The governorate of Qena is considered one of the most promising governorates for agricultural investments, especially in the field of non-traditional export crops such as medicinal and aromatic plants, in addition to producing high value varieties of vegetables and fruits.

Comparative Advantage and Economic Return to Water

The Case of Vegetables and Fruits in Qena

Egypt Network for Integrated Development

Policy Brief 002

The Need

Agriculture in Egypt is faced with several natural, economic, financial, technical, and policy constraints. The design of sustainable agricultural development strategies and policies require identifying priorities for government and private sector interventions. The identification of these priorities and opportunities for sustainable agricultural development in Egypt in general and in Upper Egypt in particular depend mainly on the efficiency of utilization of domestic resources (land, water, labor and capital) in producing different agricultural products under different farm systems (old land vs. new land) and different irrigation systems (surface irrigation vs. modern irrigation) need to considered.

Assessing the economic incentives and comparative advantage of agricultural products is considered as a prerequisite for designing priority interventions and for formulating meaningful policies to achieve the declared national objectives and targets for sustainable agricultural development and food security.

ENID Approach

To reach the objective of identifying the priority crops and hence priority policies and development interventions, the analysis included the use of a Policy Analysis Matrix (PAM) model for assessing the comparative advantage and the efficiency of the crop and livestock production for 17 dominating crops in the producing districts of Qena governorate and 9 livestock enterprises. The corner stone of the PAM is the commodity budget.

As the published secondary data on the Markaz (district) level are available only in monetary units not on the basis of quantity used and unit prices and as there are no data at all for crops cultivated in newly utilized hinterland. Also, there is no data about the cost of discharging the underground water. Accordingly ENID has trained the local staff of the Department of Agriculture in Qena to carry out a survey for two agro-ecological zones: old (valley) and new lands (desert) and for two irrigation models: surface and underground water.

The survey was designed to collect primary data in the 9 districts of Qena governorates and focused on the dominating crops for the time being and the promising crops (high-value crops) in the new lands. Different questionnaires forms were designed to cope with the different agricultural practices of different crops. Also, interviews with extension specialists, engineers and other agricultural officials in the Department of Agriculture in Qena and field visits were undertaken.

Two training workshops on data collection, validation, review and analysis were carried out for the local team in the Directorate of Agriculture in Qena. Data entry for some farms was adjusted accordingly by the local team. Data collection and review was completed for crops and livestock products and for the production of the Farm Data Handbook.

Secondary data collection (i.e., water requirements under each selected irrigation system and geographical area, export and import prices, foreign trade data) was collected by the staff of the Department of Agriculture with the guidance of ENID experts. Additional information was obtained from the General Directorate for Irrigation in Qena.

This policy brief focuses on vegetables and fruits as promising high value crops in addition to selected aromatic and medicinal crops as fennel and cumin. These estimated measures for Qena provide a good proxy for comparative advantage for crops and livestock products for Upper Egypt.

Box 1: The Framework of DRC

The domestic resource cost ratio (DRC) is a measure of the total cost of production when prices are adjusted for taxes and subsidies and resources are valued in alternative uses. It compares the opportunity costs of the domestic production to the value added that it generates. The DRC analysis envisages splitting inputs and outputs into "tradable" and non-tradable".

Tradables are commodities which are imported or exported. Non-tradables are resources that do not enter international trade. All tradable commodities are valued at their world price equivalent (shadow value). This is the price at which the commodity can be exported (or imported), adjusted for transport costs and exchange rate. Inputs which are partly tradable and partly domestic (e.g. transport with tradable fuel and spare parts, but non-tradable labor) are divided into their tradable and domestic components. Non tradables are valued at their returns in alternative opportunities. They are valued at the world price.

To determine DRC, evaluation is done using social prices rather than nominal prices. The DRC is measured as the ratio of opportunity costs of domestic factors of production per unit of value added in world price. The DRC is used to show the efficiency of production alternatives in using domestic resources. The DRC indicates whether there are social costs or benefits in producing the commodity rather than importing it. A country has a comparative advantage in producing a crop when the value of DRC is between 0 and 1. When DRC is greater than 1 or less than 0 there is no comparative advantage in producing this crop.

Results

- Presently, farmers base their production decisions on the changing economic conditions and incentive structure; growing crops that yield higher financial profits and productivity.
- The analysis shows that wheat has a comparative advantage in the old valley and in the new desert land. All fruit crops cultivated in the old valley enjoy high comparative advantage. The cultivation of grapes and lemon enjoy a comparative advantage in the new desert land.
- Qena enjoys a significant comparative advantage in the production and export of high value horticultural products. This comparative advantage is based on a number of factors, including favorable agro-climatic conditions.

