Ministry of Agriculture and Agrarian Reform

NAPC

National Agricultural Policy Center

Comparative Advantages of selected Syrian commodity chains: implications for policy formulation

Technical Note

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June 2004

with the support of the FAO

Project GCP/SYR/006/ITA

Food and Agriculture Organization of the United Nations

COOPERAZIONE ITALIANA

Ministry of Agriculture and Agrarian Reform

and

Project TCP/SYR/2906 (A)

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1 Objectives and Issues at stake.

This memo 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 on the comparative advantages of selected commodity chains. The study assess 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 state led to a market driven economy, combined with an increasing opening to the world economy, and the corresponding increasing competition between local and foreign source 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.

Within the limited period of time available to carry out the study it was not possible to cover the totality of the agricultural sector, therefore a number of commodity chains have been selected by the NAPC in consultation with members of the Ministerial Price Committee; the selected chains include cotton, wheat and olive oil for the group of strategic crops, tomato for vegetables, orange for fruit production and beef meat and cow milk production for livestock. These chains and their related final outputs under the form of processed agro-food products have been selected in order to provide a first set of indications about the capacity of the agricultural sector to continue to fulfill is expected contribution to the economic development in a new policy environment.

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 affordable staple food to the population 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 the 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. This issue is particularly important for women, their livelihood depending largely upon rural and agricultural based jobs. 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, is from now on a major element of the formulation of the Syrian Agricultural policy.

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 the agriculture was facilitated by the availability of revenue generated by oil exports, a policy option that would be less and less feasible at mid-term with the expected decrease of oil surplus exports. Concurrently the gradual liberalization of the

Syrian economy materialized in the AFTA membership, the Association Agreement with EU and the application to WTO means that direct public intervention in the agricultural sector would become more an exception than the usual policy option for promoting the development of the Syrian agriculture

The results presented in this memo aim at assisting policy maker in formulating policy options and priorities on a commodity basis that address the whole range of functions devoted to the agricultural sector with the most cost-effective compromise between economic efficiency and social equity. The following Section 2 provides a brief explanation of the method applied to measure the comparative advantage of the selected commodity chains and summarizes the various sources of information used and the process through which they have been collected and analyzed. Section 3 presents the most relevant results obtained for decision makers while the fourth and last section will address more specifically policy implications. The conclusion reviews the possible follow-up action for expanding and maximizing the usefulness of this approach to assist policy makers in decision making.

2 Methods and sources of information.

2.1 The Policy Analysis Matrix

The assessment of the comparative advantages of a given productive system encompasses a broad range of conceptual works 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 source 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), a three lines by three columns table containing all the different accounting values needed to compute the ratios required for the analysis of the comparative advantage (Table 1). This analytical framework has been widely used to assist in decision making to monitor trade liberalization process 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 includes 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 the 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 factors is central to the theory of the comparative advantages as they correspond to the resources available from which goods can be produce in the 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 from the value of the total tradable output the value of the tradable inputs and the values of the domestic factors utilized to produce the output. 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 the accounting identity measured at private prices (A B, C, D), which are the price currently used by the different agents to purchase their inputs and domestic factors and sell their outputs. The second row of the PAM gives the value of the same identity but measured at social prices. Social prices are the prices that would prevail if the value of tradables inputs and outputs and domestic factors were not modified either by the economic policy in place (tax, subsidy, price intervention) or by output, input or factors markets failures (market segmentation) which result in a distorted price system. In short the second row is a "benchmark" that will be used to asses the economic efficiency of the system. Consequently, the third row of the PAMS obtained by subtracting the social value from the private value indicates the magnitude of the divergence between the situation at private price and social price.

Table 1 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

The PAM provides straightforwardly a range of indicators for assessing the efficiency and the comparative advantages of a system. If D is positive the system generates profit under the current policy and market conditions and is competitive. Similarly, if H is positive the system is able to generate profit without benefiting from subsidy or conversely being constrained by taxes, and the system is said to have a comparative advantage. If a system is benefiting from subsidy for input use, or has to pay a lower price for casual labor than it would have if the labor market was efficient, the system can be competitive (i.e. D>0), while having no comparative advantages (i.e. H<0). The computation of a PAM for one system is of little help for decision makers who often need to choose 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 the PAMs, developed for different systems, relies on the computation of ratios that are scale, product and time independent in order to draw meaningful comparison. The following ratios will be used in this memo:

- The Financial Cost Benefit ratio (FCB), which is the value of the Domestic Factors against the difference between the Revenue minus the Tradable Input [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[1]. 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.

[1] 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.

- A similar ratio is computed at social prices, the Domestic Cost Resources ratio (DRC) which provide a measure of the level of comparative advantages achieved by the selected systems [DRC=G/(E-F)] . If the DRC is above one, the system has no comparative advantage, if it is below one the system has a comparative advantage, and the system is said to be economically efficient.

- 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 ECP above one means that the selected systems is protected while an ECP below one means that the system generates less added value at market price than he would at social prices.

- The last coefficient retained in this memo provides a synthetic index of the divergence between the efficiency of the system at private price and at social price. 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 divergence induced by the current policy or market distortions.

2.2 Construction of the PAM for representative systems

The development of a PAM begins with the selection of representative systems for each group of selected commodity. The representative systems have been differentiated firstly on the basis of the main final output, then by the type of farming technology with a particular emphasis on the type of water management technology, then by processing technique or different size of processing unit (large and small processing unit), when it applies, by the intuitional status of the marketing and processing agents (public or private) and then by the targeted market (domestic market, AFTA countries or European market). Table 2 presents the list of representative systems that have been identified and the different characteristics of each system. The last column indicates the main objective assigned to each systems with respect to agricultural policy. For certain commodity, representative systems have been selected in order to address a specific issue like the possibility to export a specific market. For instance, in the case of olive, table olives have been excluded from the analysis because they only represent a minor part of the sales. Furthermore, the analysis was limited to the filtered olive oil export to Europe, which was considered as the most challenging market.

Table 2 : Combination of criteria for representative systems characterization.

