	821	3
Rest of the World	3941	13
Total	29717.24	100

Source: NAPC database

Chapter 1 - The Olive Oil Commodity System

Olive is consumed in Syria in two forms, table olives and olive oil. About 80% of olive is processed as olive oil and the rest is consumed as table olives. Indeed the produced quantities differ from year to year due to the alternate fruit bearing phenomenon (see annex table 1). Figure 1.1 shows that table olive quantity is almost stable (about 100000 tons) whereas the quantity of olives for milling changes due to the alternation in production.

Figure 1.1. Evolution of table olives and olives for milling, 1994-2003 (thousand tons)



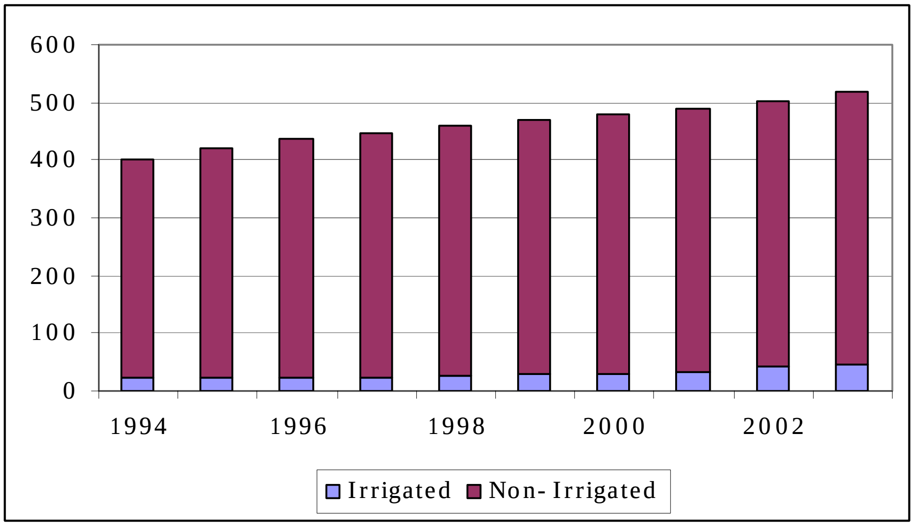
Source: NAPC Database

1.1 Description of the main cropping system

Olive is cultivated in both rainfed and irrigated areas in Syria. The total area of olive trees (rainfed and irrigated) expanded by 28%, in 2003 (from 402 thousand 1994 to 517 thousand ha). Due to the alternate fruit bearing phenomenon, the average production of two years is considered adequate to have comparable data. Olive production increased from 471 thousand tons, in 1994-1995, to 747 thousand tons, in 2002-2003). The average yields for the two periods were 15.5 and 14.3 kg/tree, respectively.

As reported in figure 1.2, irrigated area under olive represented about 9% of the total area, in 2003. It expanded by 113% in the period 1994-2003 (from 22 thousand hectare to 47 thousand hectare),

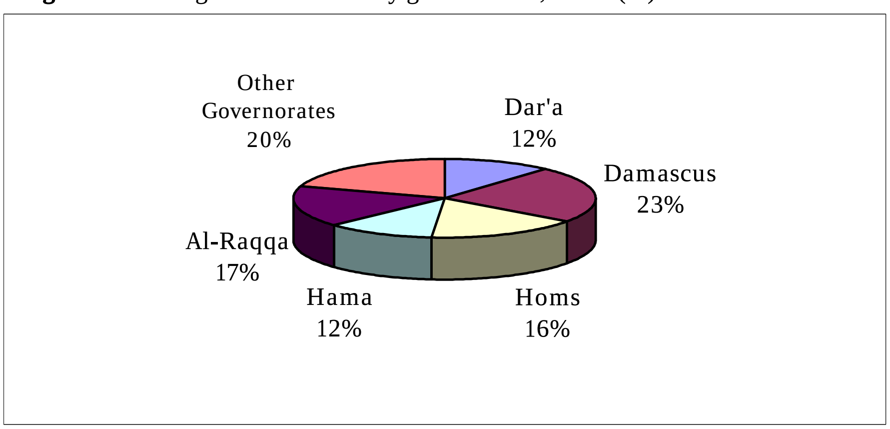
Figure 1.2. Evolution of the irrigated and non-irrigated area of olive, 1994-2003 (thousand ha)



Source: NAPC Database

Irrigated olives are basically planted in Damascus and Al Raqqa (Figure 1.3). The average production of irrigated olives increased by 168%, from 37 thousand tons, in the annual average of the period 1994-1995, to 100 thousand tons, in the annual average of the period 2002-2003. The average yields for the two periods were respectively 23.7 and 21.7 kg/tree.

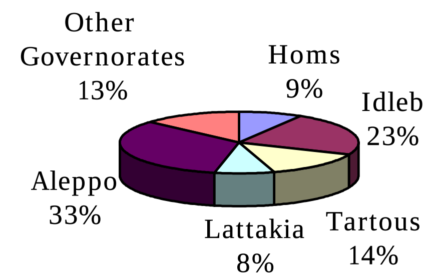
Figure 1.3. Irrigated olive area by governorate, 2003 (%)



Source: NAPC database

Rainfed area expanded by 23%, in the period 1994-2003 (from 380 thousand hectare to 470 thousand hectare due to governmental reclamation policies). It concentrates in Aleppo and Idleb (Figure 1.4). Between 1994 and 2003 rainfed olive production accounted for 80-90% of the total olive production. The average production of rainfed olives increased by 49%, from 434 thousand tons, in 1994-1995, to 647 thousand tons, in 2002-2003. The average yield decreased from 15.1 to 13.6 kg/tree due to weather conditions.

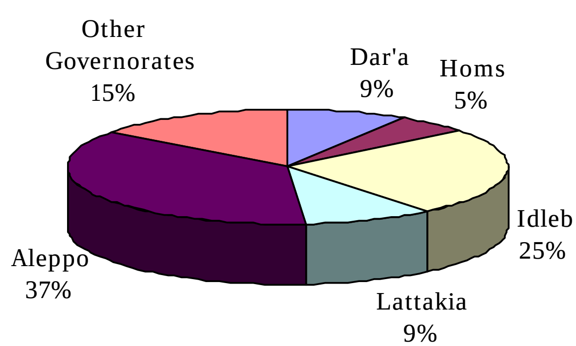
Figure 1.4. Rainfed olive area by governorate, 2003 (%)



Source: NAPC database

Not surprisingly, olive oil production is concentrated in the governorates with a high share of olive production. In 2003, for example, Aleppo and Idleb governorates accounted together for about 62% of the total olive oil production, whereas Latakia and Dara'a accounted for 9% each (Figure 1.5).

Figure 1.5. Olive oil production by governorate, 2003



Sources: The Annual Agricultural Statistical Abstract 2003.
Ministry of Agriculture and Agrarian Reform (MAAR)

1.2 Marketing and Filtering

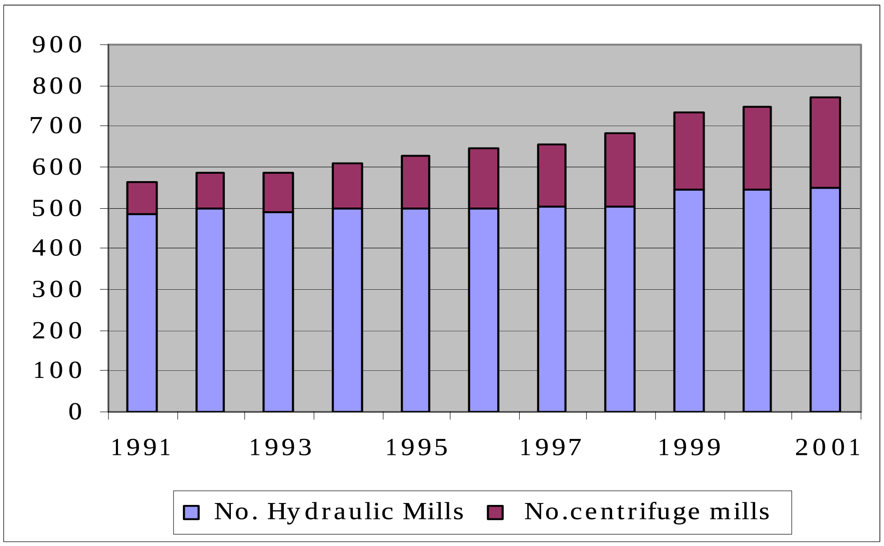
Farmers sell both olives and olive oil. Normally, they choose the best quality of the table olives varieties to be marketed as fresh fruits while the rest is milled to be sold as raw oil.

Virgin olive oil is obtained from the olive solely by mechanical or other physical means under specific conditions particularly thermal ones that do not lead to deterioration of the oil (IOOC, 1998). Olives do not undergo any treatment other than washing, crushing, preparation of the paste and separation of the solid part from the liquid, as well as clarification by sedimentation and/or centrifugation and filtering. It is virtually the only oil that can be consumed as it is obtained from the fruit and when properly processed maintains unchanged flavor and aroma. Virgin olive oil, to be classified as such, must have acidity between 0.8-2% and peroxide of 20.

There are two types of technologies used for olive milling: hydraulic and centrifuge. In the hydraulic system the milling is based on applying pressure on the olive paste to extract oil while the centrifuge power is used in the second system.

The number of mills has been increasing in line with the increase of olive production. It increased from about 562 mills in 1991 to about 796 mills in 2002. In the same period, as presented in figure 1.6, the number of hydraulic mills increased by 14% (from 486 to 555 mills), whereas the number of centrifuge mills increased by 317% (from 76 in 1991 to 241 in 2002) .

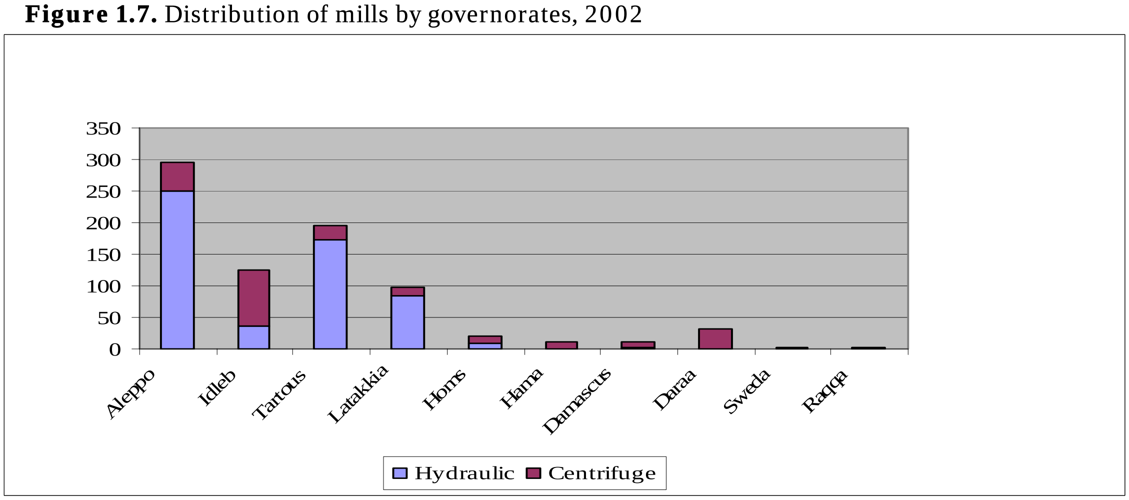
Figure 1.6. Evolution of hydraulic and centrifuge mills,1991-2002



Source: Ministry of Agriculture and Agrarian reform, olive bureau

As argued in the previous paragraph, the main olives and olive oil production and processing centers in Syria are located in the north and costal areas. Mills are mainly located in Aleppo and Idleb to meet the increased production in these areas. Statistics show that the biggest number of centrifuge mills is located in Idleb (figure 1.7).

