Figure 13: Distribution of yield value for wheat subsector's efficiency simulation**.**

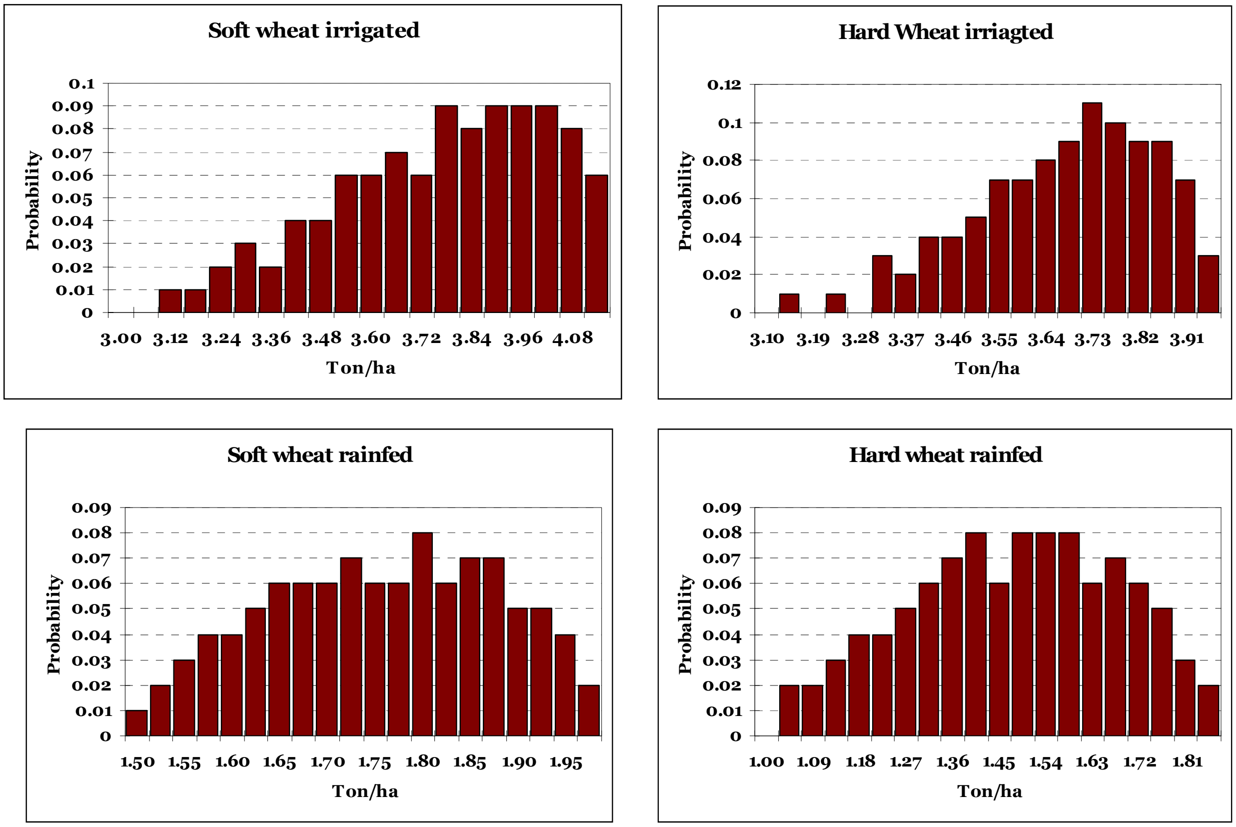
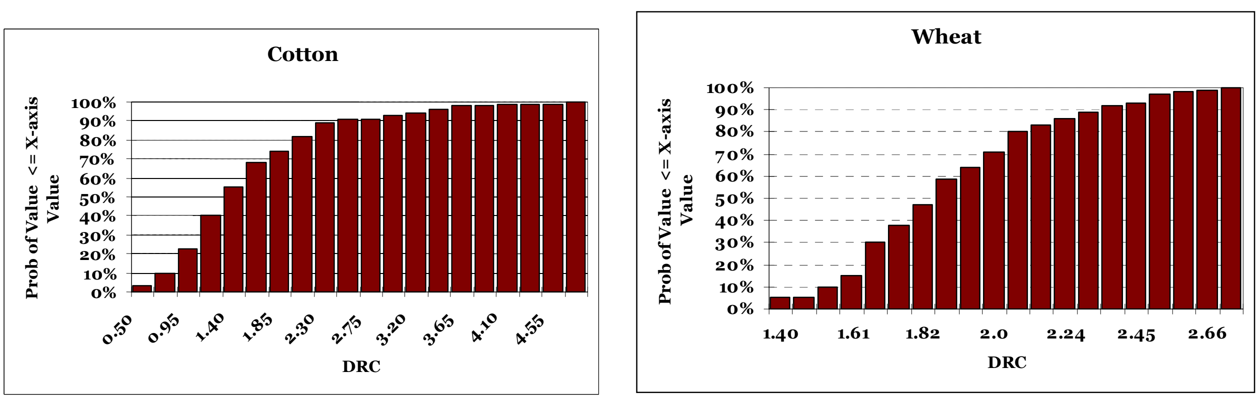