N.	Commodity	Main output	Farm level technology	Processing technology	Institutional status	Targeted market	Main policy objective
1a	Cotton	Lint cotton	all system	large ginnery	public	export EU	currency earning downward linkage
1			network irrigation				
2			well irrigation				
3a	Wheat	Standard Flour	all system	large mill	public	domestic market	food security
3	Wheat (soft)		network irrigation		public		
4			well irrigation				
5			rainfed				
6	Wheat (hard)		network irrigation				
7			well irrigation				
8			rainfed				
9	Wheat (soft)		network irrigation	small mill	public		
10		High Qual. Fl.	network irrigation		private		downward linkage
11a	Wheat (hard)	Macaroni (law quality)	all system	pasta factory	private	export AFTA	downward linkage and currency earning
11			network irrigation				
12			well irrigation				
13			rainfed				
14		Macaroni (high quality)	rainfed		private		
15	Olive	Filtered olive oil	rainfed	centrifuge	private	export EU	currency earning return to tree plantation for land improvement
16				hydraulic			
17	Tomato	Fresh tomato	open field	sorting/packing	private	export AFTA market	currency earning
18			green house				
19			green house			Export EU	
20		Tomato paste (low concentration)	open field	tomato paste factory	private	export AFTA market	currency earning downward linkage
21	Orange	Fresh orange	network irrigated	sorting/packing	private	export AFTA market	currency earning
22			well irrigation				
23			drip irrigation				water saving
24			network irrigated			Export EU	currency earning
25		Orange concentrate	network irrigated	Evaporation unit	private	Domestic market	downward linkage
26	Livestock	Beef meat	specialized fattening farm	Butcher	private	Domestic market	income opportunity and food security
27		Live Animal	specialized fattening farm				
28		Fresh packed milk	small private farmers	dairy factory			

For cotton and wheat based product (flour and pasta), as different technologies co-exist a farm level to produce raw cotton and wheat it was decides to develop 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 planted area under each technology. For cotton (system 1a), 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 (System 4a) 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%. Wheat pasta production used exclusively hard wheat and the share used to develop the wheat pasta integrated PAM (system 11a) are 23% for hard wheat irrigated network, 28% for well irrigated production and 50% for rainfed.

After the selection of the representative systems, the next step consists in computing the first line of the PAM at private price. It starts with the identification of the main agents involved in the production process from the farm to the step where the commodity is transformed into the main final output. Then a standard budget is computed each agent involved along the chains. This information has been obtained through specific surveys carried out at farm level in each agro ecological zone and interviews of private traders and processors, while the data for public agents (CMO and GECPT) has been obtained through official channels. Farm level information have been cross-check and validated with national statistics provided by the Ministry of Agriculture, in particular to adjust yield level. For budget items having both tradable and domestic factors content, like tractor hired for agricultural operation, the share of each type input was estimated on the basis of a standard budget prepared separately. Then, the standard budgets for each agent are aggregated into a unique budget for the whole representative system in main output equivalent, taking into account conversion ratio from the raw agricultural commodity to the processed main output.

The second raw of the PAM, at social prices value, is computed on the basis of secondary data. The estimation of the representative system's revenue at social prices use the price paid for importing the main output produce 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 settle 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. 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. 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. 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 country, and the depreciation of the US Dollar against the Euro, the currency of the major Syrian trading partners outside the AFTA region, no distortion was accounted for between the current exchange rate and the social exchange rate. Therefore, we applied the same exchange rate to estimate the private and the social value of the tradables.

The estimation of the social value of the domestic factors is less straight forward 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 (pension fee…), 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 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.

3 Results

3.1 Comparative advantages of the representative systems

Selected PAMs' values and indicators are presented in Table 3 . The left hand columns provide the results for one ton of main output, including the profit at private price (column 1), the value at social price (column 2), while the net transfer is listed in column 3. Columns 4 to 6 provide the same figure 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.

All the system achieved a positive profit at private price, the highest profit per hectare being achieved by tomato, followed by orange - with the exception of system 25 for Fresh Orange Juice Concentrate (FOJC) production - and olive oil production. 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 that is around four times the profit per hectare obtained by wheat based systems, where flour production get the lowest profit per hectare while past production is more profitable on a hectare basis.

Looking at the profit obtained at social price, the group who achieved the highest profit at private price, i.e. tomato, fresh oranges and olive oil, maintains its profitability under the new policy 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 live stock group only the production of packed milk is profitable at social price while meat production becomes unprofitable under live animal form or fresh meat form as well. 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 a comparative advantage, while systems targeting the domestic market do not have a comparative advantage, with the exception of the milk system. With the important exception of cotton, these results indicate that the current structure of trade flow 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.

However, the positive transfers computed for most of the systems indicate that the current policy still results in a transfer of resources from the other sectors of the economy to these commodity chains. Only three systems, fresh tomato and oranges export to European markets (system 19 and system 24) and the production of tomato paste (system 20) display a negative transfer, corresponding to a transfer of resources from the selected commodity chains to the rest of the economy, meaning that the system will get a higher profit at social price than at private price.

The impact on economic efficiency of alternative technology, targeted market or other characteristics is assessed by comparing the result of representative systems producing the same main output, with the same characteristics, but the considered one
Processing technology are less variables than farming level technology, only a few of them were retained at the system selection stage to deserve special attention. For soft flour there is almost no differences in profit level between the large capacity public mill (400 t of flour/day – system 4) and the small capacity public mill (100 t of flour per day- system 6) although the profit level is slightly higher for the larger mill at social price. This small difference can be explained by the similarity of the milling technology used in both cases, the capacity of the larger mill being actually increased by multiplying the processing lines rather than through a shift in the technology used. The same situation is observed for the olive oil production where there is almost no difference between the profit of system 15 using centrifuge oil extraction process and the profit achieved by system 16 using the older hydraulic press process. The limited impact of processing technology on the efficiency of the systems is also due to the limited share of the processing technique in the total cost of these systems as they represent on average less than 9 % of the total systems' costs. The comparison between performances of the flour produced by the GECPT' mills and the one produced by private millers does not reveal any significant differences, as both systems achieved a comparable positive profit per ton of output at private and social price.