Figure 1.7. Distribution of mills by governorates, 2002



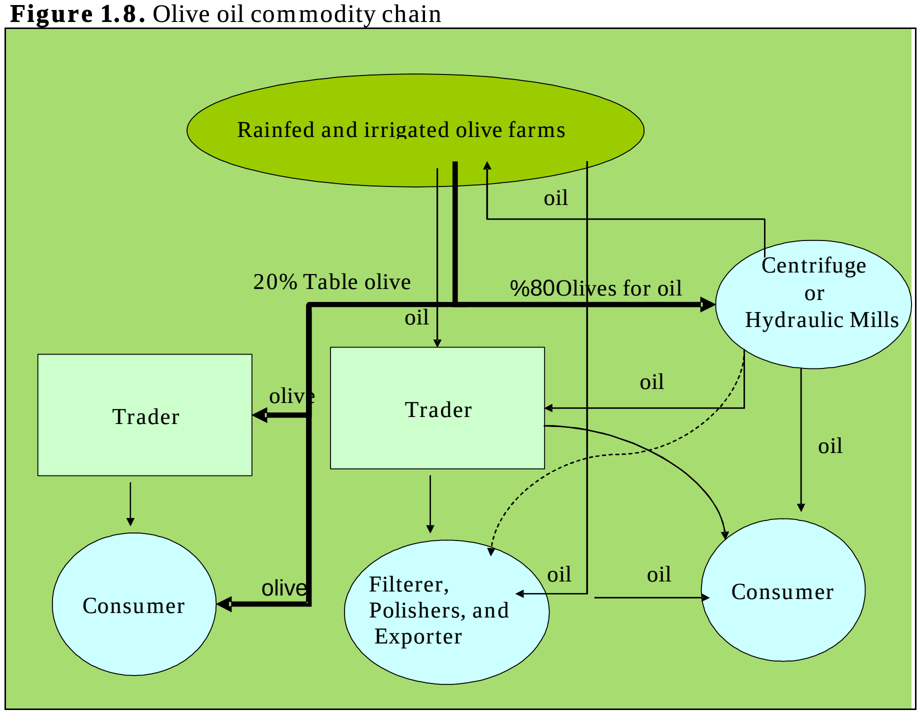
Source: Ministry of Agriculture and Agrarian reform- olive bureau

Processors are gradually changing their milling systems from hydraulic to centrifuge system, due to the higher processing capacity of the latter; 35-70 tons/day with 6 workers, against 20 tons/day with 13 workers for the hydraulic system. After milling, farmers sell their raw oil to one or more of the following agents: consumers, traders, or exporters. The exporters usually filter and polish the oil and sell it either to local or to international markets.

1.3 Selected representative systems

Olive oil commodity chain is illustrated in figure 1.8. Farmers transfer their olives to the mill by their own vehicles, mill's vehicles or by others vehicles. Due to factors, several mills offer, free of charge, bags for olives and transportation services from the farm to the mill. Farmers have to arrange with the millers to process olives as soon as possible after picking in order to obtain the best possible oil quality. It is recommended to mill olives within no more than 48 hours after picking. At the mill, the mill owner charges either 0.95 SP/kg of olives or retains 4-5% of the olive oil (usually in the area close to Aleppo).

Figure 1.8. Olive oil commodity chain



Farmers market their oil either through the mill to be sold to traders or sell it themselves directly to consumers. Traders make a profit of about 1 SP/kg and usually sell the olive oil either directly to consumers or to filtering and polishing establishments. In the process about 2% of olive oil is lost due to storage failures.

At the filtering and polishing establishment, the oil is cleaned up and packed in plastic, glass bottles, or metal cans. Finally, the oil is marketed to local or international markets. At the establishment, the loss is estimated at 2.5% of the olive oil.

This study concentrates on investigating the comparative advantages of two rainfed representative systems; filtered and polished virgin olive oil hydraulic system and filtered and polished virgin olive oil centrifuge system. These systems have been selected because: a) rainfed olive area forms about 90% of the total olive area b) operating systems in the milling filed are either hydraulic or centrifuge c) olive oil exports are mainly filtered and polished.

Chapter - 2 Agent Characteristics

2.1 Source of information

Farm level data have been collected by the Farming System Study (FSS) team[10]. 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 response to policy changes. The information collected with reference to each farming system allowed the members of the team to produce 6 farming system reports, providing an in-depth description of each one of the identified systems (farming system home page, NAPC working paper No. from 9 to 14). Given our selection of representative systems, only the data of the rainfed olive farms are used. Indeed, the farm level data were collected from Idleb and the costal area where the environment is the most suitable for producing olive. Therefore olive oil comparative advantage mainly benefited from NAPC working paper no 10 "The Mountainous and Hilly Rainfed Farming System".

Olive Yield was recorded from the FSS for year 2002, and then it was adjusted to reflect the average yield of two years in order to take into account the alternate bearing of olive production. Variables determined by the level of production such as human labor, transport and so forth have been adjusted accordingly.

Data of post harvest processing were collected from Idleb, Aleppo, and Lattakia governorates by using unified questionnaires prepared for this purpose. Thirteen operators in olive post-harvest processing have been interviewed including 8 olive mills in Idleb (4 centrifuge and 4 hydraulic), 3 traders in Idleb, and 2 filtering and polishing olive oil establishments, one in Aleppo and the other in Lattakia.

2.2 Producers (farm level)

As mentioned above, the final output of the representative farm is raw virgin olive oil. And the main systems studied in this research are hydraulic and centrifuge mill systems.

Budget of the farm has been elaborated depending on the FSS data. The budget consists of establishment cost, direct labor, and intermediate inputs. The crop calendar is addressed to calculate revolving fund. Because olive is a perennial crop, the entire cycle of olive production has been taken into account as follows: an establishment period of 1 year, a before production period of 6 years, an early production period of 5 years and a full production period of 18 years.

Furthermore, it is worth mentioning that the total establishment cost takes into account the actual price for the different operations and that the budget of the farm includes the observed costs and returns of the activity in a year of full production.

[10] Study carried out concurrently with this study

2.2.1 Establishment cost

The net value (cost minus early production revenue) of the establishment year and the period before full production result from the sum of each period without discounting, since the prices collected are at current price for each operation. This net value is treated as an investment cost, considering the useful life of the investment as the remaining term of the production cycle.

Budget analysis shows the establishment cost was reported at 50051 SP/ha, representing about 3% of the total annual cost at farm level. This cost can be disaggregated into non qualified labor (L-NQ), qualified labor (L-Q), capital (K), and tradable inputs (TI), respectively according to the following coefficients (for both hydraulic and centrifuge systems): 0.70, 0.10, 0.10, and 0.10 .

2.2.2 Direct labor

Direct labor consists of land preparation, leveling, fertilization, chemicals application, weeding, harvesting, and pruning. It is mainly used, at the farm level and represents about 36% of the total cost of the hydraulic chain system and about 33% of the centrifuge chain system. The harvesting cost represents about 68% of total direct labor at the farm level in both hydraulic and centrifuge systems.

2.2.3 Intermediate inputs

Intermediate inputs comprise fertilizers, chemicals, machinery, animals' draft, bags, transportation cost, processing cost, and land rent. Processing cost is included at this stage since the study supposes that the final output of farm activities is virgin olive oil. The highest share of intermediate inputs items is found for land rent (25% of the total cost at the farm level).

Overall, intermediate inputs represent, respectively, about 36% and 40% of the total cost of hydraulic and centrifuge systems. The difference between centrifuge and hydraulic systems is only in milling cost. In the centrifuge system, it is 2400 SP/ton of olive oil, whereas in the hydraulic system the cost is 2500 SP/ton of olive oil. Decomposition analysis of milling cost shows that the main difference between hydraulic and centrifuge mills is in unskilled labor, capital and tradable inputs (see table 2.1).

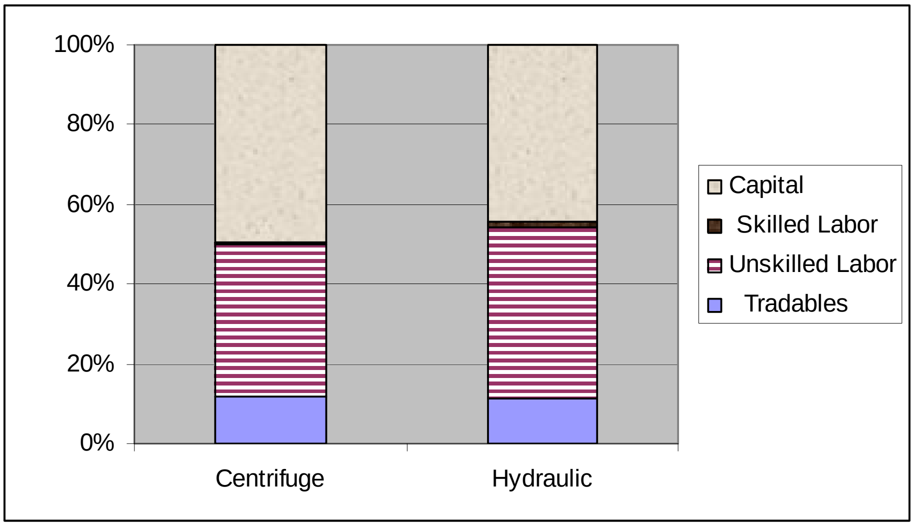
Table 2.1. Decomposition of milling cost

Item	**L-NQ**	**L-Q**	**K**	**TI**
Hydraulic	0.59	0.09	0.02	0.3
Centrifuge	0.1	0.02	0.2	0.68

Source: Calculated by the author

Total cost decomposition of both systems shows that the share of unskilled labor is higher in the hydraulic system, while the share of capital is higher in the centrifuge system. The difference is mainly due to the high establishment cost and lower needs for unskilled labor of the centrifuge system, compared to the hydraulic one (figure 2.1).

Figure 2.1. Composition of the cost of olive oil production



Source: elaborated by the author

2.2.4 Revenue

Since the study assumes that the final output of the farm is virgin olive oil, olive tree productivity and conversion ratio from olive to oil are the main factors that can be considered affecting olive oil quantity.

Regarding the productivity, it must be noted that the study refered to Idleb and the costal governorates where the agro-climatic conditions are very favorable to olive production, and the yield is relatively high compared to other producing areas. The average olive yield was calculated at 7 ton/hectare.

