Ministry of Agriculture and Agrarian Reform

NAPC

National Agricultural Policy Center

Technical Report

Comparative Advantages Study

Frédéric Lançon

August 2005

With the support of

Project GCP/SYR/006/ITA

Food and Agriculture Organization of the United Nations

COOPERAZIONE ITALIANA

Ministry of Agriculture and Agrarian Reform

Table of Contents

1. Objectives and Scope.

This report presents the outcome of a study carried out from September 2003 to May 2004 by the National Agricultural Policy Centre with the assistance of the Food and Agricultural Organization of the United Nations under Projects GCP/SYR/006/ITA and TCP/SYR 2906(A) on the comparative advantages of selected commodity chains. The study assesses the impact of the structural changes, that are taking place in the Syrian economy since the early 90's, on the economic viability of these commodity chains. With the gradual shift from a centrally planned to a market driven economy, combined with an increasing opening to the world economy, and the corresponding increasing competition between local and foreign sources of supply for food supply, the capacity of the Syrian agriculture to remain competitive in a new policy environment is a crucial issue for policy formulation. Conversely, it is equally important for policy makers to identify commodity chains that can benefit from new market opportunities created by trade liberalization, and thus, durably increase their contribution to country's economic growth.

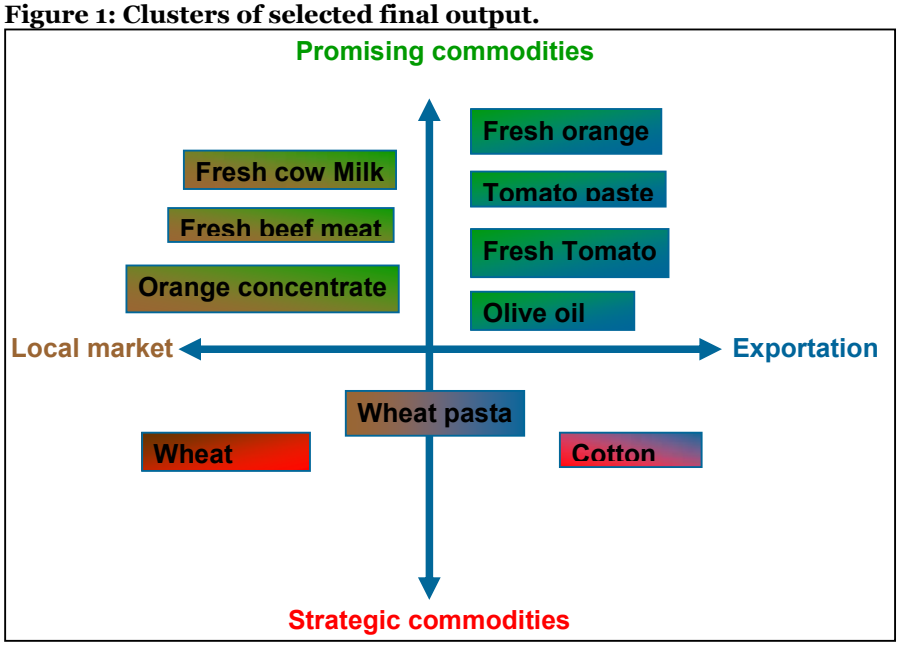
Historically food security is considered as the core function devoted to the agricultural sector to maintain the stable social environment required by the country global development strategy. Beyond the steady supply of staple food to the population at affordable price, the agricultural sector is also considered as a key element of the industrialization strategy through the provision of raw material to the agro-food industry that has acknowledged a rapid development of private investment in the past decade under the impulsion of the Law 10 framework. This downward linkage is also a key element in the expected increasing contribution of agro-food products with higher value added content to exportation and currency earning. Concurrently, agriculture is also expected to play a crucial role in counter-balancing the rural-urban increasing social and economic unequal development engendered by the economic growth, through the provision of jobs and income opportunities to a rural population that still represent the largest share of the population. Last, but not least, with the rapid extension of irrigated production that was key for agricultural output growth in the past 15 years, an optimal utilization of natural resources, and water in particular, has become a major element in the formulation of the Syrian Agricultural policies.

In the past decades, the Syrian government pursues simultaneously most of these objectives through output/input prices control and through the allocation of financial support to selected commodity chains or groups of agents such as producers or processing industries. This transfer of resources from the whole economy to agriculture was facilitated by the availability of revenue

generated by oil exports, a policy that would be less and less feasible in the mid-term with the expected decrease of oil surplus exports. Concurrently, the gradual liberalization of the Syrian economy materialized in the GGAFTA membership, the Association Agreement with EU and the application for WTO membership mean that direct public intervention in the agricultural sector would become more an exception than the normal policy option for promoting the development of the Syrian agriculture

The study assessed the comparative advantages of six major agricultural commodity systems or subsectors: cotton, wheat, olive oil, tomato, orange and cattle. The number of commodity selected was limited in order to fit with the available human resources and timeframe and to ensure that the capacity building component embedded in project can be properly implemented. With the expertise acquired during this first Comparative advantages Study (CAS) NAPC is in a position to further expand the assessment of comparative advantagess of Syrian agriculture by analyzing the additional commodities.

Figure 1: Clusters of selected final output.



Commodities have been selected by the NAPC in consultation with members of the Ministerial Price Committee in order to provide a first set of information for policy making. They have been selected on the basis of their economic importance and of their representativeness of the different functions that the agricultural sector is expected to fulfill within the Syrian Economic development. A first level of discrimination was retained between "strategic commodities" that have been the pillar or the Syrian agricultural development such as cotton, wheat and olive oil and "promising commodities" such as tomato, oranges or cattle that have acknowledged a rapid expansion in the last decade triggered by an increasing domestic demand. This initial set of raw

commodity was then further differentiated on the basis of the different final output produced by the Syrian agro-industries in order to capture downward linkages and the different targeted market (domestic market or exports). Accordingly, the study focused on the production of cotton lint, wheat flour and wheat pasta, filtered olive oil[1], packed fresh tomatoes, packed fresh oranges, Fresh Orange Juice Concentrate (FOJC), beef meat and packed fresh milk. In terms of comparative advantages analysis it is therefore possible to further differentiate the initial group of commodity on the basis or their final outputs between final output that mainly target the local or domestic market as substitute to import and final outputs that are exported. Figure 1 presents the different clusters of agro-food product retained in the study with respect to these two levels of classification.

The results presented in this report aim at assisting policy analysts in assessing policy options and substantiate priorities on a commodity basis with respect to the whole range of functions devoted to the agricultural sector, balancing between economic efficiency and social equity. The following Section 2 presents the method applied to measure the comparative advantages, the sources of information used and the process through which they were collected and analyzed. Section 3 presents the results obtained, while Section 4 addresses more specifically the policy implications of the study.

[1] In this study, "olive oil" or "filtered olive oil" are used as synonyms to refer to virgin olive oil that, according to the Syrian standard, is characterized by a level of acidity comprised between 0.8-2%, peroxide 20 meq/Kg (milligrams equivalent oxygen per kilogram), moisture below 80%, and a ratio of residuals not exceeding 0.1%. Reportedly, about 90% of total Syrian exports fall in this category. It should also be noticed that exported olive oil is normally filtrated to minimize residuals, while unfiltered olive oil is normally preferred by the domestic consumers.