Figure 14: Cumulative distribution of the DRCs for Cotton and Wheat simulation



4. Policy Implications.

4.1. Macro-Level Issues

All the selected representative systems benefit from a net transfer of resources from the whole economy. The **major shares of the transfers of resources to the systems are caused** by:

- **Trade protection** (tariff and non-tariff barriers) that increases the price of the systems' main outputs on the domestic market compared to the price prevailing on the world market.
- **Subsidy and fixed price** for cotton and wheat.
- **Non-accountability of the opportunity cost for natural resources** (water).

On the input side the current policy generates limited distortions as the average level of custom duty applied on agricultural input importations is quite low. However it should be noted that **important tradable inputs acknowledge a significant level of distortion**:

- The fee paid for network irrigation utilization at private price represents only 1/3 of the total irrigation cost that would prevail at social cost.
- The **low price of energy** compared to the prevailing parity price for diesel on the world market price is an implicit subsidy to systems that are energy intensive.
- For agro-food industries, a **high tariff on the importation of packaging device** (can, bottle…) has an impact on the profitability of agro-food industries

For domestic factors, the established labor regulation does not have a significant impact on the systems' efficiency because limited share of labor is employed on a permanent basis, and therefore subject to these regulations. Under the current level of knowledge the study assumed that there is no imperfection on the labor market, but the evolution of the wage level for casual labor should be carefully monitored if new job opportunities arise on the domestic or regional labor market. The profitability at private prices and the efficiency at social price of commodity chains that are labor intensive relatively to the others, such as cotton and olive, could be significantly affected by such increase in casual labor costs. The lack of any mechanisms to incorporate water value at private price is another sources of transfers in favor of the water intensive systems such as cotton and wheat, that are not able to covers these costs with the value added generated.

On the overall, the results indicate that the current macro-economic policy framework is supporting the development of the selected systems.

4.2. Cotton and Wheat.

Under the current level of technology and within the current trends of world markets' prices, irrigated wheat and cotton systems have a low probability to have a comparative advantages. The simulation done with the highest level of prices recorded in the past decades indicate that the probability would be still very low for the wheat systems to have comparative advantages. The least efficient systems are the wells irrigated systems for both commodities which combine most of the distortions: subsidy, high cost in energy due to the pumping and higher volume of water used because of the lack of any restriction. Rainfed systems have a comparative advantages, but there is no rainfed cotton and they roughly represent less than 40% of the total wheat supply, and therefore have a relatively low weight for the overall efficiency of the wheat commodity chains.

The first option to enhance the comparative advantages of the **wheat and cotton** is to explore ways to improve the productivity through yield increase or costs reduction. Due to the rather high level of yield already achieved, one the **most promising ways would be to improve the water use efficiency** of the irrigated based cotton and wheat systems. Water use efficiency can be improved at short term by the dissemination of new irrigation technologies (drip irrigation) although the current study was not in a position to thoroughly assess the relative gain in economic efficiency that can be obtained by alternative irrigation technology. NAPC is finalizing a preliminary study on this subject, and this field should be further investigated. Another way that can be explored at mid, long term is the dissemination of new varieties that are less demanding in water for an equivalent yield level. The technical efficiency of the system can be also improved by looking at improvement at the post-harvest level. **For instance the ginning throughput recorded for the ginneries (32 kg of lint cotton for 100 kg of raw cotton) is rather law compared to the ginning throughput achieved in other major exporting areas (38 kg of lint cotton for 100 kg of raw cotton)**. Therefore there is an urgent need to identify and exploit source of productivity increase at the post-harvest level.