The conversion ratio from olive to olive oil depends on the variety of the olives and the milling technology. The study assumes that the same variety of olives is milled in both hydraulic and centrifuge mills and that the same producing techniques were applied at farm level. Therefore, only the effect of the milling technology on conversion ratio is taken into account.

According to the mills' owners, the extracting ratios for olive processed at hydraulic and centrifuge mills are considered on average as shown in table 2.2.

Table 2.2. Conversion ratio of milling olive at hydraulic and centrifuge mills

	Oil	Cake	Water
Hydraulic	20%	55%	25%
Centrifuge	25%	50%	25%

Source: mill's owners

Consequently, the quantities produced per hectare are about 1.4 tons oil and 3.85 tons cake for hydraulic mills and about 1.75 tons oil and 3.5 tons cake for the centrifuge one. The market price of olive oil is 115000 SP/ton for both systems but there is a difference in the cake price, which is about 1200 SP/ton for the hydraulic system and about 800 SP/ton for centrifuge one, due to the high oil content in the cake produced by the hydraulic system. Table 2.3 shows the farm budget for centrifuge and hydraulic systems. This budget was calculated on the hectare base for year 2003.

As noticeable in table 2.3, at the farm level, there are no differences in the establishment and direct labor costs between the two systems (the same requirements and operations are applied in both systems). The main differences can be found at intermediate inputs level due to the differences in milling cost and land rent.

In both systems cost items are represented by fixed cost, direct labor, and intermediate inputs. The composition of such costs is somehow similar between the two systems (see figures 2.2 and 2.3). The main components of fixed inputs are capital and non-qualified labor. Direct labor is totally composed by non-qualified labor. Intermediate inputs are mainly composed by capital, tradable inputs, non-qualified labor, and, to a much lesser extent, by qualified labor

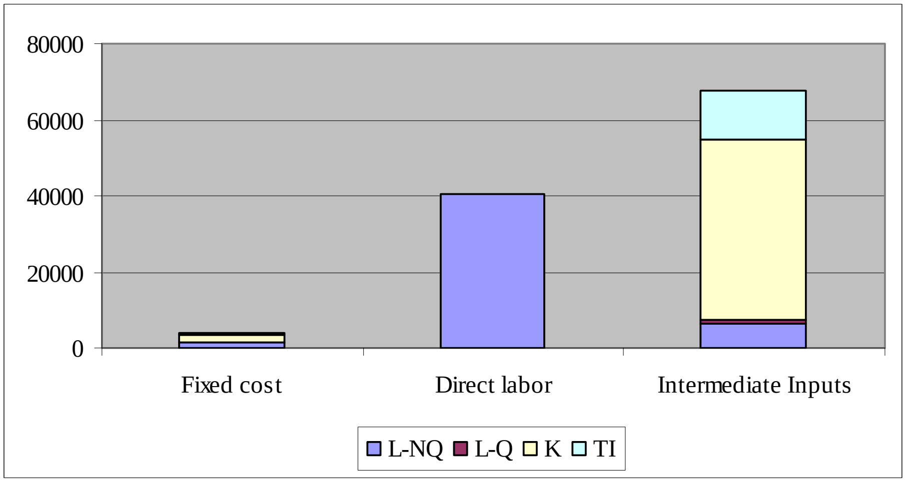
Table 2.3. Farm budget, 2003 (SP/hectare)

Item	Centrifuge	Hydraulic
FIXED INPUT		
Establishment cost per hectare	50051	50051
DIRECT LABOR		
Leveling	1825	1825
Fertilization	1033	1033
Chemicals	192	192
Cultivating/weeding	272	272
Harvesting	27730	27730
Pruning	9432	9432
INTERMEDIATE INPUT		
Manure	2551	2551
Nitrogen	4379	4379
Phosphate	873	873
Potash	252	252
Pesticides	803	803
Herbicides	153	153
Fungicides	283	283
Machinery:		
Ploughing	2950	2950
Animal draft	2412	2412
Packing materials	1229	1229
Transport to	3750	3750
Processing cost	4200	3500
Land rent	51013	41405
Interest on revolving[11] fund	3395	2910
REVENUES		
Olive oil	201250	161000
Cake	2800	4620

Source: Collected by FSS team and elaborated by the author

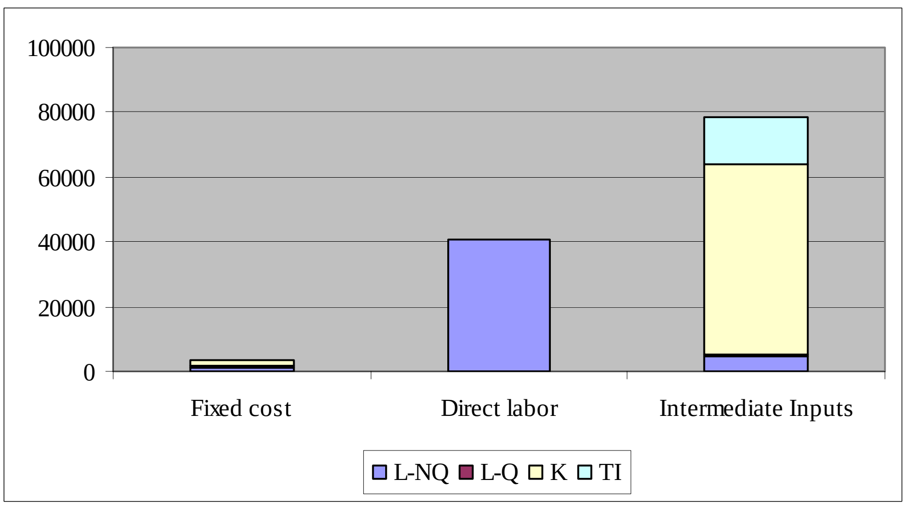
[11] Cost of revolving fund = annual interest rate x (cycle /12 months) x Total of revolving fund

Figure 2.2. Composition of main cost items at the farm level in the hydraulic system (SP/hectare)



Source: Calculated by the author

Figure 2.3. Composition of main cost items at the farm level with centrifuge system (SP/hectare)



Source: Calculated by the author

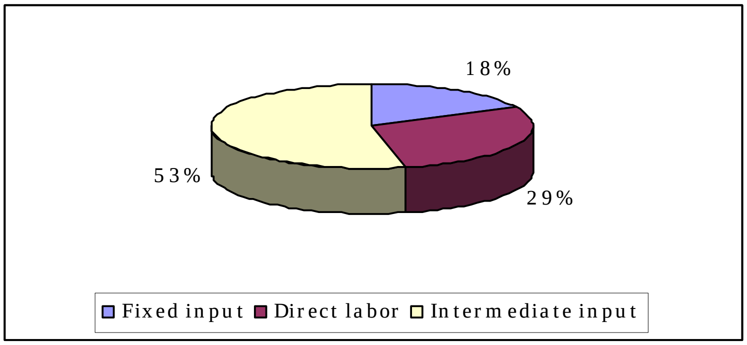
2.3 Trading and Filtering

At trading and filtering level, the same operations and costs pertain the two systems. Therefore, the analysis, at this level, will not distinguish between the two systems.

2.3.1 Trading

Traders buy virgin raw olive oil from farmers and mills to sell it to consumers or filtering and polishing establishments. The traders may also store the olive oil instead of selling it right away. Concerning trader's cost, intermediate inputs (energy, transport, water) form the biggest share of cost (53%), direct labor (workers) forms 29% and fixed cost (buildings) forms 18% (figure 2.4).

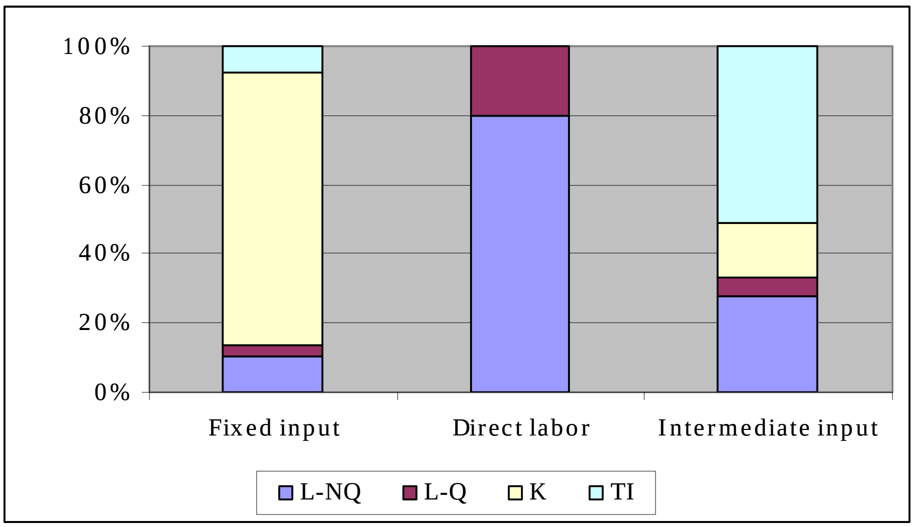
Figure 2.4. Cost structure of olive oil trade



Source: Calculated by the author

In detail, intermediate inputs consist of transport cost (82%) in addition to the other cost items such as water, fuel, and electricity. The most of direct labor is composed of non-qualified labor which is used in storages for loading and offloading olive oil. Most of the fixed cost is represented by capital (buildings) (figure 2.5).

Figure 2.5 Composition of trading item costs



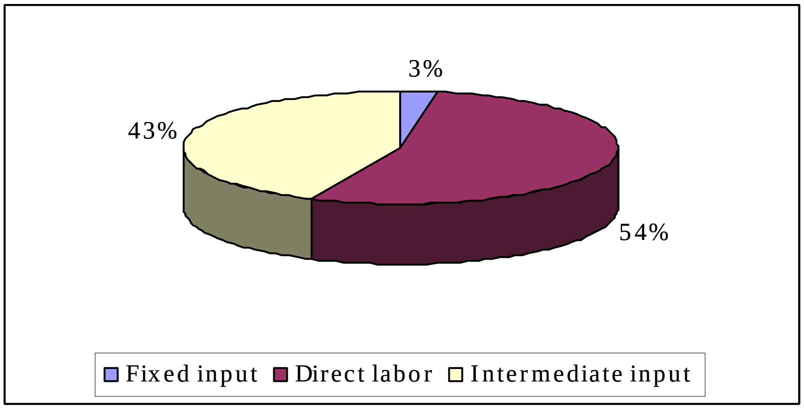
Source: Calculated by the author

2.3.2 Filtering and polishing

Filtering aims at removing impurities, reducing the moisture of the raw olive oil up to 80% and peroxide to 20, the residual maximum to 0.1%, and acidity to 0.8-2%, while polishing aims at brightening the olive oil. The cost items of the filtering and polishing establishment consist of fixed cost, direct labor, and intermediate inputs (see figure 2.6). The fixed cost consists of land, building, tanks, filtering line, polishing line, plastic barrels, and generator, the direct labor of permanent and temporary workers, and the intermediate inputs of lubricant, spare parts, big repairs, energy, fuel, sand, and paper.