2. Method and Data Analysis.

2.1. The Policy Analysis Matrix

2.1.1. The Conceptual Framework

The assessment of the comparative advantagess of a given productive system, or a subsector, producing a given good or services, encompasses a broad range of conceptual works emanating from cost-benefit analysis and the theory of international trade. 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.

In practice, the comparative advantages of a productive system are measured through the computation of several accounting entities and ratios that have been gradually developed through applied research. In the eighties these computations have been consolidated into one analytical framework, named the Policy Analysis Matrix (PAM). This analytical framework has been widely used to assist in decision making by monitoring trade liberalization process especially in European, South-East Asian and Sub-Saharan countries from the eighties onward.

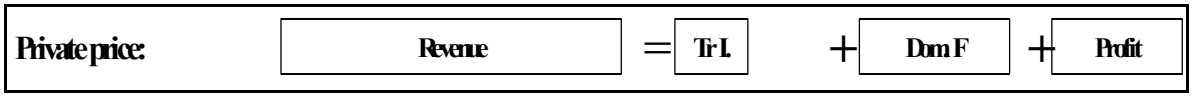
The distinction between tradable goods and domestic factors is at the core of the conceptual framework. Tradables are goods and services that can be internationally traded and include both intermediate inputs required during the process of production, and the final output of the production process. It should be emphasized that tradables include any inputs and outputs goods even if they are not actually internationally traded. The second category of costs are the domestic factors which include basically labor and capital required to produce the final output, even though, labor and capital cannot be any more considered as “pure” domestic factors in a globalized world where international migrations are frequent and where financial markets are increasingly integrated. However it is considered that the price or the value of domestic factors is mainly determined by local factor markets conditions, especially for labor.

This concept of "domestic factor" is central to the theory of the comparative advantagess as they correspond to the resources available from which goods can be produce 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. The profit generated by a selected system is measured by subtracting tradable inputs and domestic factors values from total tradable output value. Considering that the total output sale is the revenue of the system, this accounting identity can be noted as: Revenue = Tradable input + Domestics Factors + Profit.

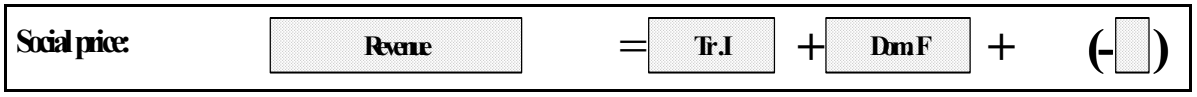
This accounting identity is computed using two price systems. The first line of the PAM contains the value for this accounting identity measured at private prices, which are the price currently used by the different agents to purchase their inputs and domestic factors and sell their outputs (Figure 2).

Figure 2: 1st row of the PAM



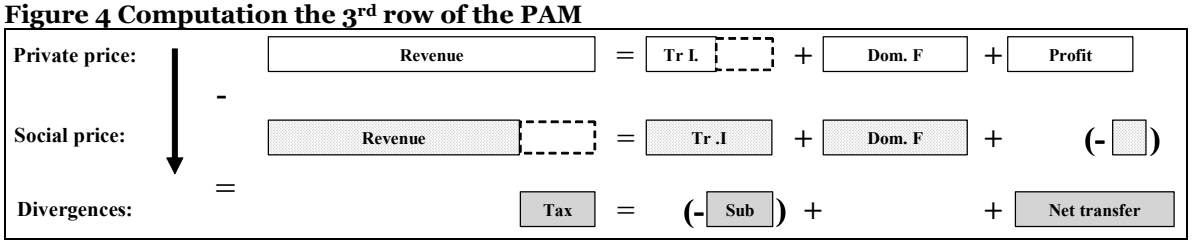
The second row of the PAM gives the value of the same identity when it is measured at social prices. Social prices are the prices that would prevail if the value of tradables (outputs and inputs) and domestic factors were not modified either by the economic policy in place (through tax, subsidy, price intervention) or by markets market imperfections (market segmentation, missing market) resulting in price levels that do not reflect the true scarcity of outputs, inputs and production factors. In short the second row of the PAM can be seen as a "benchmark" that will be used to asses the economic efficiency of the system (Figure 3).

Figure 3 2nd row of the PAM



Consequently, the third row of the PAMS obtained by subtracting the social values from the private values indicates the magnitude of the transfers induced by the current policy and market environment between the prevailing situation at private price and the optimal one at social price (Figure 4).

Figure 4 Computation the 3rd row of the PAM



It is worth noting that the concept of "transfers" is not limited to the actual release of funds to the subsector under the form of public subsidies but also include "implicit subsidies" resulting from policy measures or market imperfections that modify input or output price levels (i.e. a ban on the importation of a given output resulting in a high price on the local market for this output). Further more, these transfers can be both positive (in favor 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.

The PAM, a three-lines by three-column table, is build on the bases of these accounting identities and provide all the different accounting values needed (noted from A to L)to compute the ratios required for the analysis of the comparative advantages (Table 1).

Table 1 The Policy Analysis Matrix

	Revenues	Trad. Inp.	Domestic Fac	Profit
Market prices	A	B	C	D
Social prices	E	F	G	H
Divergences	I	J	K	L

2.1.2. Indicators of Comparative Advantages

The PAM provides straightforwardly a range of indicators for assessing the comparative advantages of a productive system. If D is positive the system generates profit under the current policy and market conditions and is said to be competitive or profitable.

Similarly, if H is positive the system is able to generate profit without benefiting from any transfer from the rest of the economic systems, or conversely transferring resources to the rest

of the economy; in this case the system is said to be economically efficient or to have a comparative advantages.

The computation of a PAM for one specific system provides only a limited set of information for policy formulation that requires choosing between different alternatives. It is, therefore, much more relevant to build a PAM for different technical combinations of inputs and domestics factors or for different category of outputs or for different period of reference to analyze changes across time.

The comparison of PAMs, developed for different technologies or different products, relies on the computation of ratios that are scale, product and time independent in order to derive meaningful comparison. Different types of ratio have been developed that provide indication on the different dimension of the comparative advantages.

Ratio of Profitability And Economic Efficiency.

- The Financial Cost Benefit ratio (FCB), is the value of the domestic factors above the value added[2] created at market price [FBC= C/ (A-B)]. If this ratio is above one, it means that the systems utilize more value of Domestic factors than it the wealth created or the Value Added, then the system is not profitable. If the FCB<1, the system is profitable; therefore the system that are the most profitable are the one that have the FCB closest to zero.

- The Domestic Cost Resources ratio (DRC) is a ratio similar to the FCB but computed at social prices. It measures the level of comparative advantagess achieved by the selected systems [DRC=G/(E-F)] . If the DRC is above one, the system has no comparative advantages, meaning that the production of one unit of output will mobilize more domestic resources than value added created. If the DRC is below one the system has a comparative advantages, and the system is said to be economically efficient.