Figure 1: DRC for Vegetables in Desert

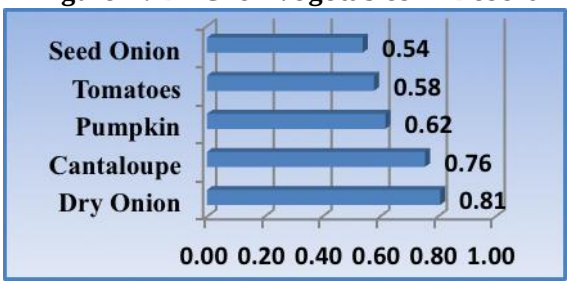
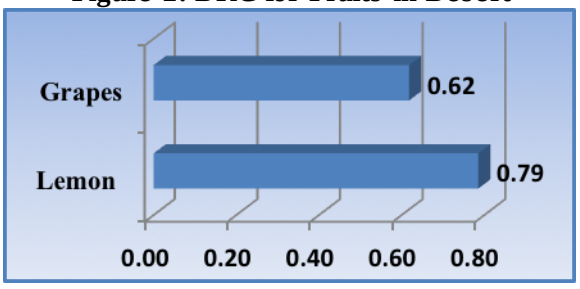


Figure 2: DRC for Fruits in Desert



- Sorghum private profitability in desert land is very low compared to other crops. Its profitability would further be eroded if economic prices were applied.

Figure 3: Economic Return to Water for Vegetables in Desert (LE/m^3)

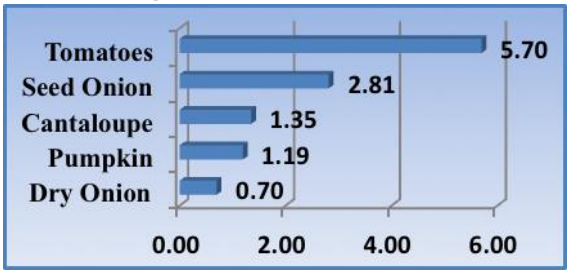
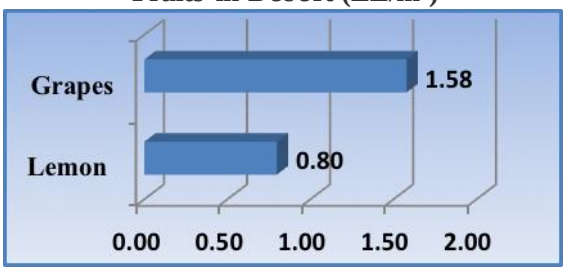


Figure 4: Economic Return to Water for Fruits in Desert (LE/m^3)



- The economic / social return to water (ERW) was estimated for different crops as well. The ERW for cereal crops in the old valley exceeds the cost of surface irrigation in all districts. The ERW for wheat in the new desert land is higher than the cost of water pumping from wells. The ERW for fruit trees is much higher than the cost of surface water irrigation (47 times for banana and 19 times for mango) in the old valley. In the new desert land, the ERW for grapes is higher than the cost of pumping water from wells.
- Return to water for surface irrigation is higher than the alternative cost of water, while it is low in the desert because of the high cost of lifting underground water.
- Furthermore, all vegetable crops in Qena have comparative advantage in both the old valley and the new desert land. The sugarcane crop enjoys a comparative advantage only in the old valley. Interestingly, the DRC estimates for the

fruit and vegetable crops are much higher than those of the sugarcane crop in the old valley. This means that sugarcane is less efficient in resource utilization than horticultural crops in Qena.

- The tomatoes crop has the highest ERW in the old land as well as in the new desert land. Meanwhile, onion's ERW is lower than the cost of pumping water in the new desert land. The ERW for the sugarcane crop is higher than the cost of surface water in the old valley and lower than the cost of pumping water from wells in the new desert land.
- It is important to differentiate between cost of water pumping, classified as purchased input, and cost of water as natural resource. The purchased cost is just the cost that the farmer is paying to get the water from the canal (in case of surface water) or from the well (in case of groundwater), while the social cost is the cost to society of using the scarce natural resource (externality cost). At present, for surface water, farmers pay a very low water charge which does not cover even the O&M cost of the waterways.