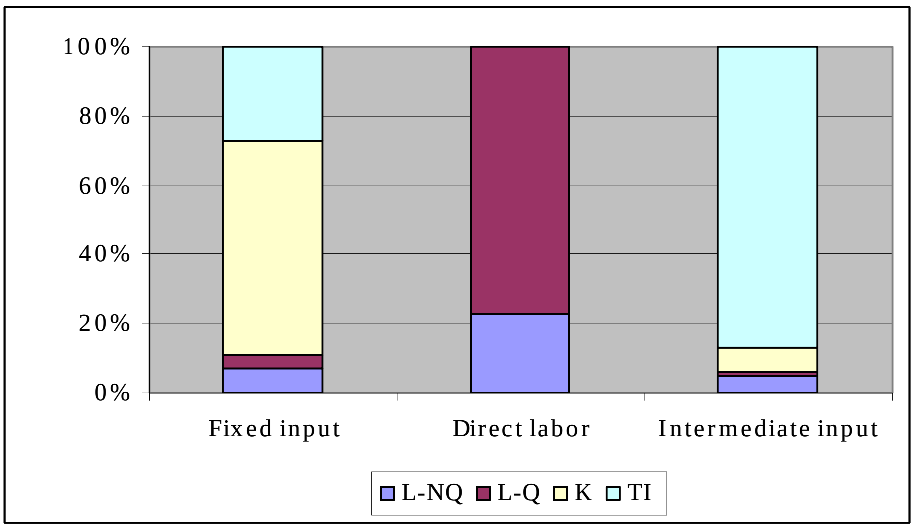
The composition of filtering and polishing cost shows that capital accounts for the highest share of the fixed cost, qualified labor for the highest share of the direct labor and tradable inputs for the highest share of intermediate inputs (figure 2.7).

Figure 2.6. Cost structure of filtering and polishing olive oil



Source: Calculated by the author

Figure 2.7. Coefficients of the cost factors



Source: Calculated by the author

2.4 Budget summary

Budget summaries for both hydraulic and centrifuge systems shows that the biggest share of revenue is earned by the farm (81%), which at the same time uses the highest share of unskilled labor and tradable inputs (see tables 2.4 and 2.5).

Noticeably, for both the hydraulic and the centrifuge systems profit distribution among the chain agents shows that the farm takes the highest share of the profit, followed by the polishing and filtering establishment and the trader (figure 2.8).

It is worth mentioning that, the centrifuge system is more profitable than the hydraulic one especially at the farm level. The profit at the farm level is 48796 SP/ton of raw oil for the centrifuge system, while it is 40335 SP/ton of raw oil for the hydraulic system.

At both systems, the distribution of the cost factor and profit show that the highest share is accounted for profit, followed by unskilled labor, tradable inputs, capital and skilled labor (figure 2.9 and 2.10).

No big difference between the two systems emerges on tradable inputs, capital, or skilled labor; the crucial difference in production cost is in unskilled labor at the farm level because a centrifuge mill needs less workers than a hydraulic one (figures 2.11 and 2.12).

Table 2.4. Budget summary of producing olive oil in hydraulic system (SP/ton)

Item	FARM	Trader	Processor	POST fARM	System
1.TOTAL REVENUES	123810	124103	150158	150158	153611
Main final output	120356	124103	150000	150000	150000
By-products	3454	0	158	158	3611
2. TOTAL COST	83475	120914	125907	122719	85838
A. Commodity in process		120356	124103	120356	
B. Tradable	9538	160	691	852	10390
C. Domestic factors	73937	398	1113	1511	75448
Unskilled labor	35936	222	265	487	36423
Skilled labor	995	51	762	813	1809
Capital	37006	125	86	211	37216
PROFIT	40335	3188	24250	27439	67773

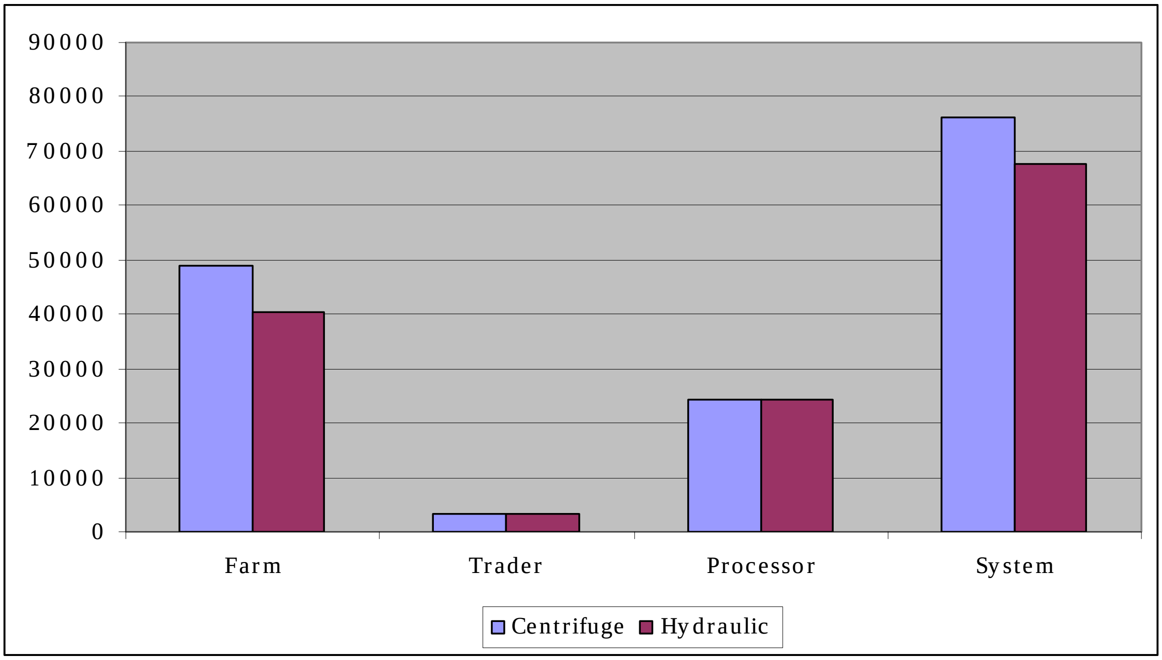
Source: Calculated by the author

Table 2.5. Budget summary of producing olive oil in centrifuge system (SP/ton)

Item	FARM	Trader	Processor	Post fARM	System
1.TOTAL REVENUES	122030	124103	150158	150158	151832
Main final output	120356	124103	150000	150000	150000
By-products	1675	0	158	158	1832
2. TOTAL COST	73234	120914	125907	122719	75597
Commodity in process		120356	124103	120356	
Tradable	8711	160	691	850	9561
Domestic factors	64523	399	1114	1513	66036
Unskilled labor	27744	222	265	487	28231
Skilled labor	679	52	762	814	1493
Capital	36100	125	87	212	36312
Profit	48796	3188	24250	27439	76235

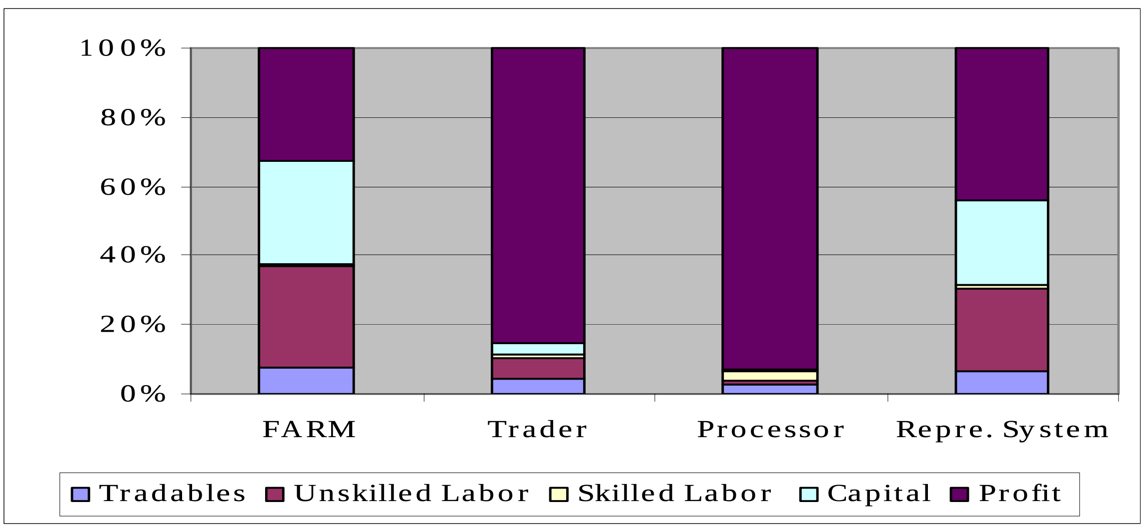
Source: Calculated by the author

Figure 2.8. Profit distribution among agents in the olive oil chain



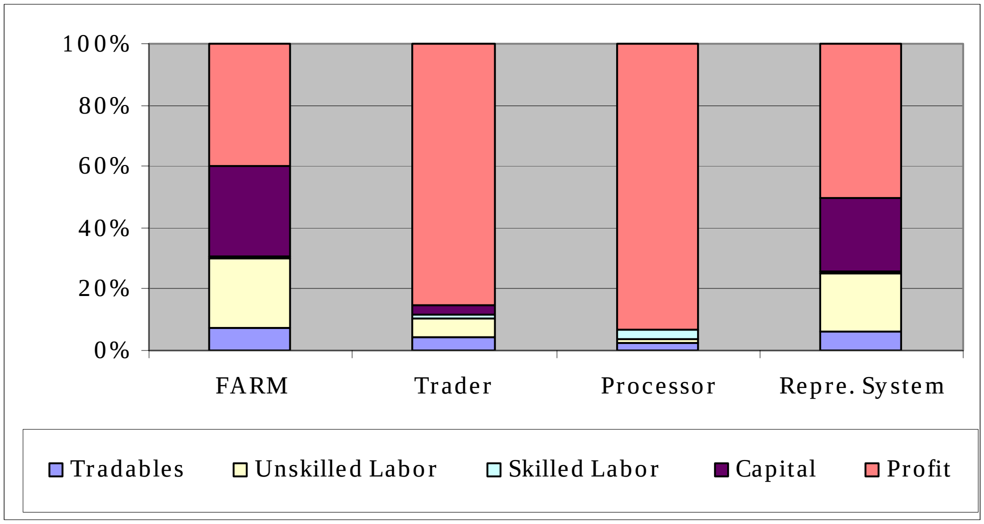
Source: Calculated by the author

Figure 2.9. Distribution of profit, tradable, and non-tradable factors at the hydraulic system