The impact of farm level technology on the systems' performance is far more important. Water procurement technique was the factor used to differentiate systems at the farm level. For field crops in all cases systems relying on wells irrigation generate the lowest profit. System based on network irrigation acknowledges the highest profit for cotton and soft wheat, while rainfed systems have achieved the highest profit for hard wheat at private price. At social prices, rainfed and network irrigation system are able to maintain a positive profit except for network irrigated cotton production with a profit slightly below zero, while field crop relying on well irrigation display a negative profit and therefore do not have a comparative advantage. Well irrigated based systems profitability is highly constrained by the cost of pumping for irrigation which represents 39% of the total cost in the case of cotton and 25% for soft wheat production. The major component of well irrigation costs is the fuel used to operate the pump, which has a higher price on the world market, and represents one third of the deficit recorded at social price. It is worth noting that, network irrigation cost at social price take into consideration the cost of developing the scheme and have been estimated at 9000 SP per hectare, while farmers currently pay 3000O, at private price. Orange is the only other selected commodities where different irrigation techniques are concurrently applied. In this case irrigation network still generates the highest profit per ton of output followed by well irrigation and drip irrigation.

The comparison between systems producing different main outputs rely on ratios computed from the PAM's value that are presented on the right hand side of the Table 3. The picture offered by this gauge of systems' achievements is less influenced by the type of commodities considered and display high variations between commodities but also within groups of systems producing the same main output.

The lowest FCB ratios , around 0.30, or the highest return to the Domestic factors at private price are achieved by the soft wheat flour rainfed systems (05), both olive oil systems (15 and 16), the fresh tomato produce in green house (18 and 19). The largest share of the other systems has a FCB around 0.4-0.5, while seven systems display a rather low level of return to the value of Domestic Factors allocated. This last groups includes soft and hard flour production public systems (n. 04, 06, 07) and pasta production systems (n.11, and 12) that are based on well irrigation and to a lesser extent on network irrigation. The production of FOJC also shows a very high FCB ratio which is consistent with the constraint faced by this industry to get an adequate supply of raw material.

In terms of return to Domestic Factors invested at social price, olive, tomato and orange (excepted FOJC) have the lowest DRC, around 0.40, corresponding to a strong comparative advantage. Among the field crops only two systems, soft wheat and hard wheat flour production ecology fall into this category. A second group of systems having a DRC inferior to 1, around 0.80, includes pasta and packed milk production systems; while the cotton network irrigated systems having a DRC slightly above the unity (1.01) could be included in this group. The remaining systems including, FOJC, meat production and flour and cotton production systems associated with well irrigation are not able to maintain their profitability at social price and therefore have no comparative advantage. In terms of the relative economic efficiency of the systems producing the same main output it is worth noting for fresh orange production, that even though drip irrigation (system 23) generates a lower profit per ton of main output or per hectare compare to well and network irrigated systems (systems 21 and 22) its DRC is comparable to the one achieved by the two other systems that are more water intensive.

All the systems benefit from protection (EPC>1) with the exception of the fresh product export to the European markets (systems 19 and 24) and the production of tomato paste (system 20). The ratio of the EPC to the NPC can be used as an indication of the respective impact of the current policy on tradable outputs and tradable inputs prices distortions. 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, and the ratio is close to 1, while a value of the EPC/NPC far above one indicates that prices distortions are also due to the policy on tradable input (subsidy). For most of the systems, the gap between the ratio of NPC to EPC is rather small, meaning that most of the distortion between the private price and the social price situation is due to divergence on tradable outputs. In other words the current policy, inputs and factors markets' configuration has a limited influence on the production costs. As expected, the gap between the EPC and NPC is higher for lint cotton and flour systems which are the only selected systems with a public intervention on the factor side through the form of price control and subsidy.

Table 3: PAM's selected values and indicators.

