Assessment of the Agricultural Sector in Egypt[1]

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[1] The views expressed in this paper are those of the authors and do not necessarily represent the views of USAID or the US Government.

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ACRONYMS

AERI	Agricultural Economics Research Institute
AFIS	Agricultural Farm Income Survey
AMO	Fruit, Vegetables and Aromatic, Medicinal and Oil Plants
ARC	Agricultural Research Center
BM^3	Billion Cubic Meters
CAPMAS	Central Agency for Public Mobilization
CBE	Central Bank of Egypt
CPI	Consumer Price Index
DDC	American University's Desert Development Center
ECES	Egyptian Center for Economic Studies
EOS	Egyptian Organization for Standardization and Quality Control
FA	Farmers Association
FAO	United Nations Food and Agriculture Organization
FDI	Foreign Direct Investment
FY	Fiscal Year
GAFI	General Authority for Investment
GCI	Global Competitiveness Index
GD	Growth Diagnostic
GDP	Gross Domestic Product
GOE	Government of Egypt
GOEIC	General Organization for Exports and Imports Control
HRV	Ricardo Hausmann, Dani Rodrik, and Andrés Velasco
IPCC	Intergovernmental Panel on Climate Change
LE	Egyptian Pound
MALR	Ministry of Agriculture and Land Reclamation
MENA	Middle East and North African
MWRI	Ministry of Water Resources and Irrigation
NPI	National Planning Institute
NWRC	National Water Research Center
OECD	Organization for Economic Co-operation and Development
PBDAC	Principal Bank for Development and Agricultural Credit
PPM	Parts per Million
R&D	Research and Development
SPS	Sanitary and PhytoSanitary Agreement
TDS	Total Dissolved Solids
UN	United Nations
WTO	World Trade Organization
WUA	Water User Association

EXECUTIVE SUMMARY

Agriculture is the main source of livelihood for over a quarter of all employed Egyptians and accounts for approximately 14 percent of Egypt's gross domestic product (GDP) and almost 27 percent of the labor force (61 percent of the labor force in Upper Egypt). A recent study by the World Bank and Central Agency for Public Mobilization (CAPMAS), an Egyptian statistical agency, found that *agriculture was the main engine of poverty reduction, despite its lower-than-average growth rate.* Over one-half of all movements out of poverty in Egypt from 2005-2008 were accounted for by those employed in agriculture. In addition, the sensitivity of poverty with respect to the growth of value-added in agriculture is largest among all sectors of the Egyptian economy. If the productivity of this sector can be improved, employment and income of the poorest segment of the Egyptian economy will be increased and food security enhanced.

This paper utilizes a model inspired by the growth diagnostic (GD) methodology developed by Ricardo Hausmann, Dani Rodrik, and Andrés Velasco (HRV) (2005) and modifies it to fit the agriculture sector in Egypt so that USAID's resources can be appropriately targeted to yield higher returns. This assessment will identify the constraints that, if mitigated, would result in the greatest attainable impact on private investment in the sector. *From the GD perspective, private investment is the key variable that explains sustained economic growth and productivity in all sectors.* The reason we focus on private investment as the key variable of interest is because no country has ever enjoyed sustained productivity, employment, and output growth in any sector without the active participation of the private sector. *Furthermore, increasing the level of private investment directly contributes to a demand for more productive employment.*

Binding Constraints in the Agricultural Market		
Sector Wide	***Smallholder Farmers***	***Agribusinesses***
1. Poor Policy/Extensive "crowding out" by Government activities 2. Time and Cost to enforce contracts 3. Low Competition in Finance	1. Weak Farmer's Associations/Water Users Associations and Cooperatives 2. Land Fragmentation 3. Lack of available Market Information	1. Compliance with Standards to Export/Traceability Issues 2. Lack of available Human Capital

Poorly functioning Farmers Associations (FAs) and agricultural cooperatives is the key identified binding constraint for small-holder farmers because their documented weakness and politicization prevents the realization of economies of scale in the sector. Cooperatives are government-owned types of associations formed under the very old cooperatives law, which is generally considered out of date and not representative of current sector priorities. Agricultural cooperatives have mainly been used as a political tool for information gathering and elections. There are agrarian reform cooperatives and credit cooperatives but both are neither efficient nor effective. FAs are NGO-type associations that are formed by a group of farmers (e.g., in a certain area or for a specific value chain) for the purpose of supporting their members in accessing necessary services, finance, and information. There are a few effective FAs such as the Horticulture Export Improvement Association and the Egyptian Seed Association, but they serve a very limited number of members. Overall, however, state-control of these organizations leads them to pursue political rather than market objectives. Effective FAs and agriculture cooperatives would help small-holder farmers gain access to important capital inputs they currently lack, such as cold storage trucks and cooling facilities, machinery, and drip irrigation. Strengthening FAs and cooperatives and making them more efficient would greatly facilitate the smallholders' role as an entrepreneur and would foster needed cooperation in the sector, which would result in greater levels of private investment.

Land fragmentation, especially in the "old lands", is a related yet separate binding constraint for smallholders because small plot sizes inhibit economies of scale in production, make workers more vulnerable, and limits investment in the adoption of technologies. Fragmentation also prevents farmers from adopting modern varieties of traditional crops and/or shifting to non-traditional crops. Only about five percent of land in Egypt is considered arable and the per-person endowment of cropland is one of the smallest in the world. While this land is highly productive, it is severely limited by this a high degree of land fragmentation.

The third binding constraint is a lack of sector wide market information, which affects smallholder farmers the most. Government intervention and inconsistent policies distort market prices and make them unpredictable for farmers, discouraging investment. Furthermore, there are few accessible sources for reliable current market data on the agricultural sector to enable small farmers to decide what to grow and where to sell their produce or purchase needed inputs on time and at a competitive price.

For agribusinesses, the binding constraints are the lack of compliance and enforceability of international standards for export and a lack of available human capital resources. The government does a poor job informing agribusinesses of procedures and international standards necessary for export and providing credible verification that products are meeting these standards. In addition, maintaining traceability documents along the supply chain is a major challenge. In terms of human resources, the lack of appropriate technical and vocational training negatively impacts the sector, resulting in lower productivity and therefore wages (overall, Egypt ranks close to last in the world for "quality of education system" at 131st of 139 countries).

Poor policy is a binding constraint for the whole sector as most sector laws were drafted in the 1950s and thus reflect collectivist ideologies that no longer fit current government strategies. The lack of policy advocacy groups has resulted in slow implementation of policy reforms in the sector. For example, current tax policy exacerbates land fragmentation because it gives farmers incentives to maintain small plots of land. Subsides and price floors on the production side, coupled with extensive government intervention create significant market distortions that crowd out and discourage private investment.

Nowhere is this crowding out more evident than formal agriculture finance, which has for a long time been dominated by the state-owned Principal Bank for Development and Agricultural Credit (PBDAC) and demonstrates the lack of competition in the market. Although PBDAC offers a relatively lower, subsidized cost of finance compared to other commercial banks, credit availability and cost of finance are still major constraints to agriculture growth as PBDAC lends at relatively high implicit interest rates, due to its high transaction costs and inefficient mobilization of savings. It also engages in commercial activities such as the supply of inputs to small farmers, but these operations tend to be politically rather than market driven.

Institutionally, the time and cost to enforce contracts (Egypt ranks 147th out of 183 countries by the World Bank) is key factor prohibiting the increased commercialization of the sector. Small farmers and other SMEs cannot effectively contract with larger agribusinesses because of this constraint, thus preventing market access and sector wide efficiency improvements.

While water is currently not a binding constraint due to the availability of Nile flood waters, it will soon become more significant in the near future is steps are not taken. Egypt is among 35 water deficit countries in the world, and 87.5 percent of the total water is being consumed by agriculture. Egypt is faced with: 1) a rapidly growing population and a limited water supply from the Nile and ground water; 2) water pollution; and 3) inefficient water usage (overuse of flood irrigation). Currently, water use efficiency is just about 50 percent and this needs to improve given water's relative scarcity.

There are also several identified constraints that, while they negatively affect private investment, were deemed to be "non-binding", most often because they related back to one of the binding constraints. These include: 1) the lack of funding and applicability of research and development (R&D) and the weakness of public extension services: the private sector does a reasonably good job filling the gap for these services and land productivity for most crops has increased significantly over the past 30 years; 2) infrastructure: while poor in places such as Upper Egypt it is comparable with its peers; 3) access to physical capital: small farmers need cold storage equipment to limit post-harvest losses, but more effective FAs and cooperatives could coordinate in order to mitigate this problem and larger land holdings would incentivize investment in capital; 4) property rights: while a major issue, most farmers have found somewhat reliable "workarounds" and informal titles are generally accepted; 5) coordination and discovery: it is well known that small farmers could be growing higher profit margin crops, but the transition is slowly being made as farmers have significantly diversified their crops over the past few decades; 6) access to foreign finance: Egypt, while protective in some areas, attracts significant levels of foreign investment in agriculture sector, especially food processing, and 7) macroeconomic stability : while an issue during the post-revolution political transition, it should not be considered binding unless political problems persist.

I. Introduction

Almost two-thirds of Egypt's poor live in rural areas and are primarily dependent on agriculture and related industries for survival. Given that the majority of the world's poor live in rural areas and are dependent on agriculture as their main source of income, agriculture is the key sector which drives equitable growth. One of the most effective ways to reduce poverty and create jobs is to increase investment in the agricultural sector and, in turn, generate complementary investment in non-farm activities, creating new opportunities for the poor. A recent study by the World Bank and Central Agency for Public Mobilization (CAPMAS), an Egyptian statistical agency, found that ***agriculture was the main engine of poverty reduction, despite its lower-than-average growth rate.*** Over one-half of all movements out of poverty from 2005-2008 were accounted for by those employed in agriculture. The elasticity[2] of poverty with respect to the growth of value-added agriculture is largest among all sectors of the Egyptian economy. On a global level, there is increasing consensus that supporting the agricultural sector is necessary to boost productivity and reduce poverty in rural areas.[3] Results from China, India and other Asian countries showed that agricultural growth is more important than manufacturing growth for poverty reduction, even though manufacturing growth matters more for overall growth.[4]

Furthermore, agriculture in Egypt has strong forward and backward linkages; it provides essential intermediate inputs to the most important manufacturing activities in Egypt (food, and textiles and clothing, which contribute respectively 4 percent and 1.8 percent of GDP, and provide 18.4 percent and 29.2 percent of industrial employment).[5] Yet the average annual growth rate for the agriculture sector (including irrigation and fisheries) from Egypt's FY05/06 to FY10/11 was 3.3% compared to an average annual growth rate of 5.5% for the overall GDP (2.2. percentage points lower) and its share in total value-added to the economy was the lowest of all sectors.