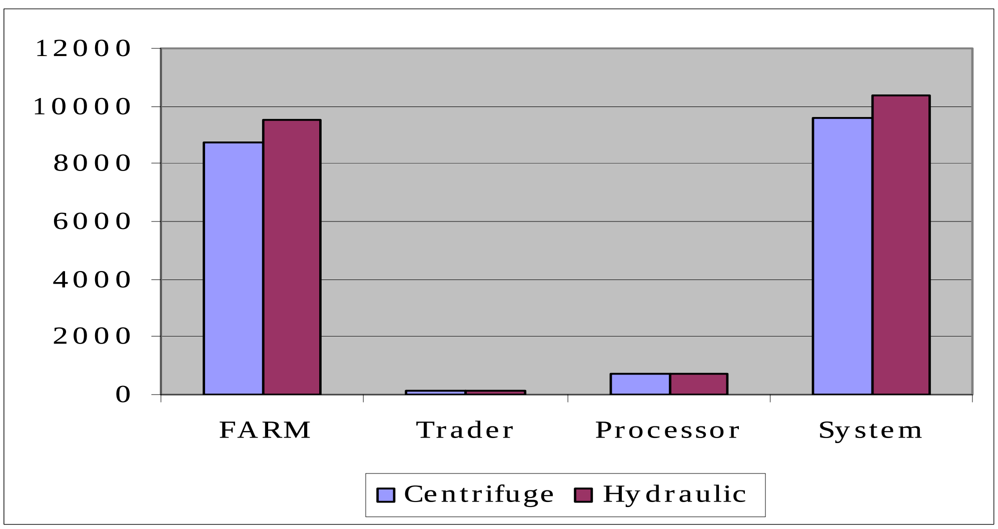
Source: Calculated by the author

Figure 2.10. Distribution of profit, tradable, non- tradable and costs at the centrifuge system



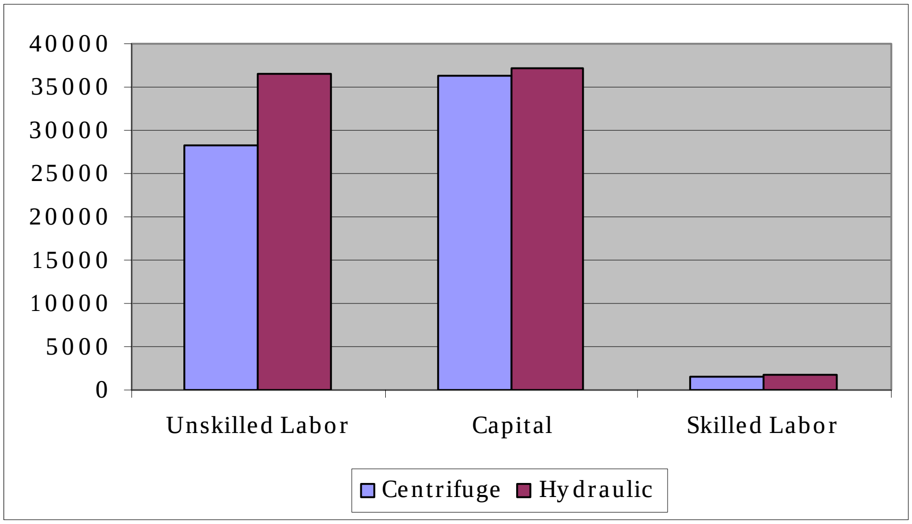
Source: Calculated by the author

Figure 2.11. Using tradable inputs for both systems



Source: Calculated by the author

Figure 2.12. Values of Domestic factors in centrifuge and hydraulic systems



Source: Calculated by the author

Chapter-3 Comparative Advantage of Rainfed Olive Oil; Hydraulic and Centrifuge Systems

The assessment of the comparative advantages of a given productive system encompasses a broad range of conceptual work emanating from cost-benefit analysis and the theory of international trade. The basic concept is that an economic activity in a given country has a comparative advantage as far as it can be profitable while competing with alternative sources of supply from import, without benefiting from any specific support from the rest of the economy under the form of transfer of resources. The comparative advantage of a productive system is measured through the computation of several accounting entities and ratios that have been gradually developed through applied research. In the eighties these different methods have been consolidated into one analytical framework, named the Policy Analysis Matrix (PAM).

3.1 PAM composition

The policy analysis Matrix (PAM) is composed of two accounting bases (see table 3.1), one calculated at private prices (first row) and the other calculated at social prices (second row). The third row of the PAM is obtained by subtracting the social values from the private values indicating the magnitude of the transfers induced by the current policy and market environment (for further information on PAM see annex 2). Moreover, these transfers can be either positive (in favour of the system analyzed) or negative, when economic agents of a selected system will have to pay a higher price for purchasing a tradable input due to high level of taxation applied to import it.

Table 3.1. The Policy Analysis Matrix

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

The private prices are the market prices while the social prices are the prices that would prevail if no distortion were in place. The calculation of these latter is quite complicated especially for domestic factors. The related row is computed on the basis of secondary data determining the level of distortion such as tariffs, income tax and fuel subsidy. The estimation of the systems' revenue at social prices uses the parity price. Tradable input values at social prices are determined by deducting from the corresponding value at private price the value of the custom duties, and conversely by adding the value of any subsidies. For the cost of energy, an implicit subsidy was applied for fuel consumption since the price in Syria is far lower than the prevailing price on the world market (Lancon, 2004). The PAM are computed in Syrian Pound, therefore the exchange rate is an important determinant of the value of tradable input usually quoted in US Dollar on the world market that need to be converted in SP. No distortion was accounted for between the current exchange rate and the social exchange rate. Therefore, the study applies the same exchange rate (51.5 SP/us$) to estimate the private and the social value of the tradable.

The estimation of the social value of the domestic factors is less straightforward as it cannot be backstopped by the value of similar input on the world market. For labor, the value of skilled labor or permanent laborer, who required the payment of various social contributions (social security...), was adjusted accordingly. As the tax on capital invested was minimal, it wasn't accounted for any tax on capital invested. However, for domestic factors, a large share of the divergence between private and social price might be caused by market failures and policies. The assessment of these inefficiencies is a challenging task that requires specific studies. Based on expert judgment, it has been assumed that there is no particular distortion on the labor market and that the current wages reported for various tasks reflect the true opportunity cost of labor. For the capital market, the current saving rates offered by the Commercial Bank of Syria, 5.5% per year, was used to compute the opportunity cost of the capital immobilized in the process of production at private price, while a rate of 3% equivalent to the weighted rate computed by the International Monetary Fund IMF for the newly industrialized Asian economies was applied at social prices. Given the high level of public intervention on the financial market and the tighten credit policy for private agents it is likely that the opportunity cost of capital could be higher at private price. However, it is important to note that the value of the private interest rate does not enter in the computation of the Domestic resource Cost (DRC) to assess the comparative advantage of a representative system. Therefore, it is preferable to keep observed value in the current situation and to assess with sensitivity analysis the impact of higher interest rate on the private profitability of the system. For land, the study supposed that land rent at social prices is 25% of the farm production.

Since we have two different milling systems, two PAMs were prepared: one for hydraulic system and the other for centrifuge system.

Parity prices

Export parity prices are used in the budget to reflect the social prices of the final output. They are calculated for bulk filtered and polished olive oil as shown in table 3.2. All the cost levied to the FOB price of 2200 US$/ton have been collected from exporting companies, assuming Italy as the targeted market. However, no account is given of different target markets since companies sell the product FOB regardless to the destination market.

Table 3.2. Calculation of olive oil parity price in 2003

Item	unit	source	Market price	Social price
FOB price	US$/ton	trader	2200	2200
Exchange rate		Data	51.5	51.5
FOB price at export point	SP/ton	Computed	113300	113300
Custom declaration	SP/ton	Data	850	-
Tax on foreign currency exchange based on 130000 SP/ton olive oil at 0.5 SP per dollar	SP/ton	Data	1262	-
Total fixed duties	SP/ton	Computed	2112	-
Price at harbor before custom	SP/ton	Computed	111188	113300
Transitor fee	SP/ton	Data	400	400.00
Sample test	SP/ton	Data	87.5	87.50
Ship agent	SP/ton	Data	45	45.00
Total handling and transport cost	SP/ton	Data	38	38.00
Total	SP/ton	Computed	570.5	570.5
Parity price at point of delivery	SP/Ton		110617	112730

Source: olive oil trader

3.2 PAM for olive oil

Table 3.4 presents the PAM for hydraulic system and shows that, at private prices, the profit accounts for 67773 SP/ton, having domestic factors as the major cost. Domestic factors remain the major cost also at social prices, but, in this case, profits are 32% lower. Being profit divergences positive it can be concluded that there is a transfer (support) from the economy to the system accounting for 32733 SP/ ton filtered oil. This transfer is caused mainly by the difference in revenues and domestic factors due to the distorting polices that affect domestic factors (insurance) and protectionist policies, restricting the import of olive oil.

Table 3.4. The Policy Analysis Matrix for hydraulic system, SP/ ton filtered oil

Item	REVENUES	COSTS TRADABLES INPUTS	DOMESTIC FACTORS	PROFITS
PRIVATE PRICES	A 153,611	B 10,390	C 75,448	D 67,773
SOCIAL PRICES	E 116,341	F 10,541	G 70,760	H 35,040
DIVERGENCES	I 37,271	J -151	K 4,688	L 32,733

Source: elaborated from the collected data

Table 3.5 presents the PAM for centrifuge system. Noticeably results are not so different from the pervious system, with the main cost being the domestic factors, accounting for about 87% of the total cost at both private and social prices. In fact, the transfers from the economy to both systems are almost the same.

Table 3.5. The Policy Analysis Matrix for the centrifuge system, SP/ ton filtered oil

Item	REVENUES	COSTS TRADABLES INPUTS	DOMESTIC FACTORS	PROFITS
PRIVATE PRICES	A 151,832	B 9,561	C 66,036	D 76,235
SOCIAL PRICES	E 114,562	F 9,796	G 61,312	H 43,453
DIVERGENCES	I 37,270	J -235	K 4,724	L 32,782

Source: elaborated from the collected data

3.3 Main PAM indicators

10 PAM's indicators have been calculated, for both hydraulic and centrifuge systems, and the results are shown in table 10, for more information about PAM indicators see Annex 2.At private prices, the centrifuge system is 12% more profitable than the hydraulic system. Moreover the cost benefit ratio accounts for 46% in the centrifuge system and 53% in the hydraulic, meaning that investing in the centrifuge system is preferable from a financial point of view.

Profitability at social prices is also higher in the centrifuge system, being the Domestic Resources Cost (DRC) 58% in centrifuge system and 67% in the hydraulic one. This means that there is a comparative advantage in producing olive oil in both systems. The centrifuge system however has a stronger comparative advantage.

In both systems, the values of the other indicators are similar (table 3.6). The Value of the Nominal Protection Coefficient (NPC) is above 1.3 indicating that the olive oil sector in Syria is protected.

The ratio of the EPC on the NPC can be used as an indication of the respective impact of the current policies on distortions of tradable outputs and tradable inputs prices. When the value of the EPC is close to the value of the NPC, most of the protection is due to the output trade policy. In our case this ratio is 1.02 for both systems, meaning that the distortion is mainly due to the trade policy.