N.	System	PAMs selected values						Selected ratio					
		Per ton of main output			Per hectare(or head of animal)								
		FINANCIAL PROFIT-ABILITY	SOCIAL PROFIT-ABILITY	TRANSFERS	FINANCIAL PROFIT-ABILITY	SOCIAL PROFIT-ABILITY	TRANSFERS	FCB	DRC	NPC	EPC	ESP	EPC/NPC
		(D)	(H)	(L = D-H)	(D)	(H)	(L = D-H)	C/(A-B)	G/(E-F)	A/E	(A-B)/(E-F)	(L/A)	
		1	2	3	4	5	6	7	8	9	10	11	
1a	Lint cotton export large ginery all	39 164	-11 392	50 556	48 883	-14 532	63 415	0.55	1.33	1.11	2.51	0.46	2.26
1	Lint cotton export large ginery network	48 153	-390	48 543	58 554	-474	59 028	0.44	1.01	1.11	2.30	0.44	2.07
2	Lint cotton export large ginery well	34 441	-17 619	52 060	44 084	-22 552	66 637	0.60	1.54	1.11	2.65	0.48	2.39
3a	Flour soft import public large all	4 660	732	3 927	9 028	951	8 077	0.47	0.84	0.85	1.92	0.28	2.25
3	Flour soft import public large network	5 119	2 050	3 069	14 334	5 740	8 594	0.43	0.64	0.78	1.58	0.22	2.04
4	Flour soft import public large well	1 753	-1 697	3 450	6 029	-5 839	11 868	0.78	1.41	0.78	1.96	0.25	2.52
5	Flour soft import public large rainfed	6 430	3 671	2 759	11 831	6 755	5 076	0.30	0.40	0.78	1.48	0.21	1.90
6	Flour hard import public large network	1 876	134	1 741	5 852	418	5 433	0.75	0.98	0.68	1.36	0.12	2.02
7	Flour hard import public large well	1 947	-503	2 450	6 385	-1 651	8 036	0.74	1.11	0.68	1.65	0.17	2.44
8	Flour hard import public large rainfed	6 542	4 667	1 875	15 072	10 752	4 320	0.39	0.46	0.68	1.25	0.12	1.85
9	Flour soft import public small network	5 119	1 657	3 462	14 334	4 640	9 694	0.44	0.70	0.78	1.69	0.25	2.16
10	Flour soft import private network	5 561	1 448	4 113	13 624	3 547	10 076	0.50	0.78	1.44	1.72	0.24	1.20
11a	Pasta low export pasta factory all	5 930	2 319	3 610	12 408	4 471	7 937	0.59	0.76	1.26	1.48	0.16	1.17
11	Pasta low export pasta factory network	6 202	2 138	4 064	17 748	6 119	11 629	0.65	0.82	1.26	1.44	0.15	1.14
12	Pasta low export pasta factory well	5 400	476	4 923	14 747	1 301	13 447	0.68	0.95	1.26	1.62	0.18	1.29
13	Pasta low export pasta factory rainfed	9 337	5 360	3 977	18 400	10 562	7 838	0.53	0.64	1.23	1.36	0.13	1.10
14	Pasta high export pasta factory rainfed	32 330	4 009	28 321	35 400	4 389	31 010	0.39	0.82	2.03	2.42	0.35	1.19
15	Olive oil filitered export centrifuge rainfed	97 268	77 290	19 978	181 040	120 403	60 637	0.25	0.28	1.19	1.20	0.14	1.01
16	Olive oil filitered export hydraulic rainfed	100 177	64 234	35 943	134 007	85 926	48 081	0.30	0.39	1.33	1.35	0.23	1.02
17	Tomtao fresh export reg packing open field	5 839	3 691	2 148	306 551	193 781	112 770	0.44	0.51	1.29	1.37	0.14	1.06
18	Tomtao fresh export reg packing green house	13 074	10 591	2 482	776 579	629 120	147 458	0.32	0.34	1.17	1.21	0.10	1.04
19	Tomtao fresh export eu packing green house	19 415	40 889	-21 474	733 904	1 545 607	-811 703	0.29	0.15	0.44	0.57	-0.60	1.31
20	Tomtao paste export reg pasta factory open field	15 156	23 916	-8 760	236 600	373 356	-136 756	0.40	0.28	0.82	0.76	-0.22	0.93
21	Orange fresh export reg packing network	19 706	18 922	784	193 904	186 193	7 711	0.41	0.40	1.13	1.06	0.02	0.94
22	Orange fresh export reg packing well	17 590	15 098	2 492	173 084	148 567	24 518	0.43	0.45	1.13	1.13	0.06	1.00
23	Orange fresh export reg packing drip	12 894	11 211	1 683	126 879	110 316	16 563	0.43	0.42	1.14	1.16	0.05	1.02
24	Orange fresh export eu packing network	22 622	24 493	-1 871	222 604	241 010	-18 406	0.38	0.34	0.97	0.98	-0.04	1.01
25	Orange concentrate import FOCJ network	18 984	-9 385	28 369	5 698	-2 817	8 514	0.78	1.21	1.60	1.90	0.26	1.19
26	Fresh meat import butcher Fattener	68 337	-13 800	82 137	13 667	-2 760	16 427	0.50	1.30	1.77	2.93	0.34	1.66
27	Live animal import no proc Fattener	17 541	-2 832	20 372	8 770	-1 416	10 186	0.56	1.17	1.44	2.38	0.25	1.65
28	Packed milk import dairy factory small prod	8 343	1 805	6 538	31 705	6 860	24 845	0.55	0.84	1.48	1.66	0.19	1.12

As indicated by the positive value of the transfers, the current policy framework and local tradable and factors markets conditions increase the profit perceived by all systems in comparison to the profit that would prevails at social prices. The level of support as measured by the ESP varies from 40% of the systems' revenue in the case of lint cotton and high quality pasta production, down to a range of 15% to 20% of the revenue at private prices for the other systems. Conversely, these figures indicate the magnitude of losses in revenue that would be borne by the agents of the systems if the agricultural trade was completely liberalized and support measures dismantled. There are only three systems, fresh oranges and tomatoes exports to Europe, and tomato paste exports to the regional market, which would be better off in case of full liberalization due to the high price differentials between the Syrian markets and the parity price estimated on the basis of the CIF value in the targeted market.

3.2 Sensitivity of commodity chains economic efficiency to tradable and factor prices changes.

As mentioned in section 2.2, the construction of the PAMs relies on the collection of primary and secondary data combined with a number of hypothesis made with regards to the value of parity prices for tradables outputs, macro-economic aggregates such as exchange rate, interest rate and prevailing distortions on domestic factors markets. It is therefore necessary to look at the effect on the PAM's results of the variations the prices in order to check to what extent these results are robust enough to be referred to in decisions making. Furthermore, several variables of the PAM varies across the years; this is particularly the case for yields that are affected by climatic conditions and for the world market prices of agricultural commodity and derived processed products which varies according to changes in demand and supply across the world. Thus, beyond the uncertainty of the estimation of several costs and prices inputted in the PAM it is also necessary to look at the effect of the instability of these important parameters such as yields and parity prices, the variations of which can be traced back with available statistics.

In the first step, an analysis of each PAM has been carried out, to asses the sensitivity of the different ratio computed from the PAM to the variations of important parameters - interest rate, distortion on market labor, exchange rate, parity price, yield, conversion rate in certain case - and to cost items that represent a major share (more than 5%) of the total cost of each system.

The analysis shows that across the entire set of systems, PAM's indicators are firstly sensitive to the main output price level, followed by subsidy whenever subsidy are provided, then, the conversion rate from the raw material to the processed main output, the exchange rate and the yield (Table 4). Of course, the sensitivity of each ratio is primarily determined by the category of parameters that is included in its computation. For instance the value of the DRC is extremely sensitive to the Parity price of the main output, the conversion rate from raw material to process product and to yield achieved at farm level. The EPC is determined to a large extent by the private price and the parity price of the main output and the gap between the nominal and the real exchange rate. It is important to note that the value of the indicators might be affected by the level of distortion that prevail on the labor market while, globally, the indicators are not strongly influenced by the level of interest rate inputted in the PAM at private price and social price. This is due to the larger weight of labor in the domestic total costs (37% on average) compare to the weight of capital (17% on average).