A. Methodology

This assessment utilizes a model inspired by the growth diagnostic (GD) methodology developed by Ricardo Hausmann, Dani Rodrik, and Andrés Velasco[6] (HRV) (2005) and modifies it to fit the agriculture sector in Egypt. The ultimate purpose is to identify and prioritize the binding constraints[7] to development in this sector so that USAID's resources can be appropriately targeted to yield higher returns.[8] This assessment takes into account the agricultural value-chain and its linkages. However, the advantage of this analysis is that it is performed with respect to a single dependent variable, "low levels of private investment and entrepreneurship" in the agricultural sector. Multiple constraints can be identified in other types of analyses; however, they often do not answer the questions "in relationship to what?", and most importantly, "which constraint should be addressed first?" and "what is the likely impact of removing that constraint?" This assessment will identify the most significant constraints to private investment in the agricultural sector which, by removing these constraints, will result in the greatest attainable impact in the sector.

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[2] Elasticity is used in economics to measure and show responsiveness. In this particular case, elasticity shows the movement of people from poverty as growth in value-added agriculture increases.
[3] Christiansen, Demery and Kühl 2006
[4] Ravallion and Datt 1996; Ravallion and Chen 2004; Timmer 2005
[5] Ministry of Trade and Industry website.
[6] Hausman, Ricardo, Rodrik, Dani & Andres Velasco. *Growth Diagnostics*, March 2005.
[7] Binding constraints are constraints that most significant and inhibit (for the purposes of this model) private investment in agriculture. These constraints tend to be the largest issues where no work around exists.
[8] This analysis focuses on crop production for both small-holder farmers and agribusinesses and the supply chain process that takes them to the market. Small-holder farmers are defined as subsistence farmers that own small plots of land. Agribusinesses are defined as medium and large farmers as well as other businesses in the agricultural sector. Other agricultural subsectors, such as livestock and fisheries are discussed, and many issues overlap, but they are not the central focus of this paper.

From the GD perspective, private investment is the key variable that explains sustained economic growth and productivity in all sectors. The reason we focus on private investment as the key variable of interest is because no country has ever enjoyed sustained productivity, employment, and output growth in any sector without the active participation of the private sector. *Furthermore, increasing the level of private investment directly contributes to a demand for more productive employment.*

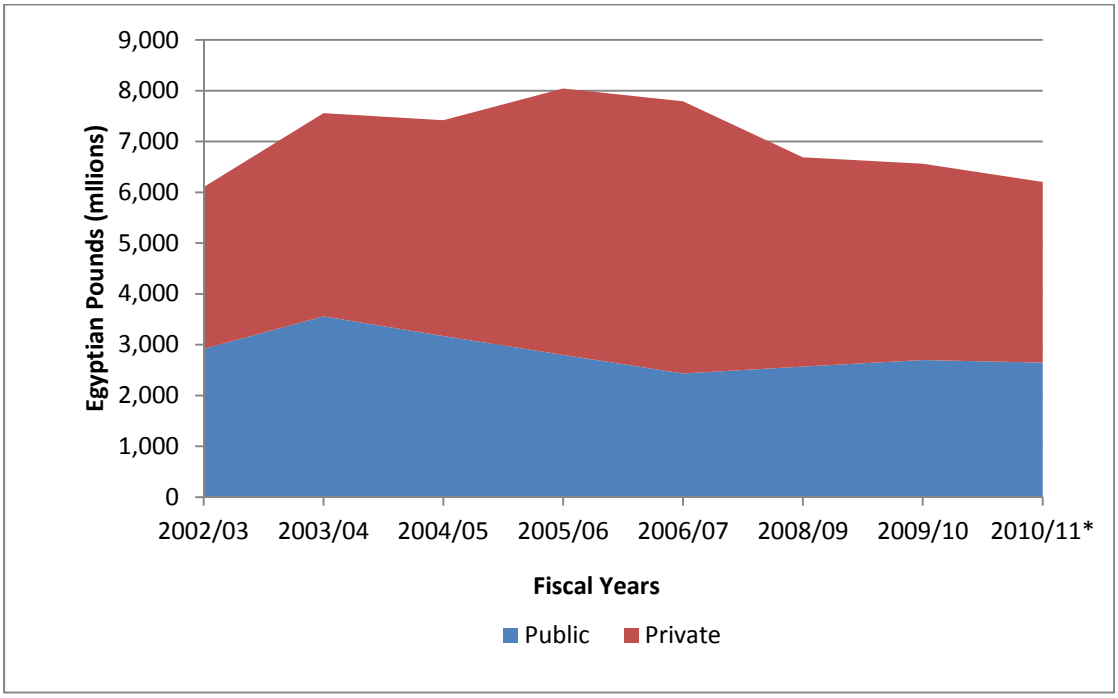
As HRV note, "problems get reflected in investment behavior" and that "there are very few cases of countries where distortions are such that private investment is too high."[9] This is not to say that government does not have an important role to play in the agriculture sector. Indeed, it plays a critical role as a coordinator and facilitator of private investment in every node on the decision tree. The government is the key player in providing access to infrastructure, finance, and human capital, as well as protecting property rights, mitigating market failures, disseminating information (R&D), and keeping the macro-economy stable; all of which determine the enabling environment for private investment. Overall, this model assumes that increasing levels of private investment in the agriculture sector will result in increased levels of employment among the poorest, rising incomes for farm and non-farm workers, and enhanced general food security in Egypt.

Figure 1 depicts both public and private investment in the agricultural sector over the past eight years. While the medium-term trend indicates that the overall level of investment is declining, the share of public sector investment has remained relatively high (41 percent in fiscal year (FY) 2010/11).[10] In Egypt's most recent FY (2010/11) investment, (both public and private) in agriculture represented 2.7 percent of total investments in Egypt. In this analysis, we will seek to get a better understanding of why we observe these trends and levels of private investment in Egypt's agriculture sector. We will seek to answer the following key questions: Are returns to capital relatively low in this sector? And if so, why? If returns are not low, why are we not observing increasing rates of private investment? Is it because the private sector cannot capture the returns to their investments (i.e. low appropriability)? Or is it because of a lack of access to finance? Overall, relieving which of the identified constraints would result in the greatest increase in private investment in this sector?

[9] One other common critique of the model is that, "investment is not necessarily productivity". This is a key misunderstanding of the methodology. The level of investment in this model is determined by the returns to such investment. The entire left-hand side of the decision tree is about the determinants of productivity that would increase the demand for investment. Therefore, productivity is implicitly the central focus.

[10] While general trends show that in the medium-term the amount of public investment is general declining, from FY 2008/09 to FY 2009/10, public sector investment grew by 5 percent from LE 2,570 billion to LE 2,698 respectively. CBE Website.

Figure 1: Private and Public Sector Agricultural Investment

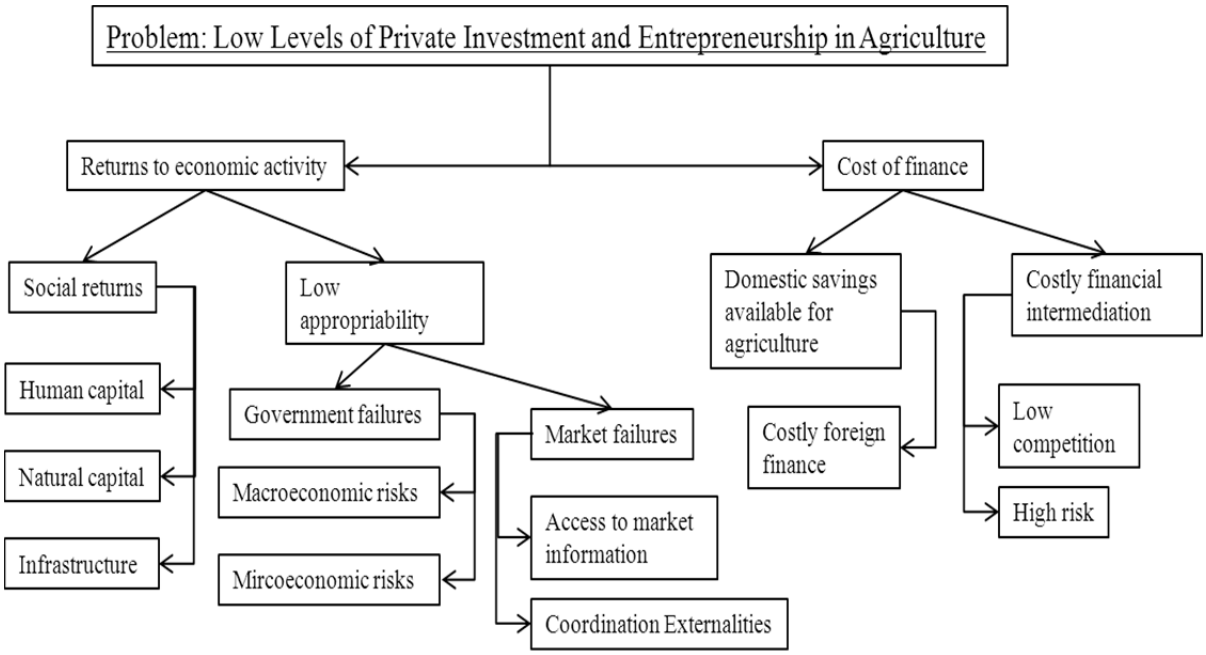


Note: Data for FY 2007/08 is not available and data for FY 2010/11 are expected numbers. 1 US dollar was approximately equal to 6 Egyptian Pounds as of this writing. Source: CBE Website.

1. The Growth Diagnostic Map

Using this model, we will work our way down a decision tree so that we can compare data and ask questions about causalities and linkages between identified constraints (Figure 2). Returns to economic activity and cost of finance are the two key variables that affect the decision to invest. An entrepreneur cannot capture returns to economic activity if that person does not have access to finance. Conversely, an investor may have access to finance but there may be no profitable opportunities to invest, a large share of investment is not likely to be appropriable, or markets may not be functioning properly in the sector. Both variables are important in determining the level of private investment and entrepreneurship that invests in Egypt.