Table 3.6. PAM indicators for both centrifuge and hydraulic system

Indicators	Formula	Centrifuge	Hydraulic
1. FINANCIAL PROFITABILITY	[D = A - B - C]	76,224	67,773
2. FINANCIAL COST-BENEFIT RATIO	[C / (A - B)]	0.464	0.527
3. SOCIAL PROFITABILITY	[H = E - F - G]	43,414	35,040
4. DOMESTIC RESOURCE COST	[G / (E - F)]	0.585	0.67
5. SOCIAL COST-BENEFIT RATIO	[(F + G) / E]	0.621	0.67
6. TRANSFERS	[L = I + J + K]	32,810	32,733
7.NOMINAL PROTECTION COEFFICIENT	[A / E]	1.325	1.320
(Including by-product)			
7A. NOMINAL PROTECTION COEFFICIENT (Main final output only)	[A* / E*]	1.331	1.331
8. EFFECTIVE PROTECTION COEFFICIENT	[(A - B) / (E - F)]	1.358	1.354
9. PROFITABILITY COEFFICIENT	[D / H]	1.756	1.934
10. PRODUCERS SUBSIDY RATIO	[L / E]	0.286	0.281
11. EQUIV. PRODUCER SUBSIDY	[L / A]	0.216	0.213

Source: elaborated from the collected data

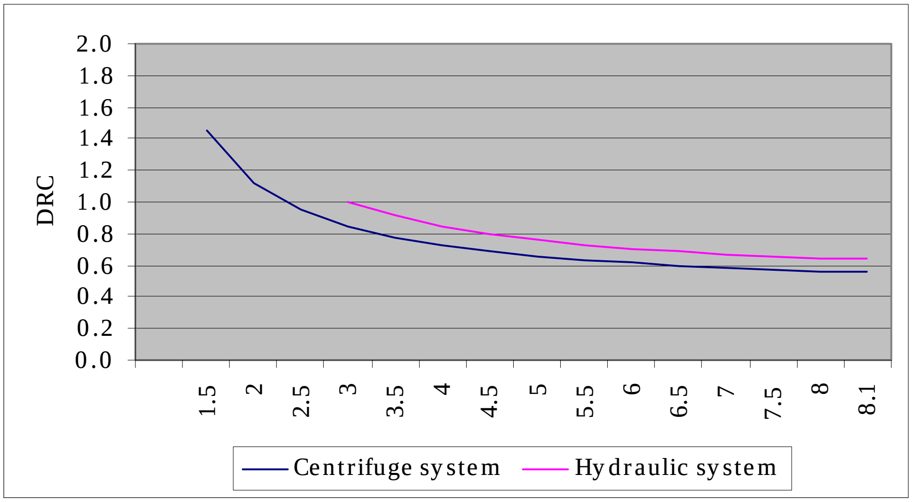
3.4 Sensitivity analysis of factors determining comparative advantages

A sensitivity analysis can be conducted on the basis of the observed value in the current situation to assess the impact of changes in the factor determining comparative advantage on the PAM indicators. In this study the sensitive analysis is conducted using elasticity. The elasticity is the ratio of the incremental percentage change of one variable with respect to an incremental percentage change of another variable. The key factors determining olive oil comparative advantage are assumed to be yield, conversion ratio of olive into olive oil, exchange rate, and parity prices. The sensitivity analysis allows to assess to what extent the PAM's indicators react to the changes in the value of the above mentioned factors. Following it is presented the sensitivity analysis of the DRC while the sensitivity analyses of some other indicators (FC-BR, SC-BR, EPC, PSR) are presented in the annex (annex tables 6-13).

3.4.1 Yield

As illustrated in figure 3.1 the yield of olive trees has a negative relationship with DRC in both systems. This means that having higher yields leads to lower values of the DRC, hence a stronger comparative advantages is expected. The elasticity in the centrifuge system is higher than that in the hydraulic system in absolute values. That to say the DRC in the centrifuge system is more sensitive than the DRC of the hydraulic system to yield changes. Moreover, the analysis shows that for yield less than 2.75 t/ha, in the centrifuge system, and less than 3t/ha, in hydraulic one, the systems have no comparative advantages (DRC>1 indicates that the system under analysis does not have comparative advantage).

Figure 3.1. Yield changes and corresponding changes of DRC, (ton/hectar)

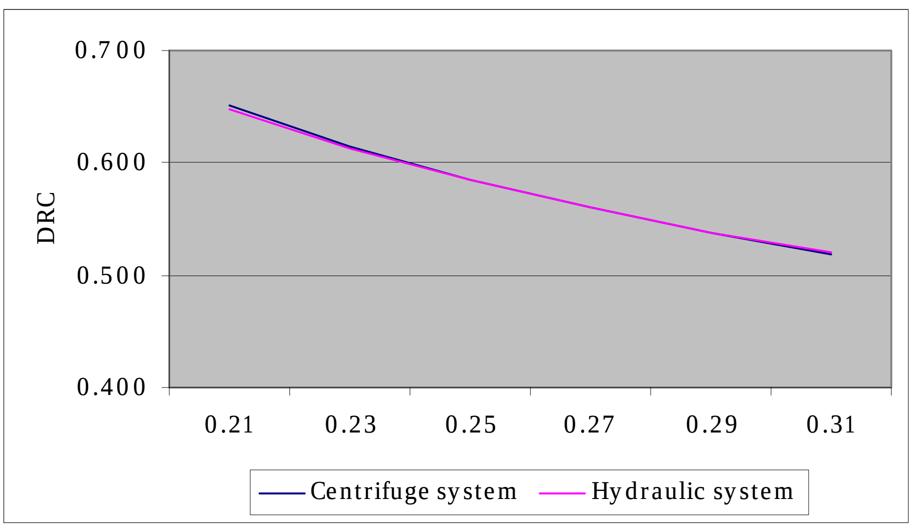


Source: elaborated by the author

3.4.2 Conversion ratio

Noticeably, the conversion ratio does not affect significantly the comparative advantage of the system. The system maintains comparative advantage for low conversion ratio values. The conversion ratio of olive into olive oil does not affect significantly the DRC since the elasticity, although still negative, is low; about 0.43 for both systems. This means that variation in the conversion ratio equally affects the comparative advantage at both systems (figure 3.2).

Figure 3.2. Conversion ratio from olive to olive oil changes and corresponding changes of DRC(%)

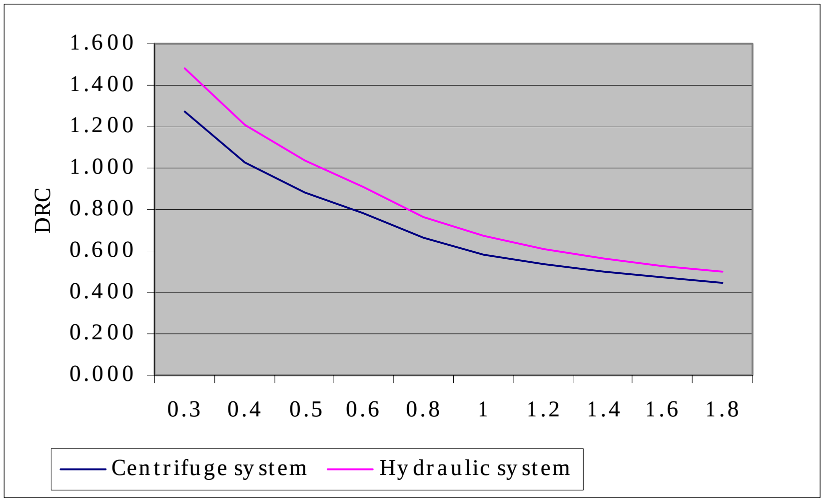


Source: elaborated by the author

3.4.3 Exchange rate

The analysis shows that the exchange rate does not affect the DRC in the same way for both systems. In fact, it affects the value of the DRC, hence the comparative advantages of the hydraulic system is impacted more than that of the centrifuge one (figure 3.3).

Figure 3.3. Exchange rate changes and corresponding changes of DRC (%)

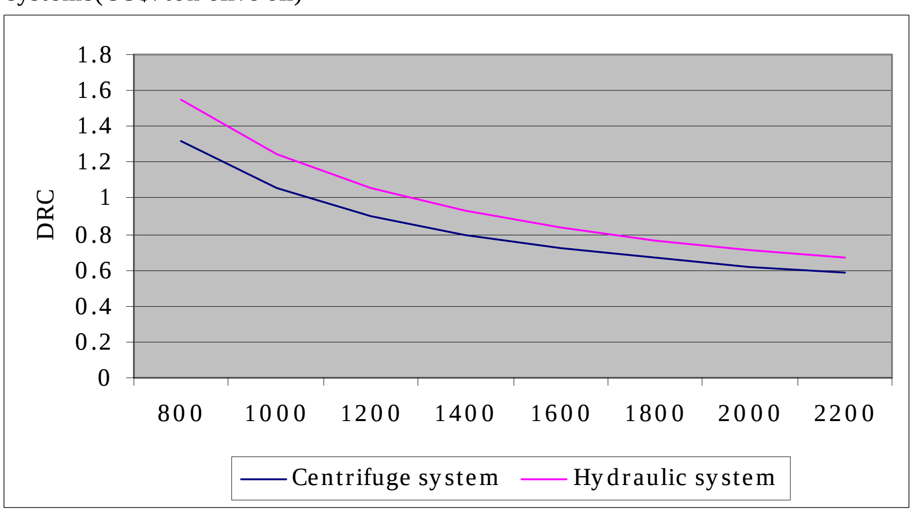


Source: elaborated by the author

3.4.4 Parity price

Sensitivity analysis shows that the parity price elasticity is higher in the hydraulic system than in the centrifuge system, with a negative sign for both systems. This means that the parity price has a negative relationship with DRC and it affects the comparative advantages more in the hydraulic system than in the centrifuge one. The comparative advantage is maintained for parity prices values above US$ 1400 in the hydraulic system, and above US$ 1200 in the centrifuge system (figure 3.4).

Figure 3.4. Parity price changes and corresponding changes of DRC in both systems(US$/ton olive oil)



Source: Elaborated by the author

3.4.5 Break-even points

Break-even point is the point in which costs equals revenues. It is computed by assuming that all cost elements are constant other than the studied factor. The beak even points are calculated for the yield, and the price of the main final output at both private and social prices. Tables 3.7 and 3.8 indicate the gap between the break-even value and the current value as a percentage of the current value, which can be considered as an indicator of the sensitivity of each variable; the higher the percentage, the more the result of the PAM are sensitive to this variable or group of variables. The above mentioned tables allow noting that the centrifuge system achieves comparative advantages up to a reduction of 39% in the yield and price, while the hydraulic system achieves comparative advantages up to a reduction of 33% in the yield and 31% in the price.