Table 4 : Index of sensitivity for the most determinant parameters*.

Parameters	Indicators			
	FCB	DRC	EPC	EPS
Main output private price	0.650		0.580	0.690
Main output social price		0.522	0.571	0.646
Subsidy	0.346		0.338	0.406
Conversion rate	0.403	0.422	0.356	0.261
Exchange rate	0.070	0.322	0.418	0.370
Yield	0.541	0.461	0.132	0.038
Distortion on the labor market	0.109	0.337	0.053	0.219

*Note: the value in the table is the average of the standard β coefficient for each parameters included as an explanatory variable in the multiple regression where the PAM's indicator is the explained value. The regression used a data set of outputs computed on the base of 200 combinations of cost values generated randomly for each PAM along a triangle shape distribution with a positive and negative variation of maximum 20 % around the initial value.

For cost items, as expected, field crops based systems using well irrigation (system 2, 4 and 12) are highly sensitive to the costs of pumping, while labor intensive systems such as the olive oil production (system 15 and 16), where labor represent around 70% of the total costs are particularly sensitive to wages and to the level of distortions prevailing on the labor market.

The conversion rate from the raw agricultural product to the processed main output has a particular impact for the cotton and FOJC systems efficiency. In the case of cotton it was noted that the conversion rate from the raw cotton to lint cotton declared by the managers of the ginneries - 320 kg of lint cotton per ton of raw cotton - is rather low compared to the ratio achieved in other cotton producing countries, like West African countries, where it is close to 400 kg of lint cotton per ton of raw cotton. In the case of orange concentrate (system 25), the processors are able to produce 60 kg of concentrate per ton of oranges while the usual quantity is around 120 kg. This law technical efficiency is caused by the varieties of orange produced in Syria which are adapted to the fresh fruits markets, the major outlet, while oranges varieties selected for juice production have a higher liquid content. For orange producers and wholesale traders, the FOJC is only a marginal market where they can sale fruits that cannot be sold on the fresh fruit markets. Therefore, in addition to the issue of orange variety, producers of FOJC are also facing a problem of under utilization of their processing capacity. The simulation made using a higher conversion ratio and a higher level of processing capacity utilization show that this system can have a comparative advantages under more favorable technical and market conditions. However, sensitivity analysis carried out for these two variables, other parameters being equals, indicates that the efficiency of this systems is much more sensitive to the conversion rate than to the level of capacity utilization. The utilization of the processing capacity is also a central issue for the private wheat millers who are facing difficulties in getting enough quantities of wheat to operate continuously their mills. However, a sensitivity analysis made with the system 10, other parameters being equal shows that for a mill with a maximum capacity of 70000 t per year, the DRC is inferior to the unit as soon as the utilized capacity reaches 1350 t, 2 % only of the maximum capacity.

The parity price of the main output and the yield achieved at farm level being the most unstable parameters among the ones that influence significantly the value of the DRC, another set of sensitivity analysis was carried for the most important systems to evaluate the probability to have a DRC below one. The variations of the parity price and yield inputted in the sensitivity analysis follow the pattern of variations observed during the last decade. For field crops, the simulations were done only on the aggregated systems combining the different type of water management techniques at farm level (system 1a, 4a and 11a). For each system, Table 5 provides the probability to obtain a DRC below 1, the minimum DRC and the maximum DRC that was obtained during the simulation.

Taking into account world cotton price and yield variations there is a probability of 69% that the cotton commodity chain has a comparative advantage, the higher DRCs obtained when each cotton system (1 and 2) was considered individually, indicate that reference year use to build the PAM (2002-2003) is rather disadvantaging compared to the general case. The lowest DRC achievable is about 0.45 and the highest is 3. This wide range of variation confirms the importance of the parity prices level and of the average yield retained for the computation, hence in the utilization of the results for decision making.

Given the uncertainty about the future trends that would prevails on the wheat markets and the absence of a clear pattern emerging from the yield level achieved in the past decades, three scenarios have been developed to assess the impact of wheat parity price and yields on the comparative advantage of standard flour system. In Scenario 1, the worst case scenario, it is assumed that world wheat price varies around an average of 116 USD per ton of soft wheat, while yield levels vary around 3.5 tons per hectare for irrigated wheat and 1.5 tons for rainfed wheat. In Scenario 2, world price remain at their lowest level, while average yield increase up to 3.8 ton per hectare for irrigated wheat and to 1.7 ton per hectare for rainfed wheat. In Scenario 3, the best case scenario, soft wheat world price average varies around 135 USD per ton and the yields remain at the level defined in Scenario 2. The DRC is highly sensitive to the scenario retained. For the worst case scenario standard flour agro-food chain has almost no comparative advantage (probability of 1% to have a DRC<0), while in the best case scenario there is a probability of 70% that the commodity chain has a comparative advantage. Two scenarios were developed for pasts production, with the same yield pattern as the one selected in Scenario 1 for standard flour production, while in the Scenario A the average parity price for pasta production is 400 USD per ton and in Scenario B the average parity price for pasta production is 500 USD per ton. In this case again the average level and the pattern of variation of the main output parity price has a significant impact on the probability that the pasta agro-food commodity chain has or not a comparative advantage; the probability that the DRC is below one increase from 10% in the worst case scenario to 82% with the best case scenario.

With regards to the other commodity chains, olive oil, fresh tomato and fresh orange production systems have a comparative advantage with any combination of parity prices and yield level observed in the past decade. For FOJC, the CIF value per ton of concentrate imports in Syria's neighboring countries display large variations during the last decade (from 800 USD t up to 1770 USD per ton) giving evidence of the high instability that prevail on this market. Under these world market conditions the FOJC commodity chains has a probability of 30% to have a comparative advantage, which corresponds to the probability to have a parity price above 1700 USD per ton.

The livestock situation is particularly contrasted with a very a low probability to have a comparative advantage for the beef meat systems and the live animal systems which cannot have comparative advantages, while the packed milk systems have a high probability to have a comparative advantage.

Table 5 : DRC sensitivity to parity price and yield instability.