Figure 2: Growth Diagnostic Mapping for Agricultural Sector in Egypt



2. Returns to Economic Activity

The key reason for a lack of private investment in all sectors is low returns to economic activity. In general, low returns are driven by two major constraints: low social returns and/or low appropriability (i.e. the inability of an investor to capture the returns to her investment). As depicted in Figure 2, low social returns are driven by constraints to natural, physical, and human resources necessary to complement investment in agriculture. If there are natural, physical, and human resource constraints then the capital structure required to ensure efficient production are limited, thereby constraining investment. Low social returns in one sector generally indicate higher available investment returns in other sectors, and investment should naturally flow to the highest return sectors, or where an economy has comparative advantages.[11]

How do social returns affect private investment and entrepreneurship? Human capital (the number and quality of workers in the sector), natural capital (land and water), and infrastructure (proper on-farm equipment, cold-storage trucks and cooling facilities, water infrastructure, and roads) all affect productivity for both small-holder farmers and agribusinesses. As productivity increases, so does return on investment, profits, and wages. As a result, the sector becomes more attractive and as stated earlier, investment will flow to sectors that are able to garner higher-returns.

Low appropriability can exist in the presence of high potential returns to investment, yet private sector actors are unwilling to invest because of institutional and governmental failures that would prevent them from capturing the returns to such investments (think barriers to investment). A variety of issues can influence appropriability and these factors can fall into market or government failures. Market failures involve the issue of opportunities and the ability of investors to take advantage of them. Access to market

[11] A comparative advantage in producing or selling a good is possessed by an individual or country if they experience the lowest opportunity cost in producing the good. Individuals and nations gain by producing goods at relatively low costs and exchanging their outputs for different goods produced by others at relatively low cost.

information is important because when information is distorted or lacking, private investment is inhibited because investors cannot properly gauge market trends, opportunities, and risks. Specifically in the agriculture sector, poor value-chain linkages are a critical determinant of the rate of return to investments because products require value-added at multiple levels "from farm to fork." Often, the weakest link on this chain can inhibit an investment because it can disrupt the entire process of agricultural production. The second market failure related to the degree of effective coordination within the sector in order to facilitate the "self-discovery" process about what to grow/produce. This specifically refers to conditions that make coordination among farmers, different links in the value-chain, agribusiness firms, as well as government agencies difficult or more costly. Coordination and mutually beneficial cooperation are necessary in order to exploit new market opportunities, combine human, natural, and financial capital in new and productive ways, and create an environment conducive to sustained growth in the agricultural sector.

Government failures (most of which revolve around the effectiveness of institutions and policies) is the second key variable impacting appropriability. Government is important because as mentioned earlier, it is the key player in providing access to the complementary goods and services necessary to enable private investment. If the government cannot provide these services, then the enabling environment for private investment is significantly constrained, and private investors cannot capture returns to otherwise profitable investment opportunities.

3. Cost of Finance

Private investment in agriculture, as well as the rest of the economy, could be also low because, for any private return on investment, accumulation is kept down by a high cost of finance. The cost of finance may be high because the country has limited access to external capital markets or because of problems in the domestic financial market, commonly caused by low levels of competition. Small farmers may also lack access to formal collateral due to larger institutional weaknesses. The agricultural sector may have difficulties accessing external capital markets for a variety of reasons including high country risk, unattractive foreign direct investment (FDI) conditions, vulnerabilities in the debt maturity structure, and excessive regulations of the capital account. Bad local finance may be due to low domestic savings and/or poor domestic financial intermediation.

II. Overview of the Agricultural Sector in Egypt

Agriculture is the main source of livelihood for over a quarter (27.8 percent) of all employed Egyptians and accounts for approximately 14 percent of Egypt's gross domestic product (GDP) (Table 1).[12] Agriculture is especially important in Upper Egypt, accounting for 56 percent of total employment and it also provides employment to 83.2 percent of females in rural Egypt, who are mostly engaged in non-wage work (35.9 percent) or as farm self-employed (40.2 percent).[13] Arable land resources are extremely limited, consisting of a narrow strip along the Nile River amounting to less than 5 percent of the country's total land area. In 2010, these "old lands" along the Nile contributed approximately 82 percent of the total value of agricultural production in Egypt while the "new lands" (reclaimed desert land) contributed 18 percent.[14]

[12] Data for employment is for Fiscal Year 07/08. Data for percent of GDP is for FY08/09. Ministry of Finance and Central Bank of Egypt, http://www.mop.gov.eg/annual.html.
[13] Kheir-el-din, Hanna and Heba El-Laithy (2008) "Agriculture Productivity Growth, Employment, and Poverty in Egypt" Egyptian Center for Economic Studies (ECES) Working paper.
[14] "Bulletin: Estimation of Agriculture Income 2010". Ministry of Agriculture and Land Reclamation, Issue 20, 2010.

Table 1: Overview of GDP and the Agricultural Sector						
Years	**2006/2007**	**2007/2008**	**2008/2009**	**2009/2010**	**2010/2011**	**2011/12 (First Half)**
Total GDP (LE millions, current prices)	810,388	855,302	994,055	1,150,620	1,309,906	747763
Agriculture, Forestry, and Fishing (LE Millions)	99,953	113,104	135,465	160,970	190,159	118747
Percent of Contribution	12.3	13.2	13.6	14.0	14.5	15.9
Total Employment (thousands)	20,120	20,810	22508	22975	23829	23456
Employment within Agriculture (thousands)	5,427	5,545	6965	N/A	6727.6	6300
Percent of Contribution	27.0	26.6	30.9	N/A	28.2	26.9
Source: Ministry of Finance and Central Bank of Egypt						

In terms of food security, the demand for food and other agricultural commodities is increasing in Egypt due to the increase in the population and improvements in living standards. Currently, 29 percent of children under-five suffer from stunting. This is particularly pronounced in Lower Egypt where the rate of stunting doubled, from 17 to 34 percent from 2005-2008.[15]

Fast growth in food prices has played a significant role in reducing the positive effect of recent economic growth (averaging about seven percent per year over 2005-2010) on living standards. The urban consumer price index (CPI), for which food and beverage costs are the largest component, has increased at an average annual rate of over 10.5 percent from January 2011 - January 2012 while the core CPI, which strips out many volatile food items, has risen an average of over 2.5 percent less over the same period.[16] This means that inflation over recent years has been especially difficult on the poor. Food absorbs 41.5 percent of total household expenditures and accounts for 54 percent of total expenditures of the poorest Egyptian households.[17]

Despite these challenges, Egypt, mainly through its generally robust rates of economic growth over the past decade or so, has managed to make modest gains in terms of basic measures of hunger and food security measures. For example, from 1990-2009, the prevalence of underweight children under five years of age fell from 10.8 percent to 6.8 percent[18] and Egypt's score on the 2011 Global Hunger Index was under five, placing it at a "low" level of hunger.[19]

[15] Demographics and Health Survey, USAID, 2008.
[16] Data from the Central Bank of Egypt.
[17] The share of food expenditure in the budget is only 28 percent in China, 33 percent in India and absorbs more than half of total household expenditures in countries such as Kenya at 51 percent, Haiti at 52 percent, Malawi at 58 percent and Bangladesh at 62 percent (OECD-FAO 2009).
[18] World Bank, World Development Indicators.
[19] In 2006, the average daily caloric intake per capita in Egypt was estimated at 4439, much higher than the world average of 2600 (United Nations Development Program 2008a, b; FAO 2008a). However, this has led to the "dual burden" of nutritional issues with significant rates of malnutrition and micronutrient deficiencies as well as increasing obesity rates.

III. Social Returns

A. Human Capital

In FY 2007/08, the agricultural sector accounted for approximately 27 percent of total employment in Egypt. However, the rate of unemployment in the rural areas reached over 50 percent during the 2000's, creating economic, social, and political problems. The majority of unemployed rural youth are graduates of technical schools and universities, demonstrating the lack of appropriate technical and vocational training which plagues the sector, resulting in lower productivity and therefore wages.[20] Rural agricultural areas also tend to have lower levels of secondary school enrolment.[21]

Starting in the late 1990's, a substantial number of commercial farms were established, geared more toward high value horticulture crops for export markets and livestock products for domestic markets, which created an increasing demand for a skilled labor force that could contribute to advanced, large-scale, production enterprises. The lack of a well-trained work force has been cited as one of the major constraints to the development of high-value horticulture and livestock in Egypt (World Bank 2006).

Overall, Egypt scores very poorly on a number of key education indicators. On the widely cited Global Competitiveness Index (GCI) produced by the World Economic Forum, Egypt ranks close to last in the world for, "quality of education system" (131st of 139 countries ranked). It also does very poorly on, "extent of staff training" (112th). According to Reda (2012), "weaknesses in the educational system include outdated curriculums, high-stake tests that do not teach or measure the skills needed by the labor market, low incentive environment, low pay for teachers, coupled with poor accountability and prevalence of private tutoring, and a serious need to monitor the quality of outcomes and develop monitoring and evaluation frameworks."

Agricultural Economics Research Institute's (AERI) Agricultural Technical School's survey results indicated that approximately 48 percent of interviewed students stated that they need additional technical training (horticulture, mechanization, irrigation, food and dairy processing, etc.) and 28 percent stated that they need additional training in general skills (computer, Arabic and English languages). The private sector was also interviewed for the survey and asked what they were looking for in agricultural workers. The following qualities and characteristics were identified: 1) modern agricultural technical skills; 2) good interpersonal skills; 3) a strong theoretical background; 4) the ability to read and write in Arabic and English languages and write technical reports; and 5) conduct cost calculations.[22]

The lack of properly educated workers in the agricultural sector limits social returns, thereby inhibiting private investment. If workers are not skilled, productivity is diminished and therefore wages remain low. The willingness for agribusiness to pay and therefore invest more in their employees is limited by the quality of education available. In addition, small-holder farmers, if lacking the appropriate training to apply good agricultural practices, will also see limited productivity gains. Consequently, insufficient education and training directly translates into diminished productivity for both small-holder farmers and agribusinesses. But a shortage of highly skilled labor mostly affects larger agribusinesses because they cannot increase their scale and profitability without access to adequate levels of human capital. Therefore, human capital is a binding constraint for agribusinesses.

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[20] The capital to labor ratio in the agricultural sector is too low, which drives the observed low labor productivity rates and directly associated low wage levels, lagging behind those of other sectors within the Egyptian economy, such as construction and manufacturing.

[21] "Beyond the Financial Crises: Competitiveness & Sustainable Development", *The Egypt Competitiveness Report*. Egyptian National Competitiveness Council, June 2009.