- The Social Cost Benefit (SCB) ratio is another indicator of the level of comparative advantages. It is computed by dividing the sum of the tradable input and the domestic factor on the revenue [(F+G)/E] at social prices. It is interpreted like the DRC, i.e. a SCB above one indicate that the selected system does not have a comparative advantages. The SCB is consistent with the DRC in the sense that a given systems with a DRC >1 will necessary have a SCB> 1. The SCB has been

[2] The value added of a given commodity chains is its output value minus the value of tradable inputs used in the production process but that have been produced by others chains and should, therefore, not be counted in the additional value created by the commodity chain considered.

developed as an alternative to the DRC because it is demonstrated that for ranking the comparative advantages of different systems, the DRC is biased in favor of activities that have a relative higher content in tradable input than domestic factors (W.A. Master 2003).

Ratio of Price Distortions And Transfers.

- The Nominal Protection Coefficient (NPC) measure the level of protection for the tradable output by looking at the ratio of the revenue at private price above the revenue at social price (NPC= A/E). A NPC above one indicates that the system benefit from a protection since he get a higher revenue at private prices than he would get at social price; conversely, a NPC below one indicates that the main output in undervalued at private price resulting in a transfer of wealth from the productive system to the rest of the economy.
- The Effective Protection Coefficient ratio (EPC) compares the added value at private price to added value at social price [EPC= (A-B) / (E-F)] which give a combined index of the level of trade distortion on both tradable inputs and outputs; it provides a more accurate measure of the level of protection than the NCP. A EPC above 1 means that the selected systems is protected while an EPC below one means that the system generates less added value at market price than he would have at social prices or, in other words, that it is explicitly or implicitly taxed.
- The Equivalent Producer Subsidy (EPS) is a ratio of the total net transfer (L) above revenue at private price [EPS= L/A]. It indicates the share of income gained (or lost) for the system due to distortions induced by the current policy or market distortions. This ratio has been widely used as an instrument to measure and monitor the aggregated level of protection to a subsector during trade negotiations (W.A. Master 2003).
- The Subsidy Ratio to Producer (SRP) compares the net transfer to the revenue at social price (L/E) and provides another measure of the magnitude of the transfer induced between the selected systems and the rest of the economy. In case of positive aggregated transfer (L>0), it indicates the magnitude of the world price increase that would be required for the selected system to have a comparative advantages.

2.2. Characterization of Representative Systems

The development of a PAM begins with the characterization of representative systems for each subsector. The purpose of the desegregation of complex commodity systems into stylized commodity chains or representative systems is both methodological and analytical.

In term of methodology it is difficult to collect the data required by type of expenditure (tradable input, labor, capital) and revenue (output) under an aggregated format at the subsector of commodity system level and to carry out the analysis at this level. For assessing the comparative advantages of a whole subsector or commodity systems it is much more manageable to initially compute a PAM for each representative system identified and, then, to aggregate them into one PAM, using a scale parameter.

From an analytical point of view, agricultural commodities are being processed into different final outputs that don't have the same importance in the agro-food system (i.e. fresh tomato and tomato past) and/or agricultural trade (import substitution or exported) and, therefore, relate to different policy issues. For instance, wheat is at the same time the raw material for wheat flour production, the supply of which is at the foundation of the Syrian food security strategy, but it is also processed into pasta, which has not a strategic position and can be indifferently consumed locally or exported. Disaggregating a commodity system into representative systems also allows focusing on a specific policy issue without having to invest scarce resources in analyzing the whole system, including the components that do not present a particular stake for decision makers. For instance, the study did not consider the production of table olives because they represent only a minor outlet for olive producers. Along the same line, the study look at the comparative advantages of filtered olive oil targeting the European market as the non filtered olive oil would not match importers' requirements. Eventually, the characterization of representative system allows taking into consideration the effect of different technologies on the performance of the subsector.

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

Main outputs produced. This has been already mentioned in the introductory section of the report, the interest being focused on assessing to what extent the type of processing and the targeted market may have or not an impact on the comparative advantages of the agricultural commodity considered. Main type of outputs produced can be further discriminated on the basis of their quality. The study didn't emphasize this aspect because it would have required the mobilization of complementary technical expertise and data collection on the cost and revenue associated with different quality standard to address it properly. A distinction was made, however, between the flour produced by GECPT combining 75% of soft wheat and 25% of hard wheat and the flour produced by private mill with a higher content of soft wheat. For wheat pasta a distinction was made between low quality pasta and high quality pasta which corresponds to a different volume of wheat requirement per volume of output (1.4 kg of wheat per kg of low quality pasta against 2.5 kg of wheat in the case of high quality pasta). For the remaining main outputs selected, the analysis was made on the basis of a uniform quality derived from the average value of the different quality standards produced weighted by their share of the total volume of production.

Farm level technology. The same raw agricultural product can be produced through different techniques. While a wide set of parameters can be retained to characterize agricultural practices, this study focuses on water management technique, distinguishing between gravitational or network irrigation, well/pump based irrigation and rainfed cropping systems. The study was not in a position to assess the effect of drip irrigation for cotton production, while this improved water management technique was used to characterize a representative system for orange production. For wheat, a distinction was made between hard and soft wheat, while in the case of tomato, tomato produced in open field and greenhouses have been analyzed separately. For beef meat production, only specialized private cattle breeder (representing 40% of the total domestic supply) raising 15 to 60 animals per cycle of production were retained because this type of farm was easier to cover in term of primary data collection.

Processing technology. This criterion was particularly relevant for olive oil milling, where two processing technologies coexist to get a similar output, the old hydraulic press system and the centrifuge system that have been introduce more recently. For the other commodity systems a uniform processing technology was retained. For wheat flour a distinction was made between high and low capacity mills to take into account possible economies of scales. However, the total capacity of an entire mill can be increased by adding milling lines of similar capacity without

shifting to a different technology, mitigating the expected correlation between processing capacity and productivity per unit of input.

Institutional setting. The nature and degree of public direct intervention and involvement in the management of the commodity chains varies across commodities and the different stage of the chain (i.e. farm production, marketing, processing). State managed farm were not included in the analysis as they remain, at most, marginal for the selected commodities. Public intervention at the down stream level of the selected subsectors is also very limited with the exception of cotton and wheat. For cotton this criteria is not relevant as marketing and processing is entirely managed by CMO. Wheat flour production is, therefore, the only commodity systems where public and private operators co-exist, even though the largest share of the wheat produced is milled through the public sector (80% in 2002).

Market of reference for final output parity price. The selection of the parity price that is used to determine the value of the revenue at social price refers by definition to a specific location. For main outputs targeting the domestic market the parity price is computed on the basis of the CIF price at border plus the transportation costs to reach the point where the final output is produced in the domestic market. In the case of main output targeting foreign market the parity price should incorporate the transport cost up to the foreign markets' borders where the Syrian product will actually compete with the output produced in the targeted market and with output coming from other exporting countries and targeting the same foreign market. Therefore in the case of exported outputs, the selection of the targeted foreign market and the related shipment cost will have an impact on the value of the parity price. The GAFTA region and the European Union are the two foreign markets that have been chosen in the CAS study to determine the parity price on the basis of the major patterns for Syrian agricultural trade and current Syrian participation in trade agreements.