Table 3.7. Break-even points for the centrifuge system

Item	At market price	At social price
Yield	1.05023 (0.60)	1.0740 (0.61)
Final output price	73765 (0.49)	69277 (0.61)

Source: Elaborated by the author

Table 3.8. Break-even points for the hydraulic system

Item	At market price	At social price
Yield	0.94391 (0.67)	0.9708 (0.69)
Final output price	82227 (0.55)	77690 (0.69)

Source: Source: elaborated by the author

Conclusion and Recommendation

Syria has got comparative advantages in producing filtered polished virgin olive oil in both hydraulic and centrifuge systems (the comparative advantage is being sounder in the case of centrifuge technology). Noticeably, according to the sensitivity analysis of the comparative advantage indicators to the factors determining them, Syria would maintain comparative advantages even if the world price decrease to 1300 US$/ton, which is not likely in the short run, due to the increasing demand for olive oil at world level. The same, Syria would maintain comparative advantage in producing olive oil if the yield decrease to 3 ton/ha. Indeed, Syria has got many competitive factors in olive oil production, such as high quality olive oil and low production cost.

In prospective terms, at world level market, not only the increasing demand for olive oil, but also the increasing demand for high quality olive oil favors Syrian olive oil production. In fact, Syrian government fosters quality concerns in olive and olive oil production. Indeed olives are produced under IPM regime and efforts are devoted to improve quality at farm (i.e. from picking stage onward) and post harvest process.

At the farm and mill levels, agents' coordination is crucial to obtain the best possible olive oil quality. In fact, after picking, the less is waited to mill the olives, the best it is in terms of resulting olive oil quality, which soundly deteriorates if olives are left not milled for just a few days. Furthermore, at the mill level, olive oil is mainly filled in metal cans that badly affect olive oil quality. Farmers should be made aware of the need to transfer their olives to mills shortly after having picked them and in coordination with mill owner making sure that olives are milled upon arrival, to obtain the best possible olive oil quality. The consciousness should be extended to the miller concerning the quality of cans that are used in filling olive oil and about the place of oil storage.

Furthermore, picking operations account for major shares of total cost. Therefore, suitable technologies to reduce the cost of picking olives should be applied.

Another factor of major importance to strengthen and maximize the benefit of Syria possessing comparative advantages in olive oil production is gaining new market shares by participating in international olive oil conferences and fairs, as well as investing in marketing actiovities, such as advertisements in agro-food magazines. Moreover, it would be of use to have an olive oil trading section in each commercial representative of Syrian embassies in markets of relevance; especially in promising markets such as China. Furthermore, protectionist policies at target markets could be seen as part of the cause of the low growth rate in olive oil exports. Indeed Syria has got the potentials to benefit from joining bilateral, as well as multilateral, and international agreements by fostering free trade of agricultural products and in particular of agricultural products that enjoy comparative advantages, such as olive oil.

This study considers rainfed olive production in Idleb and Coastal Areas as representative of the system. Indeed, similar analyses could be addressed to systems concerning different agro-ecological zones of production, taking into account the cost of land reclamation in both rainfed and irrigated areas.

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Annexes.

Annex table 1. Area, production and number of olive trees, 1994-2003, (hectare, ton, 000 trees)

Item	Irrigated				Non- Irrigated				Total			
	Irrigated Area	NO.Of trees		Product-ion	Rainfed Area	NO.Of trees		Product-ion	Area	NO.Of trees		Product-ion
		Total	Fruit bearing			Total	Fruit bearing			Total	Fruit bearing	
1994	21941	3540.8	1476.2	39902	380421	48886.1	27567.2	477990	402362	52426.9	29043.4	517892
1995	21687	3559.6	1673.6	34246	399896	50655.1	30125.8	389112	421583	54214.7	31799.4	423358
1996	22519	3634.9	1836.3	45715	416045	53268.1	30016.7	601930	438564	56903.0	31853.0	647645
1997	23315	3720.4	2017.3	40497	421865	56018.6	33337.9	362459	445180	59739.0	35355.2	402956
1998	26841	4327.2	2326.7	52819	432828	57972.8	34373.3	732181	459669	62300.0	36700.0	785000
1999	28584	4541.6	2535.4	40654	441273	58837.7	35612.8	359855	469857	63379.3	38148.2	400509
2000	28994	4468.1	2787.3	65386	448999	59875.7	37518.9	800666	477993	64343.8	40306.2	866052
2001	32254	5003.8	3087.3	62899	456703	61056.8	40719.9	434053	488957	66060.6	43807.2	496952
2002	40935	6938	4217.4	92979	460533	64087.3	47156.7	847962	501468	71025.3	51374.1	940941
2003	46799	7980.9	4947.3	106424	470150	65967.3	47741.7	445853	516950	73948.2	52689	552277
Sweida	1010	169.8	126.5	4456	6965	1216.8	750.1	10763	7975	1386.6	876.6	15219
Dar'a	5519	808.2	633.5	22529	21190	3927.4	1941.6	31065	26709	4735.6	2575.1	53594
Quneitra	395	77	57	855	2771	465.4	210.0	2100	3166	542.4	267	2955
Damascus	10904	2042.1	1392.3	32745	5112.5	858.8	412.4	4101	16016	2900.9	1804.7	36846
Dam CITY	579	50.2	49.9	997	0	0	0	0	579	50.2	49.9	997
Homs	7625	1351.6	696.7	13477	40001	6205.9	2401.7	12425	47626	7557.5	3098.4	25902
Hama	5428	920.4	571.2	10188	25442	4992.3	2503.1	15654	30870	5912.7	3074.3	25842
Ghab	118	51.6	45.9	1654	1598	276.5	237.9	4326	1716	328.1	283.8	5980
Idleb	4125	446.4	348.9	6000	107600	12112.5	10128.3	113500	111725	12558.9	10477.2	119500
Tartous	57	8.1	7.8	20	65650	9352.2	8006.2	23505	65707	9360.3	8014	23525
Lattakia	195	44	34	1050	37149	7915.0	6469	33950	37344	7959.0	6503	35000
Aleppo	1928	247.8	234.6	4321	156568	18631.6	14675	194434	158496	18879.4	14909.6	198755
Al-Raqqa	7905	1366.5	670.4	6738	103	12.9	6.4	30	8009	1379.4	676.8	6768
Dair-Ezzor	765	302.4	78.4	1392	0	0	0	0	765	302.4	78.4	1392
Al-Hassake	246	94.8	0.2	2	0	0	0	0	246	94.8	0.2	2

Source: The Annual Agricultural Statistical Abstract 2003. Ministry of Agriculture and Agrarian Reform

Annex 2: Brief presentation of the PAM.

The Policy Analysis Matrix (PAM) provides an analytical framework to estimate the comparative advantage of a given productive system. It compares two accounting entities (Income = Input cost + Factors cost + Profit) one being computed for a level of price observed under the current economic conditions (called private prices), while the second entity uses the price (social price) that would prevail under perfect market conditions leading to an optimal allocation of resources within the economic system (a situation where the welfare of any economic agent cannot be improved without affecting the welfare of another one). The last line of the matrix is computed by subtracting social values from private values and represents the divergence between the current situation and the optimal situation. Those divergences are due to distortions attributed either, to policy affecting the level of prices (taxes, subsidy), or to market failure (monopoly, externalities) that prevent markets to allocate resources efficiently. Prices prevailing on the world market are taken as the reference for building the accounting entities under social prices.

The Policy Analysis Matrix

	Revenue	Tradable Input	Domestics factors	Profit
Private prices	A	B	C	D
Social prices	E	F	G	H
Divergence	I	J	K	L

For instance, if H>0, a commodity has a comparative advantage because it can be profitably produced in an open and competitive environment without generating any additional costs to the entire economy in the form of financial transfer through government policy or of externalities caused by market failures.

The PAM provides straightforwardly a range of indicators for assessing the efficiency and the comparative advantages of a system.

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 have a comparative advantage, meaning that we use less value of Domestic Factors (labor, capital...) than the added generated (VA= E-F), if DRC>1 the system have 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 system that have a high content in 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]	Indicate the level of protection for the main output, if NPC> 1, the system benefit from a protection, if NPC<1 the system is taxed.
8. Effective Protection Coefficient (EPC)	[(A - B) / (E - F)]	Indicate 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]	Measure the impact of the policy on the profitability of the system. If PC>1, the system benefit from a net transfer from the economy, if PC<1, the economy benefit 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 (ESP)	[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 negotiation. If + it is producer subsidy, if – its consumer subsidy.

Annex table 3. Decomposition of the coefficients applied

Item		Coefficient for decomposition						Ad valorem tax
		L-NQ*	LQ**	K	TI	Source		
Fixed cost								
Fixed cost	Building	0.30	0.10	0.30	0.30	educated guess	30.0%	various
Fixed cost	Generator	0.05	0.05	0.10	0.80	educated guess	1.7%	
Fixed cost	Vehicle for handling	0.05	0.05	0.10	0.80	educated guess	10.0%	8427
Fixed cost	Truck 5-20t	0.05	0.05	0.10	0.80		14.5%	8704
Fixed cost	Van	0.05	0.05	0.10	0.80		50.5%	8704
Fixed cost	Machine/equipment (law 10)	0.05	0.05	0.10	0.80		1.7%	8704
Fixed cost	Agricultural machinery	0.05	0.05	0.10	0.80		1.7%	8433
Labor								
Variable cost	Casual labor	1.00						
Variable cost	Skilled work		1.00					
Variable cost	All labour mixed	0.80	0.20			educated guess		
Agricultural input								
Variable cost	Manure	0.07	0.05	0.17	0.72	Life calf Pam budget		
Variable cost	Seeds	0.05	0.05	0.10	0.80	NAPC report opportunity price is imported fertilizer	1.7%	
Variable cost	Fertilizer and chemical input	0.05	0.05	0.10	0.80	NAPC report	1.7%	3102
Variable cost	Mechanized labor	0.33	0.05	0.17	0.45	FSS data	-18.0%	
Variable cost	Animal draft	0.40	0.00	0.30	0.30	educated guess	1.7%	

Other costs								
Variable cost	Maintenance (with spare parts)	0.10	0.10	0.20	0.60	educated guess	20.0%	8708
Variable cost	spare parts alone	0.05	0.05	0.10	0.80	educated guess	20.0%	8708
Variable cost	Transport	0.33	0.05	0.17	0.45	assumed equal to mechanized labor	-18.0%	
Variable cost	Electricity	0.01	0.03	0.04	0.92	Data collected from electricity company	-12.0%	
Variable cost	Fuel	0.05	0.10	0.10	0.75	educated guess	-40.0%	
Variable cost	Telecommunication	0.05	0.10	0.40	0.45	educated guess	10.0%	Edu. guess
Variable cost	Other	0.30	0.20	0.20	0.30	educated guess	10.0%	
Other coefficients								
Labor	Wage discrepancy	1						
Labor	Tax on QL	employee contribution		7%		100	base salary	
		employer contribution		14%		93	net salary (Social value)	
		Health insurance		3%		117	gross salary (Private value)	
			Total	24%				
		Market	Social					
Exchange rate	Exchange rate discrepancies	51.5	51.5					
Interest on capital		5%	3%					