N.	Systems	Scenarios	Probability for a DRC<1	Lowest DRC	Highest DRC
1a	Lint cotton export to Europe		69%	0.45	3.00
3a	Standard flour	1. Low parity price and low yield	1%	0.90	4.50
		2. Low parity price and high yield	29%	0.72	1.80
		3. High parity price and high yield	71%	0.06	1.40
11a	Low quality pasta export to AFTA	A. Low parity price	10%	0.90	9.00
		B. High parity price	82%	0.54	1.80
15	Filtered olive oil centrifuge export to Eur.		100%	0.25	0.70
17	Fresh tomato export AFTA open field		100%	0.51	0.60
18	Fresh tomato export AFTA green house		100%	0.11	0.18
20	Tomato paste export to AFTA		98%	0.13	2.10
21	Orange fresh network irrigation export to AFTA		100%	0.30	0.70
24	Orange fresh network irrigation export to Eur.		100%	0.30	0.55
25	FOCJ		30%	0.85	4.00
26	Fresh meat		3%	0.94	2.20
27	Live animal		2%	0.95	3.50
28	Packed milk		98%	0.38	1.10

With the increasing pressure on land resources induced by rural population growth and the rapid development of water intensive agricultural techniques in the past decades, natural resources management is a crucial issue for the Syrian agriculture. The study provides some preliminary insights about the interaction between land and water management and the comparative advantage of the selected agro-food commodity chains.

The complexity of the land tenure institutional setting in Syria does not allowed getting a clear estimation of the value of the opportunity cost that would have to be taken into account by a land owner who can either rent out his land to another farmer or cultivate it himself. Consequently, the PAMs have been computed without taking into account land opportunity costs in farmers' budget as it was found preferable to compare ex-post the profit achieved at private and social price by each systems and the land rent value that has been gathered by previous field investigations. Land rent value between private agents that have been recorded are ranging from 3000 SP per hectare to 5000 SP per hectare for irrigated land and around 2000 SP for rainfed land. Assuming that network irrigated land can be hired for 4000 while well irrigated field would be hired for 5000P (to take into account higher fixed costs borne by the owner to equip the plot) we inputted these value to the net private and social profit achieved to field crops (wheat and cotton). There are no reported values on land rent for perennial crops cultivation as it would require the existence of long term land rental contracts, which is very unlikely in the Syrian land tenure context. In order to compare the potential impact of land opportunity cost on high value crop such as oranges or tomatoes it was assumed that land hiring cost for these types of crops should at least have the same ratio of land hiring rate to profit at private price found for field crops that is about 36%. This percentage was applied to the profit at private prices achieved by high value crops (perennials and tomato) to obtain an estimate of the land opportunity cost (Table 6). The imputation of land opportunity cost does not change dramatically the picture in terms of comparative advantage and in terms of the relative position between the groups of commodities. All the systems continue to achieve profit at private price and their relative position in terms of profit per hectare is not affected, with the exception of system 12 (Pasta production associated to hard wheat well irrigated production) that become unprofitable at social prices. In terms of profitability per hectare at social price, the rank of the fresh tomato open field systems (n. 17) shift from the second position to the fourth one, while the relative position of hard wheat flour and fresh oranges is slightly improved.

Table 6 : Impact of land cost on systems profitability (SP/Ha)

N.	System	Land rent rate	Private prices		Social prices	
			Profit	Net return	Profit	Net return
1	Lint cotton network irrigation	4 000	58 554	54 554	-474	-4 474
2	Lint cotton well irrigation	5 000	44 084	39 084	-22 552	-27 552
3	Flour soft wheat network irrigation	4 000	14 334	10 334	5 740	1 740
4	Flour soft wheat well irrigation	5 000	6 029	1 029	-5 839	-10 839
5	Flour soft wheat rainfed	2 000	11 831	9 831	6 755	4 755
6	Flour hard wheat network irrigation	4 000	5 852	1 852	418	-3 582
7	Flour hard wheat well irrigation	5 000	6 385	1 385	-1 651	-6 651
8	Flour hard wheat rainfed	2 000	15 072	13 072	10 752	8 752
11	Pasta low quality network irrigation	4 000	17 748	13 748	6 119	2 119
12	Pasta low quality well irrigation	5 000	14 747	9 747	1 301	-3 699
17	Tomato open field	*110 358*	306 551	196 193	193 781	83 423
18	Tomato green house	*279 568*	776 579	497 010	629 120	349 552
21	Orange fresh network irrigation	*69 805*	193 904	124 099	186 193	116 388
22	Orange fresh well irrigation	*62 310*	173 084	110 774	148 567	86 256
23	Orange fresh drip irrigation	*45 677*	126 879	81 203	110 316	64 640

The irrigation costs inputted in the PAM are limited to the cost for bringing the water to the field but don't take into account the value of water itself. The valuation of water cost is a more challenging task than the determination of the opportunity cost of land, since water combines various sources of supply and as to be allocated between agricultural and non-agricultural utilization. Since there is no authoritative reference on water cost issues for the Syrian case, the relative performances of the selected systems with regards to water utilizations has been assessed on the basis of the profit generated by cubic meters consumed after deduction of the land opportunity cost. As expected, private prices profit generated by cubic meters is higher for tomatoes and oranges systems (11 SP per cubic meter) than for the strategic field crops (3 SP per cubic meter). At social price, the average value of the profit being negative for a majority of field crop systems, the average value of social profit generated per cubic meters for this group decrease down to – 1 SP, a diminution by a factor of 1.5, while the less distorted policy and market environment for fresh tomatoes and fresh oranges lead to smaller decrease (by a factor 0.37 only) with a an average value of 7 SP of social profit achieved per cubic meters. The global average value of profit per cubic meter at social price is 1.7 SP which can be used as a proxy for to estimate the opportunity cost of water utilization. However this price having been derived on the basis of the residual profit is actually higher than the likely water value at social price, because the profit expected by the farmers would have also to remunerate its own management skills. In order to asses the impact of water value imputation on the relative position of each system in terms of profit achieved per hectare at social price the price of water at social cost was assumed to be 0.5 SP per cubic meter. Actually under the current cost structure and level of distortion, the addition of water costs does not change drastically the overall picture but rather accentuate the relative position of each group of systems, commodities and ecologies. As a matter of fact, without taking into account water costs, rainfed systems already show a higher return per at social price than the irrigated systems to produce the same agricultural raw material (cf. Table 6). The sensitivity analysis carried out for different value of water confirms that the integration of water cost into the PAM would not have a major effect on the relative profitability of the systems. However it is worth noting that irrigated network cotton is the most adversely affected system by the inclusion of water price, while wheat network irrigated systems would rather improve their positions in the order of profitability. Understandably, water price inclusion would not affect the position of irrigated well systems because they already have a low profitability, due to a large extent to the cost of water pumping, while they have much more effect on irrigated work systems that pay access to water with a fixed fee without any reference to the quantity of water used