For cotton and wheat based product (flour and pasta), as different farm level technologies co-exist it was decided to compute a specific PAM integrating the results obtained for each different water management techniques (public network irrigation, well irrigation and rainfed in the case of wheat). This consolidation has been done on the basis of the crop area planted under each technology. For cotton, data on the planted area under public networks irrigation (37%) and under private well irrigation (63%) was provided by CMO. For the consolidated PAM for standard flour produced by the GECPT (a combination of 75% of soft wheat flour and 25% of hard wheat) the share of network irrigation, well irrigation and rainfed production was estimated to be respectively 36%, 12% and 27% for soft wheat production, while the share for

hard wheat production are 7%, 10% and 8%[3], respectively. Wheat pasta production uses exclusively hard wheat. The share used to develop the wheat pasta integrated PAM are 23% for hard wheat irrigated network, 27% for well irrigated production and 50% for rainfed.

Table 2: Weighting coefficients for Integrated Wheat Flour PAM

Type of wheat	**Network irrigation**	**Well irrigation**	**Rainfed**	**Total**
Share of production per ecology				
Soft wheat	47%	17%	36%	100%
Of irrigated area	*74 %*	*26 %*		
Durum wheat	29%	39%	32%	100%
Of irrigated area	*42 %*	*58 %*		
Share of production per ecology weighted per type of wheat mix				
Soft wheat	36%	12%	27%	75%
Durum wheat	7%	10%	8%	25%
Total	*43%*	*22%*	35%	*100%*

Table 3 presents the list of representative systems that have been identified and the different characteristics of each system. The last column indicates the policy issues that are relevant for each system.

[3] For details on the method applied to estimate cropping system area refers to Appendix A.

Table 3 : Combination of criteria for representative systems characterization**.**

N.	Systems name	Commodity	Main output	Farm level technology	Processing	Institutional	Targeted market	Main policy objective
1a	Int PAM lint cotton large ginery	Cotton	Lint cotton	all system	large ginnery	public	export EU	currency earning downward linkage
1	PAM lint cotton netw irr large			network irrigation				
2	PAM lint cotton well irr large ginery			well irrigation				
3a	Int PAM flour public large	Wheat	Standard Flour	all system	large mill	public	domestic market	food security
3	PAM flour soft wheat irrig net	Wheat (soft)		network irrigation		public		downward linkage
4	PAM flour soft wheat well irr public			well irrigation				
5	PAM flour soft wheat rainfed public			Rainfed				
6	PAM flour hard wheat netw irr	Wheat (hard)		network irrigation				
7	PAM flour hard wheat well irr			well irrigation				
8	PAM flour hard wheat rainfed			Rainfed				
9	PAM flour soft wheat netw irr public	Wheat (soft)		network irrigation	small mill	public		
10	PAM flour soft wheat netw irr	Wheat (soft)	High Qual. Flour	network irrigation	small mill	private		
11a	Int PAM pasta hard wheat netw irr law quality	Wheat (hard)	Pasta (law quality)	all system	pasta factory	private	export GAFTA	downward linkage and currency earning
11	PAM pasta hard wheat netw irr law quality			network irrigation				
12	PAM pasta hard wheat well irr law quality			well irrigation				
13	PAM pasta hard wheat rainfed law quality			rainfed				
14	PAM pasta hard wheat rainfed high		Pasta (high quality)	rainfed				

15	PAM refined olive oil centrifuge	Olive	Filtered olive oil	rainfed	centrifuge	private	export EU	currency earning return to tree plantation for land improvement
16	PAM refined olive oil hydraulic				hydraulic			
17	PAM tomato fresh open field reg	Tomato	Fresh tomato	open field	sorting/packing	private	export GAFTA market	currency earning
18	PAM tomato fresh green house reg market			green house			Export EU	
19	PAM tomato fresh green house eu			green house				
20	PAM tomato paste open field law		Tomato paste	open field	tomato paste factory	private	export GAFTA	currency earning
21	PAM orange fresh netw irr reg market	Orange	Fresh orange	network irrigated	sorting/packing	private	export GAFTA market	currency earning
22	PAM orange fresh well irr reg market			well irrigation				water saving
23	PAM orange fresh well drip			drip irrigation			Export EU	currency earning
24	PAM orange fresh netw irr europe			network irrigated				
25	PAM orange concentrate net irr		Orange oncentrate	network irrigated	Evaporation unit	private	Domestic market	downward linkage
26	PAM of meat	Livestock	Beef meat	specialized fattening farm	Butcher	private	Domestic market	income opportunity and food security
27	PAM of live animal		Live Animal	specialized fattening farm	(no processing)			
28	PAM packed milk		Fresh packed milk	small private farmers	dairy factory			

2.3. Data Sources and Analysis for Budget Development.

The computation of PAMs' indicators for each representative system requires the elaboration of a budget for the whole system where costs are classified into tradable inputs and domestic factors. This budget at the system level is build trough the combination of individual budgets developed for each economic agent involved in the production of the main final output from the farm level up to the parity point, e.g., processing unit, exporter, etc.

Individual budgets have been developed on the basis of primary data collected within the framework of the CAS study for marketing and processing operations and within the framework of Farming System Study (FSS) concurrently carried out by NAPC for the elaboration of farm budget. In total 54 agents involved in processing and/or marketing have been interviewed while 187, plots including milk farm, have been covered by the FFS team (Table 4and Table 5).

The limited size of the sample for post-harvest activities does not hampered the representativeness of the developed budgets since there is less variability in the input-output coefficients for a given processing technology compared to agricultural practices. In order to improve the reliability of the data collected at farm level, this information has been cross-checked and validated with national statistics provided by the Ministry of Agriculture, in particular to adjust yield levels.

The organization of the farm data collection on a plot basis didn't allow capturing the share of fixed costs managed at the farm level (equipments, tools) that is allocated by the farmer to the cropping of the selected commodity. For infrastructure, such as well, greenhouse, pipes, the corresponding value were taken from previous survey done by NAPC, while the utilization of agricultural machinery was treated as a "pure" variable cost, as if the farmer was paying for a service provided by another agent. This adjustment has a limited effect in terms of PAM computation since each cost item (fixed and variable cost) has to be decomposed into tradable and domestic factor component[4].

[4] In the case of a tractor owned by a farmer, the depreciated value of the tractor would be inputted as a fixed cost and further decomposed into tradable input (the value of the tractor) and domestic factor (the capital cost corresponding to the opportunity cost of the capital invested in the tractor); fuel, spare parts, and driver salary if any would be reported as variable costs and further decomposed into tradable and domestic factor components. When the tractor is used on a service basis, the value of the fee paid by the farmer to the service provider is decomposed into tradable and domestic factor component including the value and opportunity cost of the investment done by the service provider for purchasing the tractor. This option is less accurate in term of farm management analysis as we assume that the equipment are optimally used (no excess capacity) but does not change the results the perspective of a subsector analysis.

Table 4: Sample of farm level budget per cropping system.

