



POLICY BRIEF # 6

A Vision for Agriculture, 2017

Agriculture was and continues to be a vital sector in Egypt's economy, accounting for 14.6% of GDP as compared to a share in employment of 30%. These contrasting figures reflect the very low productivity of labor in the sector, and hence the fact that it is in rural Egypt where three quarters of Egypt's poor live. In rural Upper Egypt - which has the highest incidence of poverty - this region has not experienced any growth at all over the past five years. The challenge of a pro-poor vision is therefore to raise incomes from agricultural activity via mechanization and to promote off-farm employment in rural Egypt, mostly via the SME sector.

Another problem is the share of agriculture in total exports, which has also been dwindling, down to a mere 7% in 2004-5. The challenge here is to shift to high value export crops, especially in fruit, vegetables and flowers for the EU and Arab markets. Further, Agriculture consumes more than 85% of the country's water resources annually as a result of reliance on the traditional irrigation practice of flooding and a lack of cost sharing.

Cultivated land in Egypt amounts to about 6 million feddans in old lands and 3 million feddans in reclaimed lands, at an average farm size of only 1.5 feddans. It is in rural agricultural Egypt, particularly in the South where poverty is most prevalent, with over 50% of the population spending US2 or less a day. While agriculture is now a free-market, export oriented sector of the Egyptian economy — with price fixing, obligatory cropping patterns and other restrictive policies features of the past, the sector still lacks tools, such as information and technical assistance, guaranteed voluntary prices, effective cooperatives, credits and regulatory measures, which would help it become an engine of economic modernization as well as indirect employment in related sectors.

The EHDR 2005 vision for agriculture over the next decade presents a blueprint for a 25%

increase in real incomes and standards of living for the rural population, as well as greater food security for the country as a whole, Reform of agricultural practice provides a significant opportunity for employment growth through increasing cultivable land and agricultural production, introducing farm mechanization, as well as expanding exports of high valued crops, rationalizing water use in irrigation, and introducing more valuable cropping patterns. Promoting alternative animal production such as fish farming, as well as encouraging foreign direct investment to create new agricultural growth poles will help improve real incomes and raise the living standards of Egypt's rural population.

1. Growth of Agricultural Production

Agricultural output and value added grew at a rate of 2.6%-3.5% between 1982 and 2004 as a result of increases in the area of cultivated land, cropped area and the yields of several crops. Under the Egypt Human Development Report 2005 vision, however, agricultural production is set to grow at a rate of 4.1% through the optimum management and allocation of resources, including water, and reclaiming and cultivating an additional 3.4 million feddans of land.

Table 1. Targeted Areas for Reclamation (000')

Area	Feddans
Sinai	413
East Delta	648
Middle Delta	109
West Delta/West Desert	1,013
Middle Egypt	99
Upper Egypt	468
Naser Oasis	50
Halayeb and Shaletan	60
South Valley (Toshka)	540
Total	3400

Source: Ministry of Water and Irrigation

Although the main strategic food crops saw an increase in yield, production and self sufficiency

Table 2. Extra Revenues Expected as Result of Farm Mechanization

Crop Field Operations	Yield Increase/Fed	Cost	LE/FedExtra	Revenue LE/Fed
Wheat 1,2,3,6,7a	4Ardab + 4 himl	(LE1,060)	-673	1823
Rice 1,2,5,7b	0.75 tons/Fed	(LE675)	-815	1490
Maize 1,2,4,6	8 Ardab	(LE1,200)	26	1174

Note: 1=seedbed preparation, 2=land leveling, 3=wheat planting, 4=row planting, 5=rice transplanting, 6=pesticide control, 7a=harvesting of wheat, 7b=harvesting of rice.

Source: A. Haddad, Background Paper, EHDR 2005

ratios between 1982 and 2004, further improvements are planned for strategic commodities such as wheat, legumes, oils, and meat. These improvements can be achieved through vertical plant expansion (producing new higher yielding, better quality varieties, and greater animal production (particularly in small ruminants, poultry, and fish) to increase the per-capita consumption of animal protein from 18 to 24 grams/day.