[22] Survey of Stakeholders in the Agriculture Exports and Rural Incomes II Agricultural Technical Schools (AERI-II ATS), prepared by the Blue Consulting Group, October, 2011.

B. Natural Capital

1. Land

Egypt's arable area totals about 3.3 million hectares (8.1 million acres), about one-quarter of which is land reclaimed from the desert. Only about five percent of land is considered arable and the per-person endowment of cropland is one of the smallest in the world. Over the period 1980-2007, crop production in Egypt increased in terms of cultivated area, which rose by 44 percent from 5.87 million feddans in 1980 to around 8.44 million feddans[23] in 2007[24]. However, due to increasing water scarcity, enlargement of the cultivated area is not likely to continue at significantly high rates. Yet Egypt's land is extremely productive and can be cropped two or even three times per year. Most land is cropped at least twice a year, but agricultural productivity is limited by salinity (which afflicts an estimated 35 percent of cultivated land) and drainage problems.[25]

In 2010, newly reclaimed desert lands ("new lands") added 18 percent to the total value of agricultural production[26] and accounted for 30 percent of total cultivated land.[27] To increase the country's capacity to grow 254 million tons of fruits and vegetables annually, the Ministry of Agriculture has set a goal of converting 1.3 million hectares of desert land into farmland by 2020. According to them, Egypt will then be able to increase exports to 38 million tons of produce annually with a projected total value of US USD 1.5 billion in 2020.[28] There are several main constraints that involve the issue of land in Egypt: 1) the high degree of land fragmentation; 2) the limited availability of agricultural land; 3) decreasing land productivity due to nutrient loss, and 4) the increasing cost and accessibility of land.

Egyptian agriculture in old lands is characterized by small landholdings. Table 3 illustrates how landholdings are skewed toward small and extra small holdings by region. Landholdings appear to be more evenly distributed among various sizes in Lower Egypt, but extra-small landholdings account for more than 42 percent of the total number of farms in Upper Egypt while both extra small and small landholdings represent more than 78 percent of farms in that region. The majority of farmers with extra small landholdings practice subsistence agriculture.

Land fragmentation is a major concern because small plot sizes inhibit economies of scale in production, and perhaps most importantly, limit the adoption of technologies and the incentives of farmers to use more mechanized methods when harvesting their crops.[29] Fragmentation also prevents farmers from adopting modern varieties of traditional crops and/or shifting to non-traditional crops (fruit, vegetables and aromatic, medicinal and oil plants (AMO)) (Appendix A). In addition, there are limited financial incentives for small-holder farmers to invest in drip irrigation so they instead tend to use flood irrigation methods, which is not only an inefficient use of water, but also removes vital nutrients from the soil.

On top of these factors, land fragmentation has been showed to contribute to "vulnerable employment" which is highly linked to poverty. According to Abdel Mowla (2011), "vulnerable employment is a relatively new concept that refers to those who are employed under relatively precarious circumstances.[30]

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[23] 1 feddan = 1.038 acres
[24] Ministry of Agriculture and Land Reclamation, *Strategy for sustainable agricultural development 2030*, 3rd edition (2009).
[25] Egypt's Future Depends on Agriculture and Wisdom, http://www.egyptianagriculture.com/egyptian_agricultureV1.pdf
[26] "Bulletin: Estimation of Agriculture Income 2010". Ministry of Agriculture and Land Reclamation, Issue 20, 2010.
[27] Old lands account of 70 percent of total cultivated land. Note that the percent of cultivated area for new and old land are 2009 figures. Ministry of Agriculture, 2009. http://www.capmas.gov.eg/pdf/Static%20Book/PDF/5-%20الزراعة/5-1.pdf
[28] General Authority for Investment (GAFI), Invest in Egypt: Agribusiness (2010)
[29] Interview with Dr. Siddik, March 27, 2012.
[30] "Vulnerable workers usually lack elements of decent employment, including access to social protection, health insurance and an effective social dialogue mechanism. Thus, they suffer more in case of illness or disability. They usually work under

They find that, "overall, working in agriculture, being female and having a low level of education increase the incidence of vulnerable employment." Why is agriculture highly associated with vulnerable employment and hence poverty? They conclude, "The agriculture sector in Egypt is dominated by very small land ownership. This may explain why vulnerable employment is widespread in this sector."

Hala Abou-Ali and Hanaa Kheir-El-Din (2010) use a regression model to estimate the impact of various factors on crop productivity in multiple governorates across Egypt. They find significant levels of inefficiency and conclude, "technical efficiency was found to be higher in areas with larger size landholdings and probably relatively less labor intensive pattern of production. Producers with larger landholdings are usually better connected to processing and marketing firms and have better access to international markets… observed increasing returns to scale confirms the necessity of consolidating exploitation of small landholdings to benefit from the advantages of economies of scale."

One of the reasons for land fragmentation among small-holder farmers is that plots of land become further subdivided among their offspring over time and current government policies exacerbate this outcome by creating direct disincentives to sell and combine land. For example, farmers that own less than two feddans are exempt from property taxes and property taxes grow in proportion to land holdings (which are assessed based on the estimated value of the land, which government officials tend to arbitrarily link to land size). Poor property rights enforcement (to be discussed below) also leads directly to these observed outcomes.

Table 3: Distribution of Farms by Size and Region

Size of Farms	Extra Small	Small	Medium	Large	Total
Region	‹ One Feddan	1 to ‹3	3 to ‹5	5 and More	
Metropolitan	7.3	22.63	18.97	51.1	100
Lower Egypt	36.61	37.49	11.01	14.89	100
Middle Egypt	40.14	41.54	10.63	7.69	100
Upper Egypt	50.2	32.82	8.59	8.9	100
Border	8.48	18.94	15.91	56.67	100

Source: Hala Abou-Ali and Hanaa Kheir-El-Din. "Economic Efficiency of Crop Production in Egypt." *Egyptian Center of Economic Studies*, April 2010.

In the old lands, nutrient levels are depleting on farmland along the Nile due to over-farming and the inability to replenish them. The construction of the Aswan Dam has prevented yearly river floods upstream of the dam, which in the past would deposit four million tons of nutrient-rich silt on the valley floor. In addition, each year as farmers cultivate their land, nutrients and soil organic levels are being depleted from the soil. Intercropping and other good agricultural practices, when used properly, take many years to see the financial and soil benefits. Consequently, Egypt's farmers use large quantities of chemical fertilizers in order to maintain their crop yields, making certain commodities more costly to produce (Appendix B).[31] The overuse of fertilizers also results in the remaining nitrogen finding its way to water ways and contributes to the decline in water quality.[32]

In addition to old lands, Egypt has a smaller modern agricultural sector on newly reclaimed lands, which is characterized by relatively larger farms (exceeding 10 feddans) and a relatively less labor-intensive

conditions that do not provide security in the workplace; they also do not receive any training to enhance their skills. Due to lack of social protection, the vulnerably employed are exposed to a higher economic risk, especially during economic downturns."

[31] Cox, Stan. "The Politics of Bread in Egypt." *Al Jazeera*, March 10, 2012.

[32] Raun and Johnson. 1999. Agron. J. 91:357–363

pattern of production. While the land itself is much less productive, production techniques on the 2 million acres in the reclaimed lands are much more efficient and products are largely exported. Producers in new lands also appear to be better connected to processing and marketing firms and have better access to international markets.[33] There are roughly 300 larger agribusiness companies invested in those lands and enjoy strong financial backing. These large agribusinesses apply significantly more sophisticated production methods than the small farmers that operate along the Nile. They acquired the land mostly through government allocation through a bidding process open to investors.

Prior to selling the reclaimed land, the government of Egypt invests in drip irrigation to help make it arable and water efficient. However, the cost of reclaimed land is very expensive and the productivity of the land itself is significantly diminished in comparison to land found along the Nile. A feddan of land in the delta (that is being sold with a title) was worth about 250,000 LE while a feddan of newly reclaimed land (that is being sold with a title) sold for about 70,000 LE in 2011.[34] New policies designed to ease access to agricultural land and bring down the price per acre are needed.[35] To enhance and realize maximum yields and incomes from cultivated lands, many farmers grow two or three cycles a year or grow double-planted crops (vertical production) producing more than one crop per year. Greenhouses are also being introduced on new lands for producing new and high value crops particularly on reclaimed lands.

Land fragmentation is a binding constraint for small farmers. Fragmentation of land prevents economies of scale thereby inhibiting investment in the land by small-holder farmers. For example, the farmer will not invest in a drip irrigation system for a small plot of land because the costs outweigh the benefits. Land fragmentation also prevents farmers from investing in farming machinery and post-harvest storage equipment because it is also too costly relative to the scale of production (to be discussed further in the next section). Consequently, the agricultural sector in Egypt is far too labor intensive, thereby reducing productivity, pushing down returns on investment and hence levels of investment.

2. Water

Egypt is among 35 water deficit countries in the world, and 87.5 percent of the total water is being consumed by agriculture, 5.4 percent by industry, while the human consumption is just 6.8 percent of the total water.[36] The development of Egypt's economy strongly depends on its ability to conserve and manage its water resources. Egypt is faced with: 1) a rapidly growing population and a limited water supply of 55.5 billion cubic meters a year from the Nile; 2) threats to humans, the environment and agriculture caused by water pollution; and 3) inefficient water usage.[37]

a. Fixed Water Supply and Growing Demand

According the United Nations (UN), a country is considered a water scarce country if the per capita share of water is less than 1,000 cubic meter per year. The current per capita share of water in Egypt is 740 cubic meters per capita per year. At the current population growth rate of two percent per annum, this figure would drop to about 534 cubic meters by 2025 and to less than 300 cubic meters in fifty years.

[33] Kheir-el-din, Hanna and Heba El-Laithy (2008) "Agriculture Productivity Growth, Employment, and Poverty in Egypt" Egyptian Center for Economic Studies (ECES) Working paper.
[34] Interview with Omar Adel El Maghawry, Cairo Financial Hold, April 5, 2012.
[35] Aref, Amr, Agricultural Reform, Again. *Business Times*, December, 2011.
[36] Shalaby, 2005.
[37] There are five identified issues concerning water, but for the purposes of this GD, we only discuss the top three constraints. The five water resource problems in Egypt are: 1) fixed water supply and growing demand; 2) water quality deterioration due to industrial expansion and urbanization; 3) rising infrastructure maintenance costs and limited government funds; 4) uncontrolled extraction of ground water; and 5) lack of public awareness on water scarcity.