Water source	Commodities									
	Cotton	Wheat		Olive	Orange	Tomato		Livestock		Total
		Durum	Soft			Open field	Green house	Milk	Meat	
Network flood	33	9	6		11					59
Well flood	16	14	2		6	8	4			50
Well drip	2				4					6
Well sprinkle	1	3		1						5
Rainfed		22	6	19						47
Animal								10	10	20
Total	52	48	14	20	21	8	4	10	10	187

Table 5: Sample of agents interviewed for post harvest operations**.**

Final output	Institutional status	Collector/trader	Processing	Output wholesaler	2nd processing	Total
Lint cotton	Public	Integrated in Ginning costs	2 ginneries			2
Flour	Public	Integrated in miller costs	2 mills			2
	Private	3 traders	3 mills			6
Pasta	Private		1 mill		2 pasta factories	3
Olive oil	Private		2 hydraulic units 3 centrifuge	1 big trader 2 small traders	2 filtering units	10
Fresh tomatoes	Private		3 sorting/ packaging units			3
Tomato concentrate	Private		3 factories			3
Fresh oranges	Private		4 sorting/ packaging units			4
Orange concentrate	Private		3 units of concentrate productions			3
Packed fresh milk	Private	3 collectors	2 private factory 1 public			6
Beef Meat	Private	6 traders	2 slaughter houses		4 Butchers/ meat retailers.	12
		12	31	3	8	54

Given the complexity and heterogeneity of the prevailing land tenure, the value of the usual share cropping contract was used as a proxy to input into the farm budget the opportunity cost

of land utilization. The sharecropping system mentioned in the literature[5] varies according to the crop: 15% of the value of the production for cotton, and 20% for cereals. As, no value was available for tomatoes and oranges an arbitrary value of 30% has been applied, to take into account the rather more risky nature of these crops and the longer period of land immobilization that a sharecropping contract on a perennial crop supposed.

Another issue pertaining to the imputation of fixed cost is the percentage of utilization of processing capacity for agro-industries which determine the value of fixed cost per unit of output. While for most of the selected subsectors the capacity does match the current supply, the level of capacity utilization was an issue for the private wheat mill and FOJC unit. For wheat, private millers interviewed claimed that there were not able to run their processing line optimally with the share of the wheat that is sold out of the GECPT channel (share of GECPT around 70% and 30% marketed through the private channel). While some part of the wheat purchase by the GECPT is milled by private mill on a fee basis, private millers have to rely on potential wheat import to complete as far as possible their procurements. In the framework of the CAS study, we assumed that a private mill will use 50% of its capacity a rather optimistic scenario because, otherwise, the comparison between public and private operators' performances would be biased in favor of the public sector (operating at full capacity). It would, therefore, not be possible to compare the sole effect of the two types of mill ownership on the level of economic efficiency achieved. In the case of FOJC units, we retain the very low level of capacity utilization because it results from the "structural" lack of supply of fresh oranges for industrial processing (10% of the total supply). As a matter of fact, industrial processing is residual outlet for orange farmers and traders selling oranges to juice extracting companies only when they do not match the requirement of the fresh orange market.

2.4. Decomposition of Cost Items into Tradable and Domestic Factor Component

The distinction between tradable input/output and domestic factors is at the core of the PAM concept. Once the budget as been established each cost item is decomposed across these categories. Revenue earned from the output sale is straightforwardly classified into the tradable output category.

Labor directly provided or paid for by any agents involved in the subsector is considered as a domestic factor. Family labor at the farm level was inputted into the budget using the corresponding wage rate for each agricultural operation. In order to assess the potential of labor

[5] N.FORNI, 2001, Land Tenure Systems Structural Features and Polices, Project GCP/SYR/006/ITA.

regulations on the performances of the systems analyzed, two categories of labor are distinguished.

- Qualified labor is subject to formal employment contract associated with employer's contribution to social insurance retirement schemes. Drivers, technician and engineers attending to processing equipments, clerks, manager were included into this category
- non-qualified labor, or so called casual labor such as farm workers, packer and so forth that are often paid on a daily or short term basis without any formal contract.

The decomposition becomes more complex for intermediaries inputs. For physical goods directly purchased by an agent, 5% of the purchase value was arbitrarily inputted as qualified labor, 5% as non-qualified labor and 10% as capital cost to account for the domestic resources spent to market the product up to the delivery point. The remaining 80% was considered as tradable input.

Complementary investigation and computations were made for complex intermediary input, such energy purchase, maintenance services, transport, that incorporate a more balanced share of labor, capital and tradable. Specific budgets were developed on the basis of data already collected by NAPC or additional data collected by the FFS to estimate more precisely the labor, capital and tradable content of one hour of tractor, or water pumping and so forth (c.f. Table 6 - for an illustration of the computation refers to Appendix B). This additional computations have been limited to major cost items such as mechanized farm operation, energy, while for other cost item the allocation was made on the basis of educated guess or coefficient applied in other study made in similar environment. When a selected sub-sector use as an input an output produced by another subsectors, and that this output is not international traded, the decomposition coefficient where taken from the corresponding PAM.

2.5. Budget Development at Social Price

The determination of the value at social price for each cost and income items is done by correcting the prevailing market price on the basis of the price distortions that have been identified.

2.5.1. Adjustments for tradable output and input.

Exchange rate.

The PAMs are computed in Syrian Pound, therefore the exchange rate is an important determinant of the value of tradable output and input usually quoted in US Dollar on the world

market that need to be converted in SP. For instance an exchange rate that is arbitrarily fixed by the government at a higher than the one that would prevail without public intervention (overvaluation) decrease the price of tradable input and output in their local currency equivalent. Given the rapid integration of the various currency exchange mechanisms that were still enforced in the recent years, the small gap between Syrian inflation rate and the one observed in its main trading partners countries, and the depreciation of the US Dollar against the Euro, the currency of the major Syrian trading partners outside the GAFTA region, no significan distortion was accounted for between the current exchange rate and the social exchange rate. Therefore, we applied the so called "Beirut exchange rate" (for an average rate of 51 SP to USD 1 for year 2003) to compute the parity price for the main output in Syrian Pound equivalent and no correction was made to adjust input value at social cost beyond the sole adjustment for duties and subsidy (see hereafter).