*Labor non -Qualified

** Labor Qualified

Annex table 4. Decomposition of centrifuge mill cost

Fixed cost											
				Rate of return market			0.055				
Equipment depreciation											
Item	Equipment value	Annual capacity	Capacity needed for activity	Unit of capacity	Life time (year)	Used up portion	Residual value	Ad valorem duty	Fixed duty	Financial cost and import tax	Depreciation
whole production line	2250000	375	375	ton/year	25	100%	225,000	0%		101,175	88,342
land	45000	375	375	ton/year	50	100%	4,500	0%		2,353	897
building	1000000	375	375	ton/year	50	100%	100,000	0%		52,282	19,932
Water	70000	375	375	ton/year	50	100%	7,000	0%		3,660	1,395
Generator	200000	375	375	ton/year	25	100%	20,000	0%		8,993	7,853
Total										168,462	118,419

Decomposition of Coefficient

	Value at market price	**Coefficient**				**Value**				**Coefficient check**	**ad valorem**
		L-NQ	L-Q	K	TI	L -NQ	L- Q	KI	TI		
Fixed cost											
Equipment cost TI depreciation	118,419				1	0	0	0	118,419	1	2%
Equipment cost Financial	168,462			1		0	0	168,462	0	1	

Variable cost											
Temporary workers	103125	0.9	0.1			92,813	10,313	0	0	1	
Lubricant	3000				1	0	0	0	3,00 0	1	0.2
Spare parts	350000				1	0	0	0	350, 000	1	0.2
Energy	160000	0.01	0.03	0.05	0.91	1,600	4,800	8,000	145,6 00	1	-0.13
Fuel	4000				1	0	0	0	4,00 0	1	-0.4
Total	903,006	0.10	0.02	0.20	0.69	94,413	15,113	176,462	621,0 19	1.00443	

Annex table 5. Decomposition costs of hydraulic mill

Fixed cost

					Rate of return market			0.055			
Equipment depreciation											
Item	Equipment value	Annual capacity	Capacity needed for activity	Unit of capacity	Life time (year)	Used up portion	Residual value	Ad valorem duty	Fixed duty	Financial cost and import tax	Depreciation
production line	100000	120	120	ton/year	25	100%	10,000	0%		3,364	3,895
land	5000	120	120	ton/year	50	100%	500	0%		194	99
building	25000	120	120	ton/year	50	100%	2,500	0%		970	497
Water	3500	120	120	ton/year	50	100%	350	0%		136	70

Generator	12500	120	120	ton/year	25	100%	1,250	0%		421	487
Total										5,084	5,047

Decomposition Coefficient

	Value at market price (SP)	Coefficient				Value				Ad valorem
		L-NQ	L-Q	K	TI	L-NQ	L- Q	KI	TI	
Fixed cost										
Equipment cost TI depreciation	5,047				1	0	0	0	5,047	0.17
Equipment cost Financial	5,084			1		0	0	5,084	0	
Variable cost										
Temporary workers	210000	0.9	0.1			189,000	21,000	0	0	
Lubricant	5000				1	0	0	0	5,000	0.2
SPare parts	50000				1	0	0	0	50,000	0.2
Big repairs	25000	0.1	0.2		0.7	2,500	5,000	0	17,500	0.2
Energy	10000	0.01	0.03	0.05	0.91	100	300	500	9,100	-0.13
Fuel	3000				1	0	0	0	3,000	-0.4
Others	2000				1	0	0	0	2,000	0.2
Total	300,132	0.64	0.09	0.02	0.31	191,500	26,000	5,584	91,647	

Annex table 6. Conversion ratio sensitivity analysis, centrifuge system

Conversion ratio	FC-BR	DRC	SC-BR	EPC	PSR
0.21	0.513	0.652	0.687	1.363	0.284
0.23	0.486	0.615	0.651	1.360	0.285
0.25	0.464	0.585	0.621	1.358	0.286
0.27	0.445	0.560	0.595	1.356	0.287
0.29	0.429	0.538	0.573	1.354	0.288
0.31	0.415	0.519	0.553	1.353	0.288
Elasticity					
y	-0.19	-0.20	-0.19	-0.01	0.02
x	0.48	0.48	0.48	0.48	0.48
y/x	-0.40	-0.43	-0.41	-0.02	0.03

Annex table 7. Yield sensitivity analysis, centrifuge system

	FC-BR	DRC	SC-BR	8. EPC	PSR
8.1	0.447	0.562	0.595	1.354	0.287
8	0.448	0.563	0.597	1.355	0.287
7.5	0.456	0.574	0.608	1.356	0.287
7	0.464	0.585	0.621	1.358	0.286
6.5	0.474	0.599	0.635	1.360	0.286
6	0.486	0.615	0.652	1.363	0.285
5.5	0.500	0.634	0.672	1.366	0.285
5	0.517	0.657	0.696	1.370	0.284
4.5	0.538	0.687	0.725	1.374	0.283
4	0.565	0.724	0.761	1.380	0.282
3.5	0.600	0.774	0.808	1.388	0.280
3	0.648	0.843	0.870	1.399	0.278
2.5	0.719	0.947	0.957	1.416	0.276
2	0.832	1.117	1.088	1.443	0.272
1.5	1.04	1.45	1.31	1.50	0.26
Elasticity					
y	1.33	1.58	1.19	0.11	-0.08
x	-0.81	-0.81	-0.81	-0.81	-0.81
y/x	-1.63	-1.94	-1.47	-0.13	0.10

Annex table 8. Exchange rate sensitivity analysis, centrifuge system

	FC-BR	DRC	SC-BR	8. EPC	PSR
0.3	0.46	1.27	1.25	4.40	2.41
0.4	0.46	1.03	1.03	3.33	1.67
0.5	0.46	0.88	0.89	2.68	1.21
0.6	0.46	0.79	0.80	2.25	0.90
0.7	0.46	0.71	0.74	1.93	0.68
0.8	0.46	0.66	0.69	1.69	0.52
1	0.46	0.59	0.62	1.36	0.29
1.1	0.46	0.56	0.60	1.24	0.20
1.2	0.46	0.53	0.57	1.13	0.13
1.3	0.46	0.52	0.56	1.05	0.07
1.4	0.46	0.50	0.54	0.97	0.02
1.5	0.46	0.48	0.53	0.91	-0.03
1.6	0.46	0.47	0.52	0.85	-0.07
1.8	0.46	0.45	0.50	0.76	-0.13
Elasticity					
y	0	-0.359468	-0.32971	-0.492466	-0.688
x	5	5	5	5	5
y/x	0	-0.072	-0.07	-0.10	-0.14

Annex table 9. Parity price sensitivity analysis, centrifuge system

	FC-BR	DRC	SC-BR	EPC	PSR
400	0.46	3.13	2.17	11.79	4.66
500	0.46	2.27	1.81	8.26	3.63
600	0.46	1.80	1.56	6.36	2.93
700	0.46	1.51	1.38	5.17	2.42
800	0.46	1.32	1.24	4.36	2.04
1000	0.46	1.06	1.05	3.31	1.49
1200	0.46	0.91	0.92	2.67	1.13
1400	0.46	0.80	0.83	2.24	0.87
1600	0.46	0.72	0.76	1.93	0.67
1800	0.46	0.67	0.70	1.69	0.51
2000	0.46	0.62	0.66	1.51	0.39
2200	0.46	0.59	0.62	1.36	0.29
Elasticity					
y	4.5	4.5	4.5	4.5	4.5
x	0	-0.181	-0.16	-0.20	-0.21
y/x	0	-0.181	-0.16	-0.20	-0.21

Annex table 10. Conversion ratio sensitivity analysis, hydraulic system

	FC-BR	DRC	SC-BR	EPC	PSR
0.21	0.51	0.65	0.68	1.35	0.28
0.23	0.49	0.61	0.64	1.35	0.28
0.25	0.46	0.58	0.62	1.35	0.29
0.27	0.45	0.56	0.59	1.35	0.29
0.29	0.43	0.54	0.57	1.35	0.29
0.31	0.42	0.52	0.55	1.35	0.29
Elasticity					
y	-0.19	-0.20	-0.19	-0.00	0.02
x	0.48	0.48	0.48	0.48	0.48
y/x	-0.39	-0.42	-0.40	-0.01	0.04

Annex table 11. Yield sensitivity analysis, hydraulic system

	FC-BR	DRC	SC-BR	EPC	PSR
8.1	0.50	0.64	0.67	1.35	0.28
8	0.51	0.64	0.67	1.35	0.28
7.5	0.52	0.65	0.68	1.35	0.28
7	0.53	0.67	0.70	1.35	0.28
6.5	0.54	0.69	0.72	1.36	0.28
6	0.55	0.71	0.74	1.36	0.28
5.5	0.57	0.73	0.76	1.36	0.28
5	0.59	0.76	0.79	1.37	0.28
4.5	0.62	0.80	0.83	1.37	0.28
4	0.66	0.85	0.87	1.38	0.27
3.5	0.70	0.91	0.93	1.39	0.27
3	0.76	1.00	1.00	1.40	0.27
2	1.01	1.38	1.27	1.46	0.26
1	2.08	3.40	2.07	1.74	0.23
Elasticity					
y	1.00	1.16	0.90	0.08	-0.08
x	-0.88	-0.88	-0.88	-0.88	-0.88
y/x	-1.14	-1.32	-1.03	-0.09	0.09

Annex table 12. Exchange rate sensitivity analysis, hydraulic system

	FC-BR	DRC	SC-BR	EPC	PSR
0.3	0.53	1.49	1.44	4.23	2.27
0.4	0.53	1.21	1.19	3.24	1.59
0.5	0.53	1.03	1.03	2.63	1.16
0.6	0.53	0.91	0.92	2.21	0.88
0.8	0.53	0.76	0.78	1.68	0.51
1	0.53	0.67	0.70	1.35	0.28
1.2	0.53	0.61	0.64	1.13	0.13
1.4	0.53	0.56	0.60	0.98	0.02
1.6	0.53	0.53	0.57	0.86	-0.06
1.8	0.53	0.50	0.55	0.76	-0.13
Elasticity					
y	0.00	-0.66	-0.62	-0.82	-1.06
x	5.00	5.00	5.00	5.00	5.00
y/x	0.00	-0.13	-0.12	-0.16	-0.21

Annex table 13. Parity price sensitivity analysis, hydraulic system

	FC-BR	DRC	SC-BR	EPC	PSR
800	0.53	1.55	1.42	4.25	1.95
900	0.53	1.38	1.30	3.69	1.67
950	0.53	1.31	1.25	3.46	1.55
975	0.53	1.28	1.22	3.35	1.49
1000	0.53	1.25	1.20	3.26	1.44
1200	0.53	1.06	1.05	2.64	1.09
1400	0.53	0.93	0.94	2.22	0.84
1600	0.53	0.84	0.86	1.91	0.65
1800	0.53	0.77	0.79	1.68	0.50
2000	0.53	0.71	0.74	1.50	0.38
2200	0.53	0.67	0.70	1.35	0.28
y	0.00	-0.57	-0.48	-0.65	-0.80
x	1.75	1.75	1.75	1.75	1.75
y/x	0.00	-0.32484	-0.27	-0.37	-0.5