Another option to respond to the low economic efficiency of the cotton and wheat commodity chains is to **promote the utilization of the less costly systems in social terms: rainfed and network irrigation**. But as already noted, the area available for rainfed and network systems is limited which imply a net reduction in the cotton and wheat output as the national level. Furthermore, irrigated and rainfed systems do also have peculiar environmental costs that would have to be accounted for. While the wheat level of output should be in line with the food security objectives, it would be rationale at short term to limit as much as possible the allocation of the wells irrigated land to cotton which is the least efficient.

The last option to reduce the social cost induced by wheat and cotton production is to **promote crop substitution from cotton and wheat to promising crops**, at least for the systems that are the least economically efficient. However, this crops substitution strategy would be constrained by the absorption capacity of the domestic and world market for the crops that are promoted, a factor that would be crucial given the large areas involved.

In any case, **the mitigation of the high social cost induced by cotton and wheat production would likely rely on a combination of these options and would require the establishment of appropriate institutional mechanism to internalize the cost of water** in the business plan elaborated at private prices by cotton and wheat farmers, so as to incite them to shift as much as possible to less water intensive crops.

4.3. Promising Crops

Syria has certainly comparative advantages for the production of olive oil, fresh tomato and oranges but having comparative advantages does not mean being able to export. Attention should be given to:

- **Reinforcing the current policy for trade agreements to reduce barriers to entry**.
- **Quality issue**: quality and sanitary issues are becoming more and more determining, even for standard quality product to access markets.
- **Appropriate marketing strategy**. Syria traditional markets are highly competitive and might become saturated. It is important to explore new market opportunities where habits are changing with income increase

The promising crops targeting the local market to respond to changes in food habit, such as beef meat, milk or Fresh Orange Concentrated Juice (FOJC), does not show any comparative advantages except for fresh packed milk. Although, the selected representative systems do not cover the entire diversity of technology encountered at farm level (cattle breed) or the existing institutional set ups (cooperative sector was not taken into account for beef production), it is likely that the current level of technology does not allow reaching a level of productivity required to have a comparative advantages. The promotion of new systems should carefully assess the viability of technical options within the Syrian economic environment. The low efficiency of the FOJC system is mainly due to the low conversion ratio at the processing level due to the unavailability of appropriate oranges varieties. The efficiency of the system depends also on the capacity of the Syrian agriculture to supply a volume of juicy oranges adequate to allow using the processing capacity at their optimal level.

5. Conclusion.

The PAM provides a consistent framework to assess the impact of policy options on the **comparative advantagess 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 advantages and to neglect the other ones. This is not acceptable because comparative advantages can change according to the evolution of the world market for tradable outputs as well as inputs, 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 mean** to estimate the social cost associated with policy options pursuing non-efficiency objectives (such as ensuring a minimum level of income to certain categories of population) 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 NAPC with FAO support 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 systems 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. Moreover, 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.

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Appendix A. Computation of Cropped Area per Water Management Technology.

A major issue in differentiating the different cropping systems was to assess the respective share of network irrigation, well irrigation and rainfed based systems. Agricultural statistics provides either data for rainfed and irrigated area per crop without differentiating between well and network irrigation, or data for network and well irrigated at governorate level without differentiating by crops. In the case of cotton, CMO provided a set of data on cotton cropped area by irrigation technique for the major cotton producing area. For wheat the respective share of each system was deducted from existing dataset along the following rationale.

The first step was to assess the share of potential competing crop for network irrigated wheat, aside from cotton, based on agricultural statistics. Assuming that only strategic crops will have access to network irrigation, the only alternative to wheat and cotton production found was Sugar beat that mobilizes a negligible share of the available network irrigated area (Table I). Table I indicates that 82% of the irrigated crops are located in 5 governorates: Aleppo, Al-Rakka, Deir-ez-Zor, Hama and Hassakeh, therefore the respective share of soft wheat and durum wheat cropped under network or well irrigation can be estimated on the irrigated land allocation in these five provinces. Using the data provided by CMO for network and well irrigated cotton it was possible to compute the remaining areas for these two types of irrigated land that are available for soft and durum wheat. To further allocate the balance we presume that network irrigated land would be primarily allocated to, first soft wheat and second to durum wheat because the latter type is less sensitive to water stress. However, given the high prevalence of network irrigated durum wheat in the Gross Margin data collected by the Farming System Study, it was also presumed that at least 15% of irrigated durum wheat will be cropped under network irrigation conditions. The combination of these information and decision rules lead to the estimation of cropped area under network irrigation for each crop through successive iterations (Table II) with a share under network irrigation of 37%, 74% and 42% for respectively cotton, soft wheat and durum wheat.