Table 6: Coefficients applied to decompose intermediate inputs into tradable and non tradable components**.**

Section/ Item	**Coefficients for decomposition**				
	Labor	Qual. Labor	Capital	Tradable	Source or rationale
Fixed cost					
Building	0,30	0,10	0,30	0,30	Educated guess
Generator	0,05	0,05	0,10	0,80	Physical good
Vehicle for handling	0,05	0,05	0,10	0,80	Physical good
Truck 5-20t	0,05	0,05	0,10	0,80	Physical good
Van	0,05	0,05	0,10	0,80	Physical good
Machine/equipment (law 10)	0,05	0,05	0,10	0,80	Physical good
Tube pipe	0,05	0,05	0,10	0,80	Physical good
Plastic sheet	0,05	0,05	0,10	0,80	Physical good
Refrigerator	0,05	0,05	0,10	0,80	Physical good
Agricultural machinery	0,05	0,05	0,10	0,80	Physical good
Well	0,12	0,00	0,48	0,40	Budget from NAPC water study
Variable cost					
Agricultural input					
Manure	0,07	0,05	0,17	0,72	Beef production PAM budget
Seeds	0,05	0,05	0,10	0,80	Opportunity cost is imported the imported input
Fertilizer and chemical	0,05	0,05	0,10	0,80	
Mechanized labor	0,33	0,05	0,17	0,45	Budget from FSS data
Animal draft	0,40	0,00	0,30	0,30	Educated guess
Wheat	0,05	0,05	0,10	0,80	Physical good
Barley	0,05	0,05	0,10	0,80	Physical good
Cake	0,46	0,03	0,14	0,37	Cotton subsector PAM
Maize	0,05	0,05	0,10	0,80	Physical good
Bran	0,26	0,06	0,15	0,54	Wheat PAM
Straw	0,27	0,05	0,14	0,55	Wheat PAM farm budget
Vitamin	0,05	0,05	0,10	0,80	Physical good
Mineral	0,05	0,05	0,10	0,80	Physical good
Soybean	0,05	0,05	0,10	0,80	Physical good
Lentils	0,05	0,05	0,10	0,80	Physical good
Rambling	0,40	0,07	0,13	0,40	Wheat budget by less TI
Veterinary services	0,00	0,40	0,10	0,50	Educated guess
Milk replacer	0,05	0,05	0,10	0,80	Physical good
Starter (calf)	0,05	0,05	0,10	0,80	Physical good
Purchased conc. Mix.	0,05	0,05	0,10	0,80	Physical good
Other feedstuff	0,05	0,05	0,10	0,80	Physical good
Other costs					
Maintenance (with spare parts)	0,10	0,10	0,20	0,60	educated guess
Spare parts alone	0,05	0,05	0,10	0,80	educated guess
Transport	0,33	0,05	0,17	0,45	Mechanized labor use as a proxy
Electricity	0,01	0,03	0,04	0,92	Data collected from electricity company
Fuel	0,05	0,10	0,10	0,75	educated guess

Section/ Item	Coefficients for decomposition				
Water	0,10	0,10	0,40	0,40	educated guess
Telecommunication	0,05	0,10	0,40	0,45	educated guess
Other	0,30	0,20	0,20	0,30	educated guess
Packing	0,05	0,05	0,10	0,80	educated guess
Milling fee	0,19	0,31	0,24	0,26	Computed from Wheat Pam
Network Irrigation cost	0,22	0,05	0,09	0,64	NAPC water study
Pump Irrigation cost	0,10	0,00	0,05	0,85	NAPC water study
Maintenance of the drip	0,10	0,10	0,20	0,60	Educated guess

Output parity price.

The estimation of the representative system's revenue at social prices use the price paid for importing the main output produced by the system without duties when the domestic market is the target, or the price received for exporting the main output to the targeted foreign market. While for cotton the world prices quoted in various markets places (Liverpool, New-York…) can be easily used as a reference or parity price, the determination of the appropriate parity price for other main output, such as flour or fresh product, is more difficult because transaction are settled on a bi-lateral basis where prices are largely determined by the quality of the product and the specific situation of the supplier and the buyer. For these cases, the determination of the parity price relies on FAOSTAT database, using average import value per ton as a reference price for the targeted area for product that are exported and the CIF unit value of import in Syria's neighboring countries for main output targeting the domestic market. After selecting the reference price an addition shipment cost is added (for main output substituting to import) or deducted (for main output targeting export market) to compute the parity price that would received the last agent of the selected system. Various sources have been used to assess these shipment costs. In some case these references have been adjusted to take into account the probable higher cost for shipping product in or out Syrian harbors that are not on the major shipping route. Additional adjustments were also made to take into account possible differences in quality standard. The reference used to compute the parity prices are listed in Table 7.

Subsidy and tax on output.

Cotton and wheat are the only raw material of the selected subsectors for which there is a direct government intervention. In 2003 each cotton farmer received a subsidy equal to 53% of the total value of the revenue get from his cotton sale. This subsidy allows CMO's ginneries to purchase their raw material at a price close to the one that would prevail on the world market[6]. This subsidy is directly paid to the farmer by the Agricultural Bank. For wheat, there is fixed

[6] It is important to note that there is no international trade for raw cotton.

price determined by the government that should be applied by GECPT to purchase wheat. On the downstream part of the systems, GECPT is also requested to sell flour at fixed price of 7200 SP per ton, well below the 14 500 SP per ton charged by the private millers. This corresponds to a subsidy to consumers. In order to account for this flour price distortion we assumed that GECPT received a transfer from the government covering the losses induced by imposed low price on its output. By convention all budget at social prices were computed without taking into account these transfers.

Table 7: References for the computation of main final output parity prices**.**

Main output	Output price			Shipment cost		
	Reference	**adjustment**	**Source**	**Reference**	**adjustment**	**Source**
Cotton lint	Cotton (COTLOOK, index 'A' 1-3 / 32, Friday		FAO (http://www.fao.org/es/esc/prices)	Transport cost to Europe		*CMO*
Flour from soft wheat	Wheat (US No.2, Soft Red Winter Wheat , Delivered US Gulf ports (Tuesday)	– Increase by 1.12 to take in account average gross margin from US milling industry. – Decrease by 0.9 as Syrian wheat flour would not be of the same quality standard	FAO (http://www.fao.org/es/esc/prices) USDA Wheat Situation And Outlook Yearbook, 2004 (http://usda.mannlib.cornell.edu/reports/erssor/field/whs-bby/whs2004.pdf)	**Transport cost US Gulf to Egypt**	Increase by 50% to take into consideration packing cost as wheat may be shipped in bags and not in bulk	*FAO food outlook(various issues) (http://www.fao.org/giews/english/fo/index.htm)*
Wheat hard	Wheat (US No.2, Hard Red Winter , Delivered US Gulf ports ord. Prot.(Tuesday)		*Adjustment and source Idem with soft wheat*	**Transport cost US Gulf to Egypt**		
Pasta	Import unit value in targeted countries		*http://apps.fao.org/*			*interview*
Olive oil	Olive oil, Physicals, naked EU origin in bulk ex tank UK virgin less than 1% of free fatty acid)		*http://ro.unctad.org/infocomm/anglais/olive/prices.htm* *http://www.public-ledger.com/*			*interview*
Fresh Tomato	Import unit value in targeted countries		*http://apps.fao.org*			*interview*

Main output	Output price			Shipment cost		
	Reference	**adjustment**	**Source**	**Reference**	**adjustment**	**Source**
Tomato paste	Idem					
Fresh orange	Idem					
FOJC	Import unit value in neighboring countries.		*http://apps.fao.org*			
Beef meat	Import unit value in neighboring countries.		*http://apps.fao.org*			*interview*
Fresh milk	Import unit value in neighboring countries for powder milk to which packing cost computed from primary data collected are added.		*http://apps.fao.org*			

Tradable input social 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 (Table 8). For physical goods directly purchased by selected subsectors' agents, the duty enforced since the last revision of the tariff was directly applied. For complex intermediate inputs, combining a more balanced share of tradable and non tradable factors, a level of duty was adjusted according to the share of each tradable used in the services provided. A specific attention was given to the adjustment of the cost of energy, a major input for the agricultural subsectors. Since the current market price in Syria (7 SP/liter) is lower than the prevailing world fuel price (estimated at 12.22 SP per liter for 2003), fuels users benefit from an implicit subsidy that amount to 43% (for additional detail on computation see Appendix C).