Policy Implications

- To increase small holders income and contribute to sustainable agricultural and rural development, Government and Private sector interventions need to concentrate more on high value horticulture crops that are more profitable compared to other traditional crops and use less water per volume and value of production. This is of important given projections of potential shortfalls in water availability during the coming decade.
- Having a comparative advantage in producing certain commodity is the necessary condition for economic allocation of agricultural resources, but it is not enough to have a comparative advantage in exporting the commodity (competitiveness) to the regional markets as it depends on export environment.

Table 1: Summary of Average Results in the Valley

	Crop	Net Profit/fed (LE/fed)		Return to Water (LE/m3)		DRC
		Private	Social	Private	Social	
Valley crops	**Cereals**					
	Maize	1,934	797	0.48	0.20	0.82
	Sorghum	1,884	424	0.51	0.12	0.87
	Wheat	2,387	1,583	1.25	0.83	0.72
	Vegetables					
	Tomatoes	5,252	3,316	2.63	1.66	0.61
	Dry Onion	2,990	3,137	1.07	1.12	0.51
	Pumpkin	3,225	2,334	0.92	0.67	0.53
	Garlic	5,525	4,973	1.93	1.74	0.48
	Fruits					
	I. Bananas	13,330	11,605	1.48	1.29	0.49
	Lemon	6,451	5,441	1.08	0.91	0.53
	W. Bananas	13,554	10,026	1.51	1.11	0.54
	Mango	6,857	5,041	1.14	0.84	0.58
	Grapes	6,485	7,442	1.08	1.24	0.49
	Cumin	7,655	6,282	3.06	2.51	0.36
	Sugarcane	5,644	4,911	0.50	0.44	0.67

Table 2: Summary of Average Results in the Desert

	Crop	Net Profit/fed (LE/fed)		Return to Water (LE/m3)		DRC
		Private	Social	Private	Social	
Desert crops	**Cereals**					
	Sorghum	981	-682	0.54	-0.37	1.23
	Wheat	2,246	962	2.33	1.02	0.82
	Vegetables					
	Tomatoes	7,589	5,699	7.59	5.70	0.58
	Dry Onion	2,676	975	1.91	0.70	0.81
	Cantaloupe	6,215	2,697	3.11	1.35	0.76
	Pumpkin	4,040	2,091	2.31	1.19	0.62
	Seed Onion	5,514	5,514	3.94	2.81	0.54
	Fruits					
	Lemon	5,250	2,393	1.75	0.80	0.79
	Grapes	8,388	4,459	3.00	1.58	0.62
	Funnel	3,945	2,265	3.16	1.81	0.58
	Sugarcane	4,060	-904	0.73	-0.16	1.07

- Avoid distorting market price signals for high value and promising crops. Market forces will increasing farm prices of these agricultural crops to reflect the opportunity costs (the level of world prices).
- Making regulations and quality control practices less cumbersome.
- Promote short maturing varieties, drought tolerant varieties, and modern farming techniques.
- Effective coordination between the Ministry of Agriculture and the Ministry of Water Resources and Irrigation in order to maximize the social benefits from the groundwater and surface water management programs.
- Strengthening of rural institutions involved in the provision of support and advisory services to the farming communities to enable them to harness the opportunities for improved management of surface and sub-surface water and to support the expansion of the cultivation of high value crops with emphasis on supporting Water Users Associations.
- Improve the Post Harvesting Handling Chain particularly for perishable crops so as to minimize losses and establish cold storage facilities close to production centers with adequate and efficient Farmer Marketing Information System.
- Continue promoting Land Consolidation and improve Farm Mechanization, particularly on smallholdings.
- Improve and strengthen co-operation and planning for extension programs among farmers, extension and research Departments especially for irrigation extension and post harvest services.
- Assess the comparative advantage not only for production stage, but also for different stages of the commodity system: transport, marketing and processing. A commodity may have a comparative advantage in the production stage and may not enjoy it for another stage, as inefficiencies in transport, marketing and processing may generate negative value added, i.e., the value added at the production stage will be reduced by the activity downstream.
- Further export promotion could be achieved through export market diversification, quality and grade improvement, removal of price distortions as well as
- There is an urgent need to establish Fruit Quality Standards.
- Education, research and extension in agriculture related institutes should be guided by the identified priority crops and irrigation systems of direct benefit to small farmers.
- Secure and promote future cooperation agreements and contract farming with major trading partners and linking small producer to growing local supermarkets (especially on Red Sea) and export markets.
- Promote air and sea export through a cost effective mode to enhance Upper Egypt horticulture' competitiveness in export markets.
- Encourage solar energy for lifting groundwater from wells in the Hinterlands.
- Adopt Europe GAP & HACCP certification and ensure international compliances (SPS, TBT, etc).