Approximately 95 percent of Egypt's population lives within 12 miles of the River Nile and is dependent on its waters for irrigation. In 1959, Egypt's share of fresh water use from the Nile basin was fixed at 55.5 billion cubic meters (bm^3) per year. The population at the time was 20 million people. Currently, the water allotment remains the same; however, the population of Egypt has grown to 85 million people and has a yearly water need of 80 bm^3. According to experts at Egypt's National Planning Institute (NPI), Egypt will need nearly 50 percent more Nile water (21 bm^3) by 2050 to cater an estimated population of 150 million people. Should the Nile's total flow remain constant, Egypt will eventually need some 92 percent of the 6,695 kilometer-long river's waters, according to NPI's estimate.[38]

The difference (24.5 bm^3) is being provided by ground water, sewage water, rain water, as well as reuse of irrigation and drainage water. Drainage water is the largest supplement to the gap in supply.[39] In 2001, it was estimated that 4.8 bm^3 of ground water was being used in the Valley and Delta, as well as 0.57 bm^3 in the desert and Sinai for a total of 5.37 bm^3 of ground water. Ground water extraction was estimated to be able to be increased to 11 bm^3 without depletion of underground reservoirs. This shows that ground water plays an important role in water supply and food security (especially in drought periods), developing new lands, as well as improving the drainage in salinized areas.[40] However, most ground water is non-renewable and even if all of it could be sustainably exploited, which is currently not technologically possible or economically efficient, it would only supply about 12 percent of total demand.

Opportunities to increase the water supply are limited and therefore the main source of fresh water will continue to be the Nile for the medium future. Longer term trends show consumption increasing to around 88 bm^3 by the year 2017. This suggests a supply gap of approximately 20 bm^3. Due to the intensive use of irrigated land and the expected increases in demand for water for all uses, it is clear that unless action is taken, future demand for river water will greatly outweigh the supply.

Furthermore, The Intergovernmental Panel on Climate Change (IPCC) expects the sea level to rise by up to 59 cm in the worst of all considered scenarios by 2100. According to studies quoted by the IPCC, climate change could lead to the loss of a, "sizable proportion of the northern part of the Nile delta" to "a combination of inundation and erosion". A 0.5-m rise in sea level would lead to estimated losses of land, installations, and tourism of more than USD 32.5 billion in the Governorate of Alexandria alone, cutting off the city of Alexandria from the Delta. Erosion already increased in the Nile Delta since the construction of the Aswan High Dam in the 1970s which trapped much of the Nile sediments. Furthermore, agricultural land losses will occur as a result of soil salinization. [41]

In response to concerns about the management of scarce water supplies, the Ministry of Water Resources and Irrigation developed a National Water Resources Policy for Egypt in 2005 that covers up to the year 2017. The Policy contains three major directions: 1) to develop additional water resources; 2) to more efficiently use existing water resources; and 3) to improve quality of water in waterways.

b. Water Pollution

As the water in the Nile moves from Upper Egypt to Lower Egypt, it progressively becomes more polluted. In Aswan, water pollution levels are 250 parts per million (ppm) total dissolved solids (TDS); however, by the time the water reaches Lower Egypt and the end of the Delta, pollution stands at 800

[38] http://english.ahram.org.eg/NewsContent/3/12/41114/Business/Economy/Egypt-will-need-almost--per-cent-more-Nile-water-b.aspx
[39] Interview with Dr. Sameh Dawood Armanious. Faculty of Engineering, Ain Shams University, March 21, 2012.
[40] Doss, Mervat and Grant Milne (2001), "Water as an Economic Good: An Approach to the Egyptian Economy", *Beijer Workshop on "Property Rights Structures and Environmental Resource Management."*
[41] Intergovernmental Panel on Climate Change: Climate Change 2007: The Physical Science Basis. Summary for Policymakers

ppm TDS. The largest increase in pollution is from Cairo (400 ppm TDS) to the end of the Delta. [42] The water pollution damage to health and quality of life is estimated at about 0.9 percent of gross domestic product, while damage to ecosystems is about 0.1 percent of GDP.[43] Although major water quality problems are still limited to specific locations, rapid population growth, industrialization, and increasing use of agricultural inputs are all taxing the country's ability to deliver clean water to multiple users.

One million hectares in the irrigated areas suffer from salinization problems, water logging and sodicity.[44] The majority of salt-affected soils are located in the northern-central part of the Nile Delta and on its eastern and western sides. Increased attention is being given to the improvement of salt-affected soils, since they are potentially productive and require less investment, effort, and time for restoring their productivity, than the reclamation of new land.[45]

While there are several contributors to the water pollution in the Nile, there are two main sources of pollution. The first main contributor comes from untreated, industrial waste-water,[46] which is heavy in metal residue and contributes significantly to the pollution levels particularly in the Nile Delta. The Ministry of Environment certifies companies to ensure they treat water before releasing it into the Nile. Theoretically, the company must pay fines and is eventually shutdown if it does not treat its water. While 60 to 70 percent of the companies treat their water, these are mostly government-owned companies that are forced to follow regulations. Most of the privately-owned companies do not treat their waste water, even though it is required by law. The Government of Egypt (GOE) can fine firms that break regulations and even close facilities if waste water remains untreated; however, this would leads to lay-offs, which is not desired. As a result, it is difficult for the GOE to enforce its own rules and regulations. The government has created a program where it helps private companies treat water and then the companies are supposed to repay the Egyptian government back in installments. However, this only really targets large companies and usually smaller firms do not benefit from this program. In addition, the government has dedicated very limited money to this program so treatment assistance is limited.[47]

The second main source of pollution is agricultural run-off. Chemicals and fertilizers used in agriculture eventually enters the irrigation system and returns to the Nile.[48] Potential water quality pollutants from agriculture are salts, phosphorus, nitrogen, pesticides and pathogens. Table 2 contains the amounts of various fertilizers used in Egypt in 2009. Egypt currently applies the 4th largest amount of fertilizer per hectare in the world (724 kg/hectare).[49]

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[42] Interview with Dr. Sameh Dawood Armanious. Faculty of Engineering, Ain Shams University, March 21, 2012.
[43] World Bank (2007) Making the Most of Scarcity: Accountability for Better Water Management Results in the Middle East and North Africa. Middle East and North African (MENA) Development Report (Washington, DC: The World Bank).
[44] Sodicity refers specifically to the amount of sodium present in irrigation water
[45] Abdel-Dayem, Safwat (2011) 'Water Quality Management in Egypt', International Journal of Water Resources Development, 27: 1, 181 — 202
[46] Egypt produces about 10 billion cubic meters of wastewater, at varying levels of treatment, which most goes to the water system.
[47] Interview with Dr. Sameh Dawood Armanious. Faculty of Engineering, Ain Shams University, March 21, 2012.
[48] Interview with Dr. Sameh Dawood Armanious. Faculty of Engineering, Ain Shams University, March 21, 2012.
[49] http://data.worldbank.org/indicator/AG.CON.FERT.ZS\).

Table 2: 2009 Fertilizer Usage in Egypt	
Fertilizer	**Amount (,000 tons)**
Ammonium Nitrate	426
Ammonium Phosphate	0.2
Ammonium Sulfate	35
N- NPK compound	32
Urea	700
Ammonium Phosphate	1
P-NPK	10
Single superphosphate	134
Triple superphosphate	5
Potash/PK compound	10
Potash/Potassium Sulfate	40
Total	**1,393.2**
Source: International Fertilizer Industry Association, 2009. http://www.fertilizer.org/ifa/ifadata/search	

c. Water Efficiency

The current water use efficiency in Egypt is 51 percent according to the UN Food and Agriculture Organization (FAO). Much of the 55 billion cubic meters of water received annually from the Nile goes to waste due to inefficient flood irrigation methods. All farmers on old lands along the Nile practice flood irrigation techniques that are only 40 to 50 percent efficient, which significantly contributes to water inefficiencies. New irrigation techniques would increase efficiency to 60 percent; however, sprinkler irrigation and drip irrigation are the most effective with 80 and 90 to 95 percent efficiency rates respectively.[50] Advanced irrigation techniques, such as pivot systems that sprinkle water more efficiently, would mean more water available for land reclamation. American University's Desert Development Center (DDC) tested the drip irrigation method on one of its projects and found that not only did it save 30-40 percent of water usage, crop yields doubled. Converting one acre of land from flood irrigation to drip irrigation costs just over LE 3,000 (USD 500) and is clearly a cost-effective investment, yet because of difficulty in access to finance combined with small fragmented land holdings, this solution is not realistic.[51]

Consequently, drip irrigation has become very important in helping Egypt manage its water supply to better meet demand. Out of the 8.3 million feddans of land that is currently irrigated, 25 percent of the land has a drip irrigation system; mainly in new lands. Most of the old land use inefficient flood irrigation systems. Currently, the GOE is promoting the use of drip irrigation onto all reclaimed lands prior to approving the final land titles to investors. However, small farmers do not have access to such irrigation technology mostly because of the costs associated with implementing such a system are too large relative to the size of their land holding.[52] By using inefficient irrigation techniques (i.e., flood irrigation), farmers are depleting essential nutrients from their soil, deteriorating soil fertility, increasing drainage problems and high ground water levels, and even diminishing harvest levels.

The key factor driving the inefficient use of water among Egypt's farmers is the government set price of zero. Farmers pay nothing for irrigation water in Egypt; rather they only pay taxes on their land. However these are minimal fees since the irrigation law of 1984 has not been amended to increase the amount of tax. Farmers therefore have little incentive either to conserve water or safeguard its quality, thus leading to overuse and degradation. In Egypt, there is presently an excessive reliance on central government for

[50] Aref, Amr, Agricultural Reform, Again. *Business Times*, December, 2011.
[51] Christensen, Scott. *USAID Upper Egypt Advisory Services*. August 2011
[52] Interview with Dr. Sameh Dawood Armanious. Faculty of Engineering, Ain Shams University, March 21, 2012.

water and wastewater services. Devolution of power to local government might improve participatory efforts to manage water resources and strengthen coordination between sectors, local government, and institutions. Opportunities for partnerships between the public and private sectors for water supply and treatment also need to be explored.