- Correction for subsidy on input.
- The reduced value of the fee paid by farmers benefiting from gravitational network irrigation is the only significant public subsidy noted on the input side. Based on data collected by NAPC earlier, the total cost for gravitational cost has been estimated at 8700 SP per hectare and per year while farmers pay only 3500 SP (Appendix D).

Table 8: List of the coefficients applied for deriving tradable input social price from observed prices.

Section/ Item	Duty/implicit subsidy			Section/ Item	Duty/implicit subsidy	
	Value	Reference (HS code)			Value	Reference (HS code)
Fixed cost				**Agricultural input *(continued)***		
Building	30,0%	edu guess		Soybean	1,7%	
Generator	1,7%			Lentils	1,7%	
Vehicle for handling	10,0%	8427		Veterinary	1,7%	
Truck 5-20t	14,5%	8704		Milk replace	7,0%	2309
Van	50,5%	8704		Starter (calf)	1,7%	2309
Machine/equipment (law 10)	1,7%	8704		Purchased conc.mix	1,7%	
Tube pipe	47,0%	3917		Other feedstuff	1,7%	
Plastic sheet	47,0%	3921		Vet, drugs, feet trimming	1,7%	
Refrigerator	7,0%	8418		**Other costs**		
Agricultural machinery	1,7%	8433		Maintenance (with spare parts)	20,0%	8708
Well Irrigation cost	30,0%	computed		Spare parts alone	20,0%	8708
Agricultural *input*				Transport	-18,0%	computed
Seeds	1,7%			Electricity	-13,0%	computed
Fertilizer and chemical input	1,7%	3102		Fuel	-40,0%	computed
Mechanized labor	-18,0%			telecommunication	10,0%	educated guess
Wheat	1,7%	2304		Other	10,0%	educated guess
Barley	1,7%	2305		Packing	23,5%	3923
Cake	1,7%	2306		Milling fee	22,0%	computed from Wheat Pam
Maize	1,7%	2307		Network Irrigation cost	-6,0%	computed
Bran	7,0%	2302		Pump Irrigation cost	-35,0%	computed
Vitamin	1,7%			Maintenance of the drip	-35,0%	computed
Mineral	5,0%	2512				

2.5.2. Adjustment for Domestic Factors.

Labor and capital market

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. A first adjustment is made to take into account the impact of particular official regulation on factors costs. For labor, the value of skilled labor or permanent laborer, who required the payment of various social contributions (such as pension contributions), was adjusted accordingly. As the tax on capital invested was minimal, we didn't account for any tax on capital invested. However, for domestic factors, a large share of the divergence between private and social price values might be caused by factors markets inefficiency. The assessment of these inefficiencies is a challenging task that requires specific studies. Based on expert judgment, it was 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 FMI 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 DRC to assess the comparative advantages of a representative system. Therefore, it was decided to keep the observed value in the current situation and to assess through sensitivity analysis the impact of higher interest rate on the private profitability of the system.

Social price of water.

Putting a value on the water used is even a more challenging task than valuing other natural resources like land. There are almost no references available, as actual transaction occurring on water only concern limited quantities used during the establishment of perennial crops to take care of the seedlings; these quantities are not comparable with the volume of water required for irrigated field crops.

The method applied to find a proxy for the value of the water was to compute the residual value of the water once all the cost (including land cost) have been deducted from the revenues of each system (Table 9). Then the ratio of these residual profits divided by the volume of water required by each system provide the maximum cost that can be supported by each system, otherwise the profit will be negative. This first analysis clearly show the very low efficiency of irrigated cotton and wheat systems, all of them loosing money with or without inputting the

land price, therefore we obtained a negative value of the water use indicating that the utilization of water turn actually into a negative value added. The other water-based systems (irrigated oranges and tomatoes) obtained a positive value, meaning that the major issue in terms of water used efficiency concerned wheat and cotton irrigated systems. The opportunity cost for water for these two systems correspond to the value of water forgone in the most profitable alternative crops that can be produced under equivalent conditions. Tomato being the only alternative for which we have data available, although using other major field crops (maize, barley, tobacco…) *would be a better alternative, we assumed that a less intensive tomato cropping systems than* the one surveyed in the south of Syria would be more likely in the major wheat and cropping area of the north. The water value computed for these low intensive systems is 6 SP/m^3; taking into account the higher agro-climatic and market risk attached to tomato cropping that is a perishable crop and the fact that yield is lower for tomato grown in wheat and cotton producing area than in the tomato specialized areas,, we assumed that the actual value of water foregone by a farmer who decides to crop wheat or cotton rather than tomato would be of 3 Sp/ m^3.

Table 9: Computation of the value of water

Systems	**Revenue**	**Tradable input**	**Domestic factor**	**Land rent**	**Profit**	**Water use**	**Profit per cubic**
	SP/ha	SP/ha	SP/ha	SP/ha	SP/ha	m^3/ha	SP/ m^3
Lint cotton network	76 466	34 040	48 297	10 936	-16 808	11 500	-1.46
Lint cotton well	80 474	38 958	64 068	11 517	-34 069	13 800	-2.47
Flour soft network	29 704	13 837	10 127	5 696	44	3 000	0.01
Flour soft well	36 221	22 128	19 931	6 944	-12 782	3 780	-3.38
Tomato open field	639 231	242 635	202 816	103 342	90 439	10 000	9.04
Tomato green house	1 352 745	402 840	320 784	326 875	302 246	14 000	21.59
Orange network	386 671	77 524	122 953	106 577	79 616	9 000	8.85
Orange well	386 671	117 393	120 711	106 577	41 990	9 000	4.67

3. Results

3.1. Performance the Representative Systems

The budget for each system and the PAMs derived from these data has been computed on an Excel spreadsheet (example in Appendix E). Selected PAMs' values and indicators are presented in Table 12. The three left hand columns provide the value of profit at private and social prices and the value of transfers for one ton of main output. The next three columns provide the same indicators but with reference to one hectare of cropped area (or head of animal), which might be a better reference for agricultural policy formulation, in a context where land become a scarce resources with an increasing rural population.

3.1.1. Profitability

The financial cost-benefit ratios computed for each system are below 1, indicating that for 2003, taken as a reference year by the study, **all the system were profitable with the exception of three sub-systems** which are wheat flour produced from soft wheat cropped under well irrigation systems (BC=1.11), and flour made from hard wheat cropped under network (BC=1.11) and well irrigation systems (BC=1.11). However, wheat flour production remains profitable under the current policy environment at the aggregated level when all the different cropping techniques are considered together (BC= 0.78).