2. Job Creation

Growth in agro-processing is likely to have a positive impact on the poor via its backward linkages to the agriculture sector, which is one of the largest employers of the poor in Egypt. Hence, the promotion of the agro-industrial sector can lead to much needed growth in non-agricultural activities in rural Egypt. For example, the locational advantage enjoyed by rural areas for food processing makes this sector a particularly good candidate for promotion as part of the proposed growth strategy targeted at the poor.

The growth rate of employment in rural Egypt is projected to exceed that in urban Egypt by one percentage point as a result of the EHDR vision strategy of favoring public expenditure in the South and in rural areas, and redeploying population towards new settlements.

3. Farm Mechanization

Optimal use of agricultural resources and improved efficiency requires new farming techniques including increased mechanization. Most farms currently employ outdated land preparation, planting, irrigation, insect control and harvesting techniques. The efficiency of seedbed preparation and irrigation, for example, stands at 50%. In insect control, over 75% of sprayed liquids are lost to the ground due to the use of obsolete high volume sprayers; and an estimated 28% of rice and wheat crops are lost because harvests are still largely gathered by hand. In addition to increasing productivity, preventing the loss of seeds, and savings on fuel, farm

mechanization is projected to create an estimated additional 250 thousand jobs in agriculture-related activities.

Estimated costs of reform measures: In spite of the potential efficiency savings, farm mechanization still encounters concerns due to land fragmentation, high capital costs, lack of locally manufactured (and less costly) farm machinery, and redundancy of agricultural labor. With regard land fragmentation, experience shows that technology has already successfully been used in three large projects spanning some 248 villages, covering 13,441 feddans in 9,360 farms. Concerns over capital costs can be dismissed as long as new equipment delivers increases in yield in excess of the total costs. Indeed, this may be a window of opportunity for ventures to produce such machinery locally.

Re-absorbing excess agricultural labor: Two studies carried out by the German GTZ and Egypt's Academy of Science and Technology in 1991 and 1996 suggested that increased farm mechanization could actually create jobs in the manufacturing, service and maintenance sectors. Manufacturing can be encouraged via Egypt's Industrial Modernization Program while the service and maintenance industries will automatically expand as a result of the on-going process of rapid growth of off-farm activities in rural Egypt. Indeed, increased agricultural productivity, alongside job creation in non-farm activities including agro industries, are seen as a key means of reducing poverty in Egypt.

4. Rationalizing the Use of Water in Agriculture

Sustainable growth in agriculture relies on the use of the limited resource of water in the most effective and efficient way. At present, flood irrigation is used over 70% of Egypt's cultivated land, but this method wastes about 80% of the water used. Poor water management and high water consuming cropping patterns are also a contributing factor to wastage; in new desert



lands especially, conservation methods such as drip and sprinkle systems are recommended yet not universally used.

Several practices can help conserve water:

- Shifting from flood to drip and sprinkle irrigation will save water. Many farmers have returned to flood irrigation, for no better reason than clogged sprinklers and lack of support or training in how to operate and repair the new systems. Proper support and guidance will expand the use of hydroponics.
- Cropping patterns can be adjusted to reduce the acreage of high water-consuming crops, such as rice and sugar cane. For example, the Ministry of Public Works and Water Resources' water conservation plan aims to save about 1.5 billion cubic meters of water annually by substituting sugar cane with beets and reducing the area of rice growth from 1.3 million feddans to 950 thousand feddans. But, financial, technical support and guidance will be needed to persuade farmers of the benefits of these proposals.
- Similar methods should be used when encouraging farmers to turn to faster-growing and lesser water-intensive varieties of crops, such as the various new varieties of rice which require 6,000 m³ of water/feddans compared to traditional varieties which require 9,000 m³/feddans.
- Programs to connect wells by canal or to create water user associations with the power to apply measures to manage water demand could raise the efficiency of the use of water significantly
- Recycling of water will help to rationalize water use, although it should be considered that the reuse of drainage water (from agriculture, industry, and sewage) and the reduction in drainage flow to the sea have limitations. Excessive reuse of drainage water increases soil salinity and eventually reduces crop productivity. Also, wastewater requires costly chemical treatment (around LE 45–LE 60 per cubic meter) to purify it to acceptable standards and avoid health hazards. Reducing the flow of water to the sea would carry the risk of seawater intruding into and threatening productive land in the Nile Delta.