Table 7 : Water valuation

N.	Systems	Water requirements	Net profit per m3		Profit at social prices	
			Private price	Social price	Land value inputted	Land and water value inputted
		m^3/ha	SP/ m^3	SP/ m^3	SP/ha	SP/ha
1	Lint cotton network irrigation	11 500	4.74	-0.39	-4 474	-10 224
2	Lint cotton well irrigation	13 884	2.82	-1.98	-27 552	-34 494
3	Flour soft wheat network irrigation	3 000	3.44	0.58	1 740	240
4	Flour soft wheat well irrigation	3 780	0.27	-2.87	-10 839	-12 729
6	Flour hard wheat network irrigation	2 000	0.93	-1.79	-3 582	-4 582
7	Flour hard wheat well irrigation	2 598	0.53	-2.56	-6 651	-7 950
11	Pasta low quality network irrigation	2 300	5.98	0.92	2 119	969
12	Pasta low quality well irrigation	2 598	3.75	-1.42	-3 699	-4 998
17	Tomato open field	10 000	19.62	8.34	83 423	78 423
21	Orange network irrigation	15 000	8.27	7.76	116 388	108 888
22	Orange fresh well irrigation	13 521	8.19	6.38	86 256	79 496
23	Orange fresh drip irrigation	8 488	9.57	7.62	64 640	60 396
	Average:					
	All		5.68	1.72		
	Field crops		2.81	-1.19		
	Tomato and oranges		11.41	7.52		

4 Policy implications.

The current agricultural and macro-economic policies frameworks result in Producers Subsidy Ratios varying between 15% and 40% of the revenues generated by the selected commodity chains. However, it doesn't mean that these chains would not be able to compete with alternative sources of supply within a fully liberalized economic environment. Olive oil, fresh tomato and oranges already display a strong comparative advantage, while systems such has irrigated network cotton are closed to have comparative advantage Considering the variability of the world market environment, and yield level, the simulation carried out shows that, on the long term, Syria has a rather high probability to have a comparative advantage in lint cotton and standard flour production at the aggregate level, while cattle livestock systems are unlikely to be economically efficient under the current technology setting.

The largest share of the distortions is due to subsidy, price fixation and trade policy concerning tradable outputs. Beyond policy's induced distortions such as subsidy to cotton farmers and bread consumers under the form of budgetary compensation, it is also important to consider potential distortions that may prevail on the factors markets side such as the evolution of wages for casual labor and other rural based activities. Any significant increase of this price would have a negative effects on the comparative advantages of labor intensive commodity chains such has the olive oil, the cotton or the orange based ones. However for olive oil, tomatoes and fresh oranges agro-food chains increasing trends in rural wages would not be a crucial issue at short term given their high comparative advantages.

The total value of net transfers going to cotton and wheat commodity chains is estimated at 28 000 millions of SP on the basis of the cropped area allocation among irrigated network, irrigated well, and rainfed land and taking into account the distribution of soft and hard wheat to the GECPT, private mills and pasta industry. This amount corresponds roughly to 13% of the agricultural GDP in 2002. Out of this amount, 59% is going to the cotton, while 27% correspond to the transfer going to standard flour production and the remaining 13% to the private wheat based agro-food industry (high quality flour and pasta industry). In terms of ecology, as expected, the largest share of the transfer benefit to the well irrigated systems (51%) followed by the irrigated network (31%) and rainfed based systems (19%). Given the paramount importance of these two commodity chains within the Syrian agricultural sector, policy makers will have to make a difficult choice to determine the most efficient combinations of these systems that are competing for the same resources (irrigated scheme and water extracted from the aquifer). The quest for a higher economic efficiency through a cost effective utilization of budgetary resources should be, of course, balanced with other policy objectives pursued through the development of these two commodity chains: currency earning for cotton and food security for wheat. Both systems have the same probability of having a comparative advantage (around 70%), the respective share of each commodity chain in the value of the transfer can be used as a criteria to decide which commodity chains might be the primary target of reforms aiming at alleviating the budgetary burden of financial support to the agriculture and gaining in state resources allocation efficiency. In this perspective there is more potential gain in considering an improvement of the cotton commodity chains efficiency since it captures the largest share of the transfers. A reduction of the net transfers to the cotton chain could be achieved, for instance, through the improvement of the ginneries efficiency or by looking at any sources of cost saving along the commodity chains.

The high probability for the flour agro-food chain to achieve comparative advantage under the most frequent world market and agro-climatic conditions indicates that the economic viability of theses systems is globally sustainable, even within a more open and competitive Syrian wheat market. The fixation of a standard flour price charged by the GECPT mills to bakeries below the parity price of equivalent imported flour is a key element of the established food security policy. The value of the spread between the fixed price and the parity standard flour price represent only one third of the net transfer, corresponding to a subsidy to consumers. Therefore, the major share of the transfers induced by the current policy and market environment is benefiting to flour commodity chains' agents, to farmers in particular, through the fixation of a guaranteed farm gate price for wheat. The level of subsidy to consumers encompasses concerns that are at the core of the social and political stability, and clearly outbalances the sole issue of economic efficiency. The capacity of the chains to be profitable at parity price indicates that potential gain in economic efficiency can be considered by looking at the supply side and the current price systems in place.