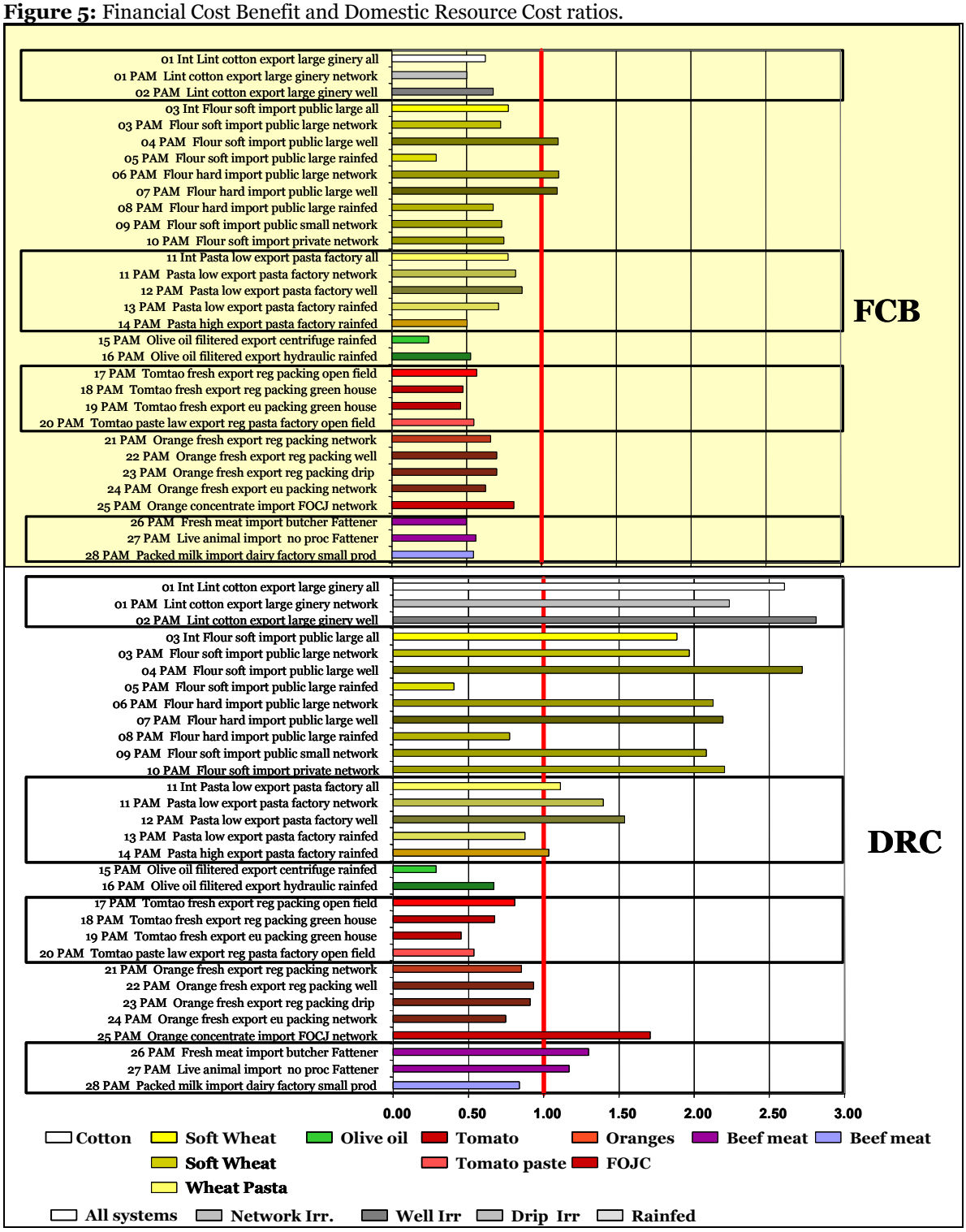
The most profitable systems are in decreasing order, filtered olive oil produced by centrifuge processing techniques (BC=0.25), fresh packed tomatoes, tomato paste and livestock products (BC around 0.50), lint cotton (0.62), fresh packed oranges (around 0.70) followed by wheat based products, wheat pasta (0.78) and wheat flour (0.78).

In absolute terms, the highest profit (profit or return?) per hectare is achieved by fresh tomato (≈ 555000 SP/ha), followed by olive oil production (≈ 120 000 SP/Ha) and fresh orange (≈ 110 000 SP/HA). Field crops, cotton and wheat achieved a much lower return per hectare compared to the tomato and perennial production systems. However, cotton still generates a profit (≈ 40000 SP/ha) that is around four times the profit per hectare obtained by wheat based systems (≈ 5000 SP/ha for wheat flour and ≈ 6500 SP/ha for wheat pasta system).

3.1.2. Economic Efficiency

Looking at the profit obtained at social price, the group achieving the highest profit at private price, i.e. tomato, fresh oranges and olive oil, maintains its profitability under the new policy and market environment, while, for the field crops' group, only systems producing pasta, hard wheat flour and some of the systems producing soft wheat maintain their profitability. In the livestock

Figure 5: Financial Cost Benefit and Domestic Resource Cost ratios.



group, only the production of packed milk is economically efficient, while meat production becomes unprofitable in both live animal and fresh meat form. Cotton production also is not profitable at social price while, the same apply to the production of FOJC.

It is worth noting that **with the exception of cotton, systems targeting foreign markets have comparative advantages, while systems targeting the domestic market do not have comparative advantages, with the exception of the milk system**. With the important exception of cotton, these results indicate that the current structure of the Syrian export flows is not significantly affected by the current Syrian agricultural policy; in other words that systems such as oranges, tomato or pasta systems which are already exporting a share of their output will do so even without any policy or market induced distortion.

In terms of return to Domestic Factors invested at social price, with a DRC ratio far above the unit, lint cotton (DRC=2.5), wheat flour (DRC=2) and FOJC (DRC= 1.7) clearly do not have a comparative advantages, while on the contrary filtered olive oil (DRC = 0.5), fresh packed tomato (DRC=0.5), tomato paste (DRC=0.5) have a strong comparative advantages. With a DRC ratio close to unit, fresh packed oranges (DRC= 0.8), packed fresh milk (DRC= 0.8), wheat pasta (DRC= 1.1) and beef meat (1.3), are in an intermediate position.

3.1.3. Transfer of Resources

The lower FCB ratios obtained compared to the DRC indicate that all systems are more profitable at private price than efficient at social price. **All the systems** have an Effective Protection Coefficient above the unit, and accordingly, **benefit on aggregate from a positive transfer of resources from the rest of the economy** with the exception of fresh tomato exported to Europe and tomato paste systems (Figure 5). The EPS, comparing the share of the revenue earned by each system as result of transfers from the rest of the economy, is highest for the cotton systems (≈ 80%) while it represent around 40% for the wheat based systems having the lowest comparative advantages and for the FOJC system. For the remaining systems, the share of revenue derived from transfers from the rest of the economy ranges from 15% to 20% of the revenues at market prices.

Looking now, at the respective share of the divergences on tradable output, input and domestic factors in the transfers of resources reported by the 3rd row of the PAM (Figure 6), **on average, the largest share of the transfer are due to price distortions on tradable output, affecting the revenue of the systems** (62% on average for all the selected systems), while distortions induced by the current policy environment and market imperfection have a more limited impact on the value of tradable input (17% on average for all the systems).