5. Introducing Alternative Cropping Patterns

Taking into account the physical (land, labor, and water) as well as the structural (crop duration matrix) constraints facing the agricultural sector, an alternative cropping pattern has been formulated using the Non-Linear Model. Under the actual cropping pattern used in Egypt in 2003, an area of around 14.47 million feddans was cultivated at a cropping intensity of 1.8. However the proposed new cropping pattern aims to increase the gross margin, reduce uncertainties, rationalize the use of water, increase self sufficiency ratios in certain strategic crops, and reduce a rice cultivation to a maximum area of one million feddans, 285 thousand feddans of sugar, and a minimum of 500 thousand feddans of cotton. This cropping pattern has several advantages, the most important of which are savings of about 4 billion m³ of water and the more efficient use of fertilizers and labor.

Introducing alternative cropping patterns will also help promote exports of those agricultural commodities where Egypt already enjoys comparative and competitive advantages, for example in cotton, fruit and vegetables, medicinal and aromatic plants and cut flowers. According to the proposal, it is expected that Egypt's agricultural exports will grow by an average of 20% per year, up from about \$1 billion to some \$5 billion per year. The EHDR 2005 proposes that:

- The cultivated area by 2017 should be 3.4 million feddans greater (the new reclaimed area) than the 2003 cropping patterns, that is, 11.6 million feddans.
- The 2017 cropping patterns could create about 1.7 million new jobs in agriculture and related activities (around 2 feddans are needed to create one job)
- The proposed cropping pattern is also more efficient because of its savings in use of water, fertilizers and labor;
- Cultivation of strategic food crops such as wheat, fava beans, lentils, and oils should become higher while those of clover, sugar cane, rice and cotton lessened.

It is expected that farmers will resist changing some of their age-old practices in terms of both the use of flood irrigation, and giving up the cultivation of some traditional crops such as rice and sugar cane. The Ministries of Agriculture and Water Resources will therefore have to use

appropriate incentives to encourage water conservation on a location-by-location basis. For example, The latter's water conservation plan aims to save about 1.5 billion cubic meters of water annually by substituting sugar cane with beets and reducing rice cultivation by 350 thousand feddans.. Financial incentives will need to be designed for each location, together with extension services to introduce new and especially, export-oriented crops. In the case of sugar cane - which is a key cash crop in Upper Egypt - the shift to off season grapes and other high valued horticulture is a case in point where the estimated return from the shift is enormous, and has been started on a small-scale with rich farmers who have the capital and the marketing expertise.

6. The Advantages of Fish Farming

Fish farms contribute about 50% of Egypt's total fish production, using an 'extensive' (and unsustainable) system whereby — according to the law on irrigation farms— fish are to be fed from agricultural drainage water, so that measures guaranteeing the purity of this water must be strictly enforced to keep them from being poisoned. Every 1kg of fish produced requires a 2.3 m² area and consumes 5.5 m³ of water at maximum efficiency. As a result, apart from the fact that Egypt loses 2.2 Bm³ of water annually as evaporation from the current 220,000 feddans of fish farms, there is also the question of increased pollution.

The semi-intensive system is an alternative, which includes different types of farming:

- *The semi-closed system.* In this system, water carrying capacity amounts to 50 kg/m³ of water, where water losses are almost nil. Here energy can be substituted for water and land, where each kg of fish requires about 5 kw.h. instead of 2.3 m² of land and 5.5 m³ of water. A 400 m² farm can produce 40 tons annually, equivalent to the production of 20-40 feddans of the current system. For this system to work, a model farm with a training facility in each governorate should be set up. At the same time, a credit line has to be established so that fish farmers using the extensive system have the means to turn to semi-closed ones..