Establishing effective and active Water User Associations (WUA) is an effective way of improving water use efficiency, involving farmers in the water use decision making process, and improving service quality. When farmers lack control of the timing and quantities of water supply, they irrigate too soon and apply too much water.[53] *Allowing farmers to participate in decision making also improves their willingness to pay water charges.* To date, USAID has helped form 1,222 WUAs covering over 40 percent of Egypt's agriculture land. These associations need to be empowered because there is a planned full transfer of the management of the irrigation system to them (according to the policy reform benchmarks developed by the USAID/APRP Program (1995 to 2000).[54]

The availability, pollution levels, and efficiency are all equally important to both small-holder farmers and agri-businesses. Without access to an abundant, clean water source the industry cannot thrive. In addition, by using inefficient irrigation techniques (i.e., flood irrigation), farmers are depleting essential nutrients from their soil and even diminishing harvest levels. While water is currently not a binding constraint for agriculture investment due to the short to medium run availability of flood irrigation techniques, unless policies are reformed and effectively enforced, water availability will become much more than just a binding constraint, it could result in famine. The more fundamental identified binding constraints are poorly functioning FAs and poor government policies which directly lead to inefficient water usage.

C. Physical Capital

1. Production Inputs

Egyptian agriculture is characterized by low share of owned physical capital stock. Farmers usually rent the services of pumps, tractors, threshers and other equipment, either against cash payments, or exceptionally exchanging machinery services for human labor services.[55]

Upper Egypt tends to be dominated by producers with extra small and small farm size that are mainly engaged in cultivation of traditional crops. Farmers in this region are likely to experience shortage in essential factors of production, primarily capital and material inputs, compared to Lower Egypt farmers. According to the Agricultural Farm Income Survey (AFIS) 2003/2004, total variable costs of production per feddan in Upper Egypt (LE 1,367.8) exceed total costs per feddan in Lower Egypt (LE 1,263) by around 8.3 percent. This difference arises mainly because of differences in cropping pattern, in quality and accessibility of other factors of production as well as in prices of other intermediate inputs.[56]

On average, approximately 25 to 30 percent of all crops are lost as a result of poor post-harvest handling; for value-chains such as tomatoes the losses can be greater than 60 percent.[57] Post-harvest lost is generally the result of a lack of access to capital equipment and is a particularly important constraint for Upper

[53] Martin Hvidt: Water resource planning in Egypt, in: Eric Watkins (Editor):The Middle Eastern Environment, ISBN 10: 1-898565-03-1, 1995
[54] Interview with Wafaa Faltaous, Water Resource Management Specialist, USAID/Egypt.
[55] ibid, 47
[56] Ibid, 47
[57] Interview with Mohsen El Batran. Agricultural Research Institute, March 26, 2012.

Egypt's farmers who lose 20 percent of their fruits and 40 percent of their vegetables in the process of transporting their produce from the farm to wholesalers.[58] Post-harvest loss is high for small-holder farmers for three primary reasons: 1) the lack of proper on-farm equipment; 2) the lack of cold storage trucks; and 3) proper cooling facilities.

Time is an important factor when harvesting crops and small-holder farmers also do not have access to proper cooling facilities and trucks with cold storage to transport crops, hampering efficient distribution of produce and contributing to post-harvest loses. Instead, produce is packed and stored in basic wooden cages without provision for fragile agricultural produce. To compound this issue, most local markets for produce (especially outside the city) are open-air markets, where crops are displayed under the sun where they are highly impacted by weather conditions and pollution.[59]

The lack of harvesting equipment, cold storage trucks, and cooling facilities is a constraint for small-holder farmers because it lowers productivity and creates post-harvest loses, thereby lowering returns to farmers and investors. Yet poorly functioning FAs and cooperatives as well as land fragmentation are the ultimate reason why small-holder farmers do not have access to more productive levels of capital equipment. If small holder farmers could achieve a greater scale of operations and benefit from better coordination, it would increase their access and willingness to invest in needed capital equipment and infrastructure.

2. Water

Egypt has the second largest and most complex irrigation/drainage system in the world. Egypt has a very old irrigation system that consists of 50,000 kilometers of canals and drains. This system (canal and drainage cross sections, structures, lining canals, land leveling, modification of irrigation basins, off-takes, installation of water measurement devices and control structures, modernization of pump stations through replacing existing old and dilapidated station, etc.) needs rehabilitation.

The Ministry of Water Resources and Irrigation (MWRI) does not have enough financial resources to rehabilitate the system and increase its efficiency. Currently, efficiency of the system amounts to 51 percent due to seepage and evaporation. Moreover, the responsibility of the various parts of the irrigation system falls under different ministries. However, who bears responsibility for what is not always clear making even regular maintenance of system difficult. For example, the Ministry of Agriculture and Land Reclamation (MALR) is responsible for maintenance and advisory services from the maska level (interface canal) to the farm and MWRI is responsible to maintain the network of canals (e.g. drainage and irrigation). However, there no clear differentiation of the roles between both ministries.[60]

The issue of water and the need for access to irrigation is of critical importance. As discussed above, most farmers in old lands rely on flood irrigation that, while inefficient, still satisfies basic requirements. While improving irrigation infrastructure would improve efficiency, it is not currently a binding constraint to private investment in agriculture.

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[58] World Bank 2006

[59] Interview with private stakeholder agribusinesses. Midwest Universities Consortium for International Activities. Cairo, Egypt, March 28, 2012 & *Egypt: Smallholder Contract Farming for High-Value and Organic Agricultural Exports.* International Fund for Agricultural Development, 2006.

[60] Interview with Dr. Hossam Fahmy, Vice President of the National Water Research Center.

3. Roads

Egypt's basic infrastructure is in place, which make improvements easier and faster to achieve. For example, rural accessibility in Egypt is 77 percent, eight percent higher than the world average.[61] Furthermore, in 2008, 86.9 percent of all roads in Egypt were paved, an increase from 81 percent in 2004.[62] However, poor quality road networks adversely affect product quality and increase product losses thereby increasing costs and reducing reliability of access to markets. The *Global Competitiveness Report* ranks Egypt 75/142 for "quality of road infrastructure".[63] The limited reliability of railways and waterways has led to a dominance of roads as the most used form of transportation. The poorest quality roads are found in Upper Egypt, which is the most highly dependent on agriculture for livelihoods in the region. In addition, basic infrastructure development in the reclaimed lands is behind schedule, making it more difficult for farmers to utilize efficiently.

The lack of good roads, particularly in Upper Egypt and to certain areas of reclaimed land in the desert is a constraint that pushes up costs of production and hence lowers the profitability of private investment. Since time is a factor during a harvest, poor roads also contribute to increased post-harvest losses. However, investment in road infrastructure will more likely follow improvements along other sections of the value-chain and the policy environment, rather than the other way around. Since other areas are more binding, investment in infrastructure improvements may not result in desired increases in private investment. For this reason, and given that Egypt does adequately well compared to its peers on standard indicators, we do not find infrastructure to be a binding constraint at this time.

IV. Low Appropriability

A. Government Failures

1. Microeconomic Risks

a. Research & Development (R&D)

There are several major constraints with regard to R&D including the lack of funding for R&D, the applicability of R&D, and the difficulties in attaining a patent. Research institutes include the Agricultural Research Center (ARC), the National Water Research Center (NWRC) (both of which are government run), and universities. However, R&D efforts are almost exclusively limited to public entities, with almost no participation by academic institutions or the private sector due to budgetary constraints.[64] In addition, more than 80 percent of researchers are based in Cairo, and do not have a visible presence in village-based research trials.

R&D efforts are not market driven and do not necessarily reflect the needs of the farmers. This is particularly relevant to small-holder farmers since agribusinesses have greater access to more resources and some are even beginning to fund their own R&D. The main research focus of public research

[61] "Beyond the Financial Crises: Competitiveness & Sustainable Development", *The Egypt Competitiveness Report*. Egyptian National Competitiveness Council, June 2009.
[62] "Roads Paved, % of Total Roads." World Bank Indicators, accessed April 1, 2012.
[63] The Global Competitiveness Report, 2011-2012. World Economic Forum, 2011.
[64] The National Water Resource Center charges for its services, and the fees for consultancy services are used to cover the consulting costs, and they also have national GOE budget, which is small and they use primarily for research. The private sector market for research in water is non-existent. Ninety-nine percent of the center's research is for public use and only 1 percent for private use. Interview with Dr. Hossam Fahmy, Vice President of the National Water Research Center.

institutions is on traditional crops (wheat, cotton, maize and sugarcane). There is a disconnect with regard to the focus of the research and the shift by increasing numbers of farmers to a more export oriented production system involving high-value crops. Nonetheless, research is not market driven and demand-based agriculture innovative research that produces appropriate, timely, inexpensive, and simple technologies is limited. Research institutions are only in their infancy in addressing these issues and understanding the needs of the farmers.[65]

Lastly, it can take 15 years (or longer) to receive a patent from the MALR. This particularly affects agribusinesses since they cannot sell their product on the market until it is first patented by MALR and then registered with PBDAC. For example, if an agribusiness develops a new seed, they have to first patent the seed before they can register it with PBDAC and sell the seed commercially. A holding company for a seed manufacturer detailed its attempts at receiving patents for new seed types: the MALR requires at least seven trials of the new seed and, at times, you have only trial year per season (once a year). After successful completion of the seven trials, the MALR begins a series of formal testing that lasts at least four years. During the first of the four years, the MALR tests the agricultural input in damaged areas to determine the resilience of the seed. If the seed passes the first year of testing, then during the following three years, the MALR plants seeds in about 75 percent of governorates to see how the seed grows in different climates. If at any point in time, the seed does not meet the standards set by the MALR, they must start the patent process again from the beginning.[66]

R&D is an important factor in the development of the agricultural sector. Ensuring that farmers are using the most modern techniques and inputs contribute to efficient production and increased profits, thereby increased private investment. While the lack of funding and market driven R&D affects agribusinesses, it predominately affects small-farmers who cannot invest in their own R&D centers. Furthermore, the lack of R&D on non-traditional crops inhibits farmers from changing their crop production to include potentially higher-valued fruits and vegetables. Nonetheless, given that larger private agribusinesses have established their own R&D units in Egypt, and the ability to simply import new seed and other technologies from abroad, relative to other constraints R&D is not considered to be binding here. Although not driven by market needs, R&D is still being performed. The most pressing issue for agribusiness appears to be the time and cost of regulatory approval for new seed technologies and other innovations, yet this annoyance also cannot be considered a binding constraint to investment in the sector as well connected businesses can normally find ways to speed up the process.

b. Extension Services

One of the greatest challenges with regard to effective government provision of extension services is being able to scale up research being done and make it applicable to farmers. This requires an appropriate amount of extension agents who are properly trained. Yet many issues exist with regard to the quantity and quality of services being offered by GOE-funded extension and the ability to affect behavioral change among farmers so they are willing to adopt modern farming technologies capable of enhancing crop yields. Government extension workers lack proper education, technical skills, and appropriate qualifications to undertake extension activities effectively and efficiently and the number available are insufficient to impact remote areas. Extension workers also lack access to complementary facilities such as transport and critical regional data resulting in poorly targeted their services. While women play an important role in the farming operations by their extensive participation in crop cultivation, pest control and harvesting, capacity building programs are not available for women extension agents.[67]

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[65] *Egypt: Smallholder contract farming for high-value and organic agricultural exports.* International Fund for Agricultural Development, 2006.
[66] Interview with Omar Adel El Maghawry, Cairo Financial Hold, April 5, 2012.
[67] Threats and Challenges to Sustainable Agriculture and Rural Development in Egypt, Shalaby, M.Y. et al, 2011, the Journal of Animal Plants and Sciences.