On the supply side for cotton and wheat, a major issue in term of policy options is the unequal performances of irrigated network and well irrigated systems, generating rents in favors of the most performing system that equally benefit of price support and other policy support measures implemented across the board. The results obtained confirm the relevance of measures already taken to control the development of well irrigated agriculture that prove to be less efficient than the irrigation and the rainfed one even without inputting a value to the water utilized. A crop reallocation across the different types of irrigated systems minimizing the amount of the total net transfers, the total output being constant, shows that, for instance, that the concentration of cotton production on network irrigated systems will only reduced value of the total net transfer by 3%. An optimization of crop allocation by type of land under the current level of technology does not bring in significant advantages to reduce the total value of the transfer. If under an increasing tighten budgetary situation the reduction of the financial support to the agriculture become unavoidable, this losses would have to be compensated by technology improvement to increase the productivity of these systems.

Another option for promoting a cost-efficient utilization of the natural resource base of the Syrian agriculture is to consider crop diversification, shifting, from the less efficient systems towards the most profitable ones on well irrigated land. However, the stronger position of systems such as olive oil, fresh tomatoes and oranges and tomato paste exports should also be put in a broader perspective. It is clear that the Syrian agriculture has a comparative advantage in producing and exporting these products. It should however be noted that having a comparative advantage does not actually mean exporting. It, primarily, validate the on-going policy promoting the development of market opportunities in the context of the AFTA, of the Association Agreement with EU and of the forthcoming application to the WTO. In relation to the European market, the current assessment show that olive oil, fresh tomato or fresh oranges systems have a comparative advantage at the CIF level, but that exporting would not be profitable if we further deduct from this price the additional "cost" represented by the duty applied in the EU. In short, it is likely impossible for the Syrian exporters to durably penetrate the European market without a specific agreement on the duty to be applied. With respect to the development of Syrian agricultural exports to the EU, it is also necessary to take into consideration the competition from other Mediterranean countries that are also targeting the EU market for the same range of products. Furthermore, while being economically efficient is a necessary condition to compete on foreign market, it is certainly not sufficient with the increasing attention given to quality aspects by consumers. Therefore, the full benefit of the comparative advantage enjoyed by these systems can only be captured if appropriate measures are taken to ensure that they can meet quality standards prevailing on potential trading partners' market. The durable maximization, of the comparative advantage enjoyed by these systems also requires enlarging the number of trading partners beyond the regional and the European markets. Given the very high profitability of commodity chains like the olive oil one, shipment and marketing costs to remote trading partners can be easily absorbed without jeopardizing their profitability; thus, emerging potential market such as the Asian newly industrialized countries might be considered and explored.

Efficiency and non-efficiency objectives should also be balanced while considering the position of the livestock and FOJC systems that have been supported through non-tariff barriers to respond to the increasing domestic demand for this category of products. The results of the PAMs computations and the derived simulations indicate that these systems have no comparative advantage, which can be considered as a justification of the trade protection established to ensure the profitability of these commodity chains. On the basis of the available information on the size of the FOJC fresh beef meat markets, and assuming that the market for sterilized packed milk would represent around 10% of the urban fresh milk market, the total amount transferred to these systems would be in the range of 4 millions SP. The social cost of the current strategy for supporting the development of these commodity chains is, thus, relatively small compared to the estimated transfer in favor of strategic commodity chains such as cotton and wheat. However, the relevance of trade protection measures for cattle and FOCJ should be put in perspective with the expected positive impacts on rural population welfare and to the level of technical efficiency achieved by these systems. For instance, the lack of orange variety adapted to the production of concentrate certainly hampered the positive impact of this system on the growth of orange producing areas. This technical constraint actually increase the social cost accrued by this system because it cannot maximize the revenue generated while being protected. It is also necessary to considered to what extent the rent created by the protection is actually distributed along the whole sequence of agents along the commodity chains? In policy terms, the construction of the PAMs also allow to point out inconsistency in the current policy framework, such as the duty charged on the importation of packaging device (glass jar, sterilized container...) which represent in certain case a significant amount (10 to 17%) of the total cost of the system and which mitigated the impact of the trade barrier to established.

5 Conclusion.

The PAM provides a consistent framework to assess the impact of policy options on the comparative advantages of commodity chains; it should, however, be seen as only one element in the formulation of agricultural policy that cannot be limited to the quest for economic efficiency and to the exclusive promotion of commodity chains that have a comparative advantage and to neglect the other ones. This is not acceptable because comparative advantage can change dramatically according to the evolution of the world market situation for tradable output and input as well, or through technical changes or following an increase in the price of domestic factors. It is important to keep in mind that this is a static method and that the application of sensitivity analysis does not thoroughly overcome this limit. Furthermore the method does not take into account non-efficiency policy objectives, such as income distribution along the commodity chains and/or among different socio-economic groups involved in the production process. However, it provides a means to estimate the social cost associated with policy options pursuing non-efficiency objectives and therefore to better assess the trade-off between different policy options.

In order to improve its relevance the method should be combined with other approaches to complement the results obtained with complementary set of knowledge. For instance, the outcome of the Farming System Study concomitantly carried out by the NPAC will allows to better grasp the function of a given commodity in the whole farm and might lead to mitigate conclusions derived from a high DRC. While the present study already provides a fairly large and in-depth coverage of commodity that are representative of the diversity of the Syrian agriculture, the development of additional PAMs for other commodity, planned by the NAPC, will further add value to this initial set of PAMs. Beyond, the provision of information on the situation of other important commodities, the expansion of the coverage in terms of commodity will allow to consider a larger number of crop alternatives at farm level and for different types of land, an important element in policy formulation. A regular update of the data inputted in this first set of PAMs will allow monitoring the impact of policy and market environment changes on the performance of the selected systems.

Rather than providing a definitive answer to issues raised by decision makers, this study should be rather considered as the starting point of an iterative process between policy analysts and decision makers. In the current context, where Syrian private entrepreneurs (including farmers) have an increasing weight in the allocation of resources for agricultural production, their participation in this process is crucial.