- *The race-way system.* In this system, fish could be produced around waterways and Lake Nasser. The target locations are shoreline areas where geographical micro-sites are appropriate. The costs involved in this system are less than those of the semi-closed technique. International experts need to be consulted and a feasibility study carried out first.
- *Cages.* These represent 3% of the total world fish production of freshwater fish and 40% of marinerwater fish. In the U.S. about 130 fish types are produced with this technology. The advantages of this system are that the large areas of sea and coastlines can be used. Normal water movements in these areas supply the fish with oxygen and carry out the residuals, and the system does not need a particular technology, allows for easy management, as cages — whether fixed, floating, submersible and submerged — are removable.

These technologies are not well known in Egypt and it is crucial for more research to be undertaken in aquaculture engineering. But the rewards are great for a new industry of intensive fish farming that will produce unpolluted fish for local and export consumption, will add back 220 thousand feddans to agricultural land, and will save about 2.2 billion m³ of water now lost in evaporation — which amount is sufficient to reclaim more than 500 thousand feddans.

7. Land Reclamation as a Magnet for Foreign Investment

In 1997, the controversial Toshka project was initiated as part of the South Valley Development Project Plan. It is located in the New Valley Governorate which comprises almost 38% of the country's total area. Given its size and its scope, the project is likely to achieve positive results only over the longer term, as infrastructure, massive funding needs, and transfers of population slowly converge to create a development model that compensates for the limited agricultural and settlement growth potential in the Old Nile Valley and Delta.

Toshka goals parallel those of the ambitious national plan to exploit the vast tracts of Egypt's underutilized desert lands outside of the Old Valley by creating new settled communities, new agricultural and industrial societies; a network



of basic and peripheral roads to serve the area as well as airports, and to transport agricultural and industrial products for local use and for export; and, where appropriate, to encourage tourism in areas that encompass many prehistoric, pharaonic, greco-roman and Islamic archeological treasures. It is an example of a highly ambitious long-term model that combines Egyptian, Arab, and foreign direct investment in agriculture, as part of this integrated plan, with a total investment estimated at LE 300 billion in the 20 years leading up to 2017. According to its development plan, GOE will undertake 20%-25% of the total investment, allowing local and foreign private investors to make up the rest. The majority of the 540 thousand feddans are to be distributed among three large investors, including the Kingdom Agricultural Development Company (a foreign private joint-stock company), the South Valley Development Company (a local publicly-owned company), and the Egyptian Company of Land Reclamation and South Valley Development (a local public-private company).

The two highly controversial issues surrounding the Toshka project are the availability of water, and the economic returns on the huge capital investment. On the technical front, it has been estimated that irrigation requirements are, at a minimum, 7000 cubic meters per feddan, and at a maximum, 16 thousand cubic meters per feddan. This translates into a total of between 3.5 and 9.3 billion cubic meters (official estimate is 5 billion cubic meter) in order to irrigate half a million feddans. To make this amount of irrigation water available, six challenging conditions must be met:

- Changing Egypt's cropping pattern away from rice and sugar as mentioned above, with a saving of 1.5 billion meters;
- Improving demand management for water

so as to reduce the waste from the current 30% to 12%;

- Shifting from flood to drip irrigation, thereby saving up to 80% of irrigation water;
- Increased utilization of recycled drainage and wastewater after treatment. It is estimated that between 15 and 20 cubic meters of drainage water is lost to the sea;
- Overcoming the problem posed by the nefarious spread of water lilies, which would increase available water by 2 billion cubic meters;
- Reducing the quantity of Nile water spilling into the Mediterranean sea, estimated at between 1.8 and 3.8 billion cubic meters. However, the threat from reducing the discharge is that seawater could inundate the most productive lands of the Delta.

Even if the key issue of water availability is resolved, there are still many questions surrounding the economic viability of the Toshka project. The first is the low profitability of dependence on agriculture only, and the need to invest heavily in related manufacturing and tourism. A second concern is the cost of the transport infrastructure necessary for Toshka produce to reach either local or foreign markets. A third is the need to estimate demand elasticity which would have to be low for the off-season horticulture prices to be sufficiently high in international markets. On the supply side, calculations are also necessary to compare the total cost of export oriented crops from Toshka with those of greenhouse cultivation.

Finally, a key problem is the low number of total jobs that are likely to be created from desert agriculture, agro-industry and tourism such that the hoped for migration of population to Toshka is not likely to happen.