While the government extension system in Egypt has been significantly diminished and is largely ineffective, the void has been partially filled by outreach units of private sector companies. Exporters, seed companies, and suppliers have been known to hire extension staff to work with farmers on the introduction of new varieties, cultivation practices, and inputs for particular issues.[68] Lastly, extension services aimed to respond to the demand for specific advisory services relating to non-traditional high-value crops is growing. For example, the cropping pattern in Egypt has evolved towards more diversification. Contribution of fruits and vegetables to agricultural production, particularly in newly reclaimed lands, increased at the expense of traditional field crops. Cropped area of fruits and vegetables rose from 3.1 and 9.3 percent in 1980 to 8.5 and 13.1 percent respectively in 2007, while the area of field crops receded from 87.6 to 78.3 percent. These developments have been accompanied by significant improvement in land productivity of most important crops, particularly grains and sugar crops. Land productivity of vegetable crops showed an impressive growth as a result of improving irrigation and fertilizer application technologies. Yields of fruit crops also increased, quality improved, and supply duration lengthened. [69] [70]

However, Hala Abou-Ali and Hanaa Kheir-El-Din (2010) found that "national efficiency indices for Egypt revealed considerable technical inefficiency in crop production in 2003/04, which if avoided, could have led to savings of up to 31.4 percent of inputs used. Furthermore, had all villages produced at the technically efficient frontier, this may have led to up to a 45 percent increase in crop production." And despite generally positive developments in productivity, in view of increasing water scarcity, significant increases in cultivated area (horizontal extension are not expected. Prospects for significant land yield increases (vertical extension), given the prevailing technologies, are also limited.[71] For small farmers who mostly focus on traditional crops, needs in this area are still significant, as yields per feddan of berseem, cotton and oil plants have stagnated, leading to significant loss of relative importance.[72]

Extension services are a valuable tool with regard to the development of the agricultural sector; however, this mostly affects small-holder farmers as larger agribusinesses have resources to either access information elsewhere or scale-up the R&D that some businesses finance internally. Nonetheless, having trained, quality extension agents on the market that target small-holder farmer needs is vital in ensuring that farmers who do not have the resources to access such services elsewhere are using the most modern techniques and inputs. This would directly contribute to more efficient production and increased profits for small-holder farmers. In addition, this would also benefit agribusinesses that rely on small farmers to fill crop quotas. However, given the relatively active and efficient private sector led extension services and generally positive recent increases in land productivity, overall, this cannot be considered a binding constraint to private investment. Furthermore, according to the conclusions of Hala Abou-Ali and Hanaa Kheir-El-Din (2010), a major source of inefficiency in production relates back not primarily to extension services, but rather land fragmentation as noted above.

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[68] Christensen, Scott. *USAID Upper Egypt Advisory Services*. August 2011

[69] MALR (2009)

[70] For wheat, yields have doubled from 1.36 to 2.72 tons per feddan between 1980 and 2007; for rice, yields rose by 67 percent over the same period, in addition to the introduction of short duration varieties which decreased water consumption of this crop by 25 percent; for maize, yields rose by around 90 percent. For sugar cane, yields increased by 44 percent, reaching the highest levels worldwide; for sugar beets, yields rose by 80 percent from 1980 to 2007.

[71] Abou-Ali, Hala and Hanaa Kheir-El-Din (2010), Economic Efficiency of Crop Production in Egypt. *Egyptian Center for Economic Studies* Working Paper.

[72] *Egypt: Smallholder contract farming for high-value and organic agricultural exports.* International Fund for Agricultural Development, 2006.

c. *Farmer Associations and Cooperatives*

There are three types of farmer associations (FAs) that exist in Egypt: associations which are registered under the MALR, MWRI[73], or the Ministry of Social Solidarity. FAs mainly sell agricultural inputs to farmers and provide extension services and although they are technically private NGO-type organizations, and maintain their own budgets, FAs are indirectly controlled by the government through whichever ministry they are registered under. The FA's lack of independence from the state is a major source of inefficiency. The main reason for this is that FAs function more as a mechanism to control the supply of political patronage goods such as access to subsidized inputs (fertilizer, seeds, etc.) and are not effective at providing services which are directly responsive to the needs of the private sector and competitive markets. [74]

When farmers (or middle men) harvest crops, they tend to go through traders but are usually offered below market prices for crops. Most farmers sell their produce to traders for several reasons. First, crops are often tied to credit obtained from the traders because farmers do not have the necessary access to financing for harvest and transport. Second, farmers do not have the skills required to deal directly with wholesalers which are highly oligarchical and rarely enforce legal floor prices for crops. Third, farmers often lack the crop volume to obtain favorable prices because production tends to be highly fragmented in Egypt, which is apparent by the high number of small farmers. The wholesalers, in turn, sell the produce by the kilogram to small home stalls, street stalls, and small rudimentary grocery stores. Stronger FAs and cooperatives would mitigate these issues by facilitating collective action among farmers in order to increase prices received, increase access to credit, and reduce the fragmentation of production.

Cooperatives are government-owned types of associations formed under the cooperatives law to perform functions similar to FAs. There are two types of cooperatives depending on geographic location: agrarian reform cooperatives, and credit cooperatives in new and old land. Yet the cooperatives law is accused of being hopelessly out of date and in need of reform as state interference and control lowers efficiency and leads cooperatives to fill political rather than market needs. Both types of associations need to be reoriented to fill the needs of small farmers and assist them to enter larger scale commercial agricultural value chains.

Every farmer must be part of a cooperative in order to get access to subsidized inputs, thereby allowing the government increased regulatory control. Inputs used in agricultural production are mainly supplied through PBDAC, the small agro-input stores or cooperatives in nearly all villages. Egypt has a long tradition of using chemical fertilizers and improved seed is available, often at subsidized prices. However, supplies of subsided inputs are limited and do not necessarily reflect the needs of optimum production.

In sum, the lack of strong, effective FAs and agricultural cooperatives predominately affects small-holder farmers in old and new lands by limiting their access to the following: 1) finance; 2) assistance in

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[73] FAs formed by MWRI are called Water Users' Associations and are working toward reform by increasing participation and the decentralization of management of water resources. MWRI is aiming to increase farmer participation in the management of the irrigation system to increase water use efficiency and productivity in order to achieve equitable allocation of water resources among and along branch canals. To help facilitate farmer participation, MWRI is forming non-governmental organizations, to be managed by local representatives who will work with MWRI to manage water resources thereby optimizing water-use. These organizations work directly with secondary canals and operate under the umbrella, Branch Canal Water Users Associations.[73] In addition, MWRI is restricting production of some cash intensive crops such as rice and sugar cane in an effort to rationalize water because of pressure from upstream countries to use its share of the Nile River's waters more sparingly. According to official data, around 20 percent of the Egyptian water quota goes on rice production, which is now banned south of Cairo and restricted to certain regions of the delta, Egypt's traditional bread basket. http://www.independent.co.uk/life-style/health-and-families/rice-production-withers-as-egypt-diverts-vital-water-supply-2146290.html

[74] Interview with Dr. Siddik, March 27, 2012.

negotiating a more favorable price for a farmer's crops[75]; 3) information; 4) efficient extension services (thereby improving human capital skills); 5) access to markets (contract with agribusinesses); and 6) economies of scale so that small-holder farmers (who are constrained by land fragmentation) can access cold storage trucks and cooling facilities, machinery, drip irrigation.[76]

Given the above, more efficient FAs and cooperatives could potentially play a vital role in the agricultural sector, giving smallholder farmers access to resources they never had, stimulating private investment and reinforcing their role as an entrepreneurs in the agricultural sector. Indeed, many of the constraints detailed in this paper relate back to functions that effective FAs and cooperatives could perform to alleviate these problems. Consequently, poorly functioning FAs and cooperatives, due largely to their politicization and general lack of capacity, are considered to be the most significant binding constraint for small-holder farmers in the sector.

d. Standards

Standards for all products are established by the Egyptian Organization for Standardization and Quality Control (EOS) in the Ministry of Trade and Industry. Verification of compliance is the responsibility of agencies affiliated with various ministries, including the Ministry of Health, the MALR and, for imported goods, General Organization for Exports and Imports Control (GOEIC) in the Ministry of Trade and Industry.

For agribusiness exporters, the share of agriculture in exports is substantial, accounting for 11.8 percent of total export of goods earnings and 20.5 percent of non-petroleum exports.[77] Yet Egypt has the potential to fill niche organic markets, especially to Europe, which is Egypt's largest market (Appendix C).[78] However, exports of fruits, vegetables, and grains are challenging because of lack of information on standards requirements and traceability. During a meeting with private sector stakeholders, the biggest challenge identified was the issue of traceability. Certain documents are required to export goods on the international market, especially to Europe. Business that contract with small-holder farmers have difficulties exporting because food processors often do not maintain documents provided by small-holder farmers and often small holders themselves do not maintain documents on their inputs. This is a clear market failure to provide needed information along the supply chain.

Compliance with international standards and good agricultural practices is critical to compete in domestic and international markets not only for large-scale agribusinesses but also for

[75] Egypt: Smallholder Contract Farming for High-Value and Organic Agricultural Exports. International Fund for Agricultural Development, 2006.

[76] USAID has funded an activity to work with the Ministry of Social Solidarity to improve their efficiency and the quality of the services they provide. The FAs registered within this Ministry charge a small fee to farmers for services and are therefore able to provide better quality extension services to farmers that are more sustainable. Furthermore, these FAs know how to better link with the sector and help create linkages for farmers on the market. Egypt: Smallholder Contract Farming for High-Value and Organic Agricultural Exports. International Fund for Agricultural Development, 2006.