In the case of cotton, the integrated PAM values was therefore equivalent to 37% of the PAM 01 (01 PAM lint cotton netw irr large ginery) and 63% of the PAM 02 (02 PAM lint cotton well irr large ginery).

For wheat, agricultural statistics indicate that, for the 1998 to 2001 period, rainfed production account for 37% of the total soft wheat total production and for 32% of durum wheat. To assess the share of each PAMs in the integrated wheat PAMS another adjustment was necessary to take into account the mixing of soft and durum wheat for flour making by GECPT; for one ton of wheat, the usual ratio is of 75% of soft wheat and 25% of durum wheat. Therefore the initial distribution of soft wheat and durum wheat production among network irrigated, well irrigated and rainfed was adjusted accordingly. Table I indicates the final weighting coefficients retained to build an integrated PAM for the public wheat flour commodity system. Since wheat pasta are only made from durum wheat, the coefficients retained for the integrated Wheat pasta PAMs were 31%, 37% and 32% for network irrigated, well irrigated and rainfed based system respectively.

Table I : Area per irrigation technique and major irrigated crop ('000 ha year 2001**)**

Governorate	**Total Irrigated**	**Area per irrigation system**		**Major Crop under irrigation**				**Total**	**% of total major crop area under**	**% of network irrigated area**
		Well	**Network**	**Cotton**	**Sugar beet**	**Durum**	**Soft wheat**			
Aleppo	**172**	**88**	**84**	**38**	**2**	**35**	**59**	**134**	**14%**	**159%**
Al-Rakka	**166**	**61**	**105**	**64**	**1**	**43**	**42**	**150**	**16%**	**142%**
Damascus	65	49	16	1	0	10	3	13	1%	81%
Dar'a	28	10	18	0	0	13	0	13	1%	72%
Deir-ez-Zor	**107**	**40**	**66**	**22**	**0**	**22**	**38**	**83**	**9%**	**125%**
Hama	**140**	**84**	**87**	**20**	**4**	**75**	**5**	**103**	**11%**	**118%**
Hassakeh	**431**	**340**	**90**	**105**	**0**	**151**	**131**	**387**	**41%**	**428%**
Homs	45	29	16	1	1	19	3	24	3%	148%
Idleb	46	38	8	6	1	17	6	31	3%	393%
Lattakia	35	2	33	0	0	0	0	0	0%	0%
Quneitra	4	2	3	0	0	2	0	2	0%	70%
Tartous	26	9	17	0	0	3	5	8	1%	51%
Total	1 266	752	545	257	9	389	294	948	100%	

Source: NAPC database.

TableII : Estimation of network irrigated share of total irrigated area per crop.

Governorate	Total irr	Well	Network	Cotton	Soft wheat	Durum	Total need	Tot need	Cot net	Cot well	Sof net	Sof well	Dur net	Dur well	% net cot	% net sof	% net dur
	NAPC	NAPC	NAPC	NAPC	NAPC	NAPC			CMO	CMO							
	a	b	c	d	e	f	g= d+e+f	h=g/c	i	j	k	l	m	n	o =i/d	p =k/e	q =m/f
Aleppo	172	88	84	38	59	35	132	157%	17	21	59	0	8	27	44%	101%	23%
Al-Rakka	166	61	105	64	42	43	148	141%	38	26	42	0	25	18	60%	100%	59%
Deir-ez-Zor	107	40	66	22	38	22	83	125%	16	6	38		12	10	73%	100%	54%
Hama	140	84	87	20	5	75	100	114%	13	7	5	0	69	6	64%	100%	93%
Hassakeh	431	340	90	105	131	151	387	428%	8	97	60	71	22	129	8%	46%	15%
Total	1 016	613	434	249	275	326	850	196%	92	157	204	71	136	190	**37%**	**74%**	**42%**