[77] Hanaa Kheir-El-Din and Heba El-Laithy (2009), "Agricultural Productivity Growth and Employment in Egypt," ECES Working Papers.

[78] The EU and Egypt have made significant progress in freeing up trade between them, with an Association Agreement between EU and Egypt going into effect in 2004. Under the agreement the EU-Egypt bilateral trade has nearly doubled. Subsequent negotiations to further increase market access in bilateral farm trade were concluded in 2009 and an agreement on agricultural, processed agricultural and fisheries products went into effect in June 1st, 2010. In FY 2010/11, Egypt exported 36 percent of total exports to the EU. Other major trading regions include Asia, which received 21 percent of total exports and other Arab countries, which received 13 percent. Egypt is now the third largest supplier of fruits and vegetables to the EU, after Morocco and Israel. In 2010, traditional field crops comprised approximately 64 percent of the total value of crop production in Egypt. Fruits, vegetables, and medicinal plants followed constituting 18 percent, 17 percent, and less than one percent of total value, respectively.

smallholders.[79] Implementation of GLOBALGAP (the most stringent international protocol) could improve the farm management practices of smallholders and certification is a tool for smallholders to access the global (European) market and to be integrated into the global supply chain. However, compliance with such standards remains a challenge as the farmers and GOE agencies do not have the capacity to comply with and enforce international traceability and food safety requirements. Egyptian green beans, oranges, peaches, pomegranates, strawberries and peppers are labeled as "high risk products" due to illegal or excessive pesticide residues.[80]

In addition, under the Sanitary and PhytoSanitary Agreement (SPS),[81] Egypt can impose whatever export standards it wishes. However, in imposing substantial export standards, it is effectively penalizing its exports by increasing their compliance costs. When time is critical, such as for perishable commodities, unjustified export inspection activity by government is not in the interests of export facilitation.[82] Alternatively, by lowering them, it will exclude itself from potential European markets with sticker standards. Many developing countries, including Egypt, are organized along traditional (pre-WTO SPS) lines. The effect of this is that the government does not have a clear focus on SPS issues and market access generally.

Egyptian tariff and non-tariff barriers adversely impact bilateral the trade of agricultural products; particularly with Europe. In Egypt, as in most countries, export standards are determined by the requirements of the importing country. However, Egypt does maintain a range of standards, some quality related, in addition to the requirements of the importing country.[83] Nonetheless, agribusinesses that export on the international market need to ensure that their products are compliant to the standards of the importing country, regardless of the standards imposed by the GOE. A transparent and compliant system for the export of goods is vital to maintaining the competitiveness of agricultural goods on the international market. In addition, the issue of traceability inhibits larger farmers and agribusinesses from working with small-holder farmers.[84] This both inhibits and constrains small-holder farmers and agribusinesses.[85]

The confusion over standards is a government failure to provide agribusinesses with critical market information that significantly reduces their export potential and ability to do business with smaller farmers. If these standards could be simplified and if the GOE could demonstrate that they are being enforced, it could greatly expand markets for Egyptian products and hence attract increased private

[79] Note – The two companies are Wadi Export Company which is fully integrated and producing 90% of its exports and is outsourcing only 10% from other medium/large farms and Aratco which is sourcing from other large citrus farms that also ready have the GLOBAL-GAP certification. Also citrus due to the minimum area required to produce profitably (more than five feddans) is not suitable for smallholders.

[80] The official control rate is currently set at 10 percent of Egyptian shipments arriving at EU ports of entry. Russia and some Arab Gulf countries have also set a stringent food safety system that is hindering exports and affecting the daily lives of the small growers.

[81] The SPS, is one of the World Trade Organization (WTO) agreements signed by Egypt. There are a number of obligations that Egypt has to fulfill to comply with the SPS agreement under the WTO. Examples of these obligations are: notifications to the member countries of any new measures, risk based analysis, and legal framework.

[82] During a meeting with private sector stakeholders, all agribusinesses that attended the meeting stated that they adhere to international standards that are accepted by the European Union and the United Arab Emirates. Interview with private stakeholder agribusinesses. Midwest Universities Consortium for International Activities. Cairo, Egypt, March 28, 2012

[83] Export inspection and certification at times involve MALR and Land Reclamation and its specialist expertise— for example a veterinary or plant scientist. In addition, GOEIC becomes involved when issues of quality are considered relevant.

[84] However, FAs could help remedy many of these issues by giving farmers resources to and therefore the ability to comply with traceability requirements. During a meeting, two of the largest citrus exporters to the European market in the Sharkiya region indicated that they prefer to buy from medium/large farmers that have the resources to obtain and maintain the certification than to purchase from small farmers.

[85] Technical Assistance for Policy Reform II & Assistance for Trade Reform.

capital. Therefore, lack of clear product standards and poor traceability is a binding constraint on agribusiness.

e. Government Policies

Private investment in the agriculture sector could be "crowded-out" in part by the public sector because the public sector bears a large degree of operational responsibilities and activities and is responsible for about 40 percent of the total investment in the sector. It is important to analyze the role of government in setting policy in the sector and the affect this could be having on the level of private investment in the sector.

i. Legislative Framework

Most sector laws were drafted in the 1950s and thus reflect socialist ideologies that no longer fit current government strategies. For example, there are restrictions on maximum amount of land a person, family, or company can own. In addition, federal legislation also gives farmers incentives to maintain small plots of land since farmers that own less than two feddans are exempt from property taxes. This is particularly distortionary given all of the inefficiencies linked to smaller than optimal scale discussed above.

Since much legislation is old and is no longer aligned with current government direction, this leads to inconsistency in enforcement, creating confusion. In addition, there is no comprehensive database of laws and decrees to which investors and sector participants can refer to understand sector legislation. This further inhibits investment due to risk of operating under legislatively ambiguous conditions.

The lack of legislative efficiency increases overheads, reduces accountability, and negatively affects the government's ability to effectively enhance sector performance. Duplication of some tasks in multiple, uncoordinated entities wastes resources. Fragmentation of other tasks among several entities leads to inefficiencies and also reduces accountability, especially since coordination is limited. The existence of multiple entities responsible for same strategic goals (such as export promotion or water resource optimization, etc.) seriously limits the ability of the sector to initiate or execute t needed initiatives and programs. Meanwhile the existence of public sector entities engaging in commercial activities (such as equipment rental, sales, and distribution of seeds and fertilizers, etc.) distracts government efforts away from conducting their core functions and crowds out the private sector, especially if such activities are conducted inefficiently and at subsidized rates.

The legislative framework underpinning the agricultural sector in Egypt is a binding constraint for the since operating in any market where policies and regulations are cumbersome and unclear significantly raises costs to the private sector. Modernizing legislation pertaining to the agricultural sector is critical for sector growth. Furthermore, accessibility and transparency and coordination among the various government entities involved in the sector is also needed so that private sector investors understand the environment within which they operate.

ii. Subsidies, Price Guarantees, and Barriers to Trade

The GOE imposes several types of market distorting policies to make basic needs affordable to consumers and stimulate domestic food production. These policies include subsidies, price guarantees of domestic commodities, and export bans. In addition, the GOE does not effectively use markets to assign a monetary/market value to water, even though Egypt is a water-scare country.

To help lower production costs, inputs necessary for agricultural production, such as fertilizers, seeds, and pesticides are subsidized. However, government ownership of most fertilizer factories and the distribution of fertilizers through PBDAC hamper the development of a well-functioning competitive market and result in fertilizers' prices being sometimes 40 percent above world market prices. Recent bans on urea

and nitrogen are also hampering access to key fertilizers and pesticides. Lastly, the GOE also provides subsidized agricultural services such as soil testing and land improvement services. Subsidies play a direct role in guiding the behavior of sector stakeholders by altering market prices and influencing production decisions.[86]

The private sector's share in seed distribution had increased to a considerable degree but remains very low for controlled and traditional crops. Horticulture and organic products' seed distribution is totally provided by the private sector with no interference from the government. In addition, the private sector is most involved in agricultural machinery and equipment, with firms involved in importation, manufacturing, assembly, distribution and after-sale service. The majority of pesticides used on fruits and vegetables are provided by the private sector. However, the private sector's role in pesticides trade is limited by Egyptian law. Importing or distributing pesticides for "controlled" crops (cotton and sugarcane) is reserved for the public sector.[87]

In order to promote Egypt's "food self- sufficiency" through the targeting of strategic crops, the GOE offers farmers guaranteed prices for the crops and seeds of wheat,[88] maize, sugarcane, sugar beet, and cotton.[89] The exact time that the MALR announces the price guarantee varies year to year, causing significant constraints to planning. If the price is announced after the harvest season, companies do not know the market in which they are dealing in during the actual harvest so cannot make informed decisions about what to produce and how much. However, when the MALR sets the price at the beginning of the season, agribusinesses can make more informed choices about production and increased production and sales.[90]

The increase in international demand for rice in the last few years has pushed market prices up, resulting in larger quantities of rice exports from 700,000 tons in 2006 to one million tons in 2007. In April 2008, the GOE banned the export of rice in an aim to secure food supplies and reduce prices on the domestic market. The ban resulted in a drop in domestic rice prices by almost USD 100 per ton to USD 330. The rice ban was lifted in October 2011; however, the ban depicts the extent of the government's involvement in regulating the prices of key commodities and its ability to manipulate and control the market, often for political rather than economic benefits. Another example of the GOE's desire to control the market came in late 2011 with an import ban on raw cotton in order to increase the demand for local cotton production, especially short and medium staple cotton from Upper Egypt.

Food Subsidies not efficient and create a significant burden on the GOE's finances. More than three quarters of Egypt's 80 million people can buy, via their ration cards, saucer-sized flat loaves of 130 grams at 5 piasters (less than 1 U.S. cent) each. In the FY10/11, the GOE spent about 33 billion Egyptian pounds (USD 5.5 billion) on wheat, sugar, rice and food oil subsidies.[91] But an estimated two-thirds of beneficiaries are not poor. Bread and flour shortages occur, allegedly, because significant portions of the heavily subsidized wheat and flour that should be used for making five-piaster bread are instead being

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[86] "Beyond the Financial Crises: Competitiveness & Sustainable Development", *The Egypt Competitiveness Report*. Egyptian National Competitiveness Council, June 2009.

[87] Goueily and Miniawy, Food and Agricultural Policies in Egypt, CEHIAM Options Mediterraneennes, Vol. 4 http://ressources.ciheam.org/om/pdf/c07/94400054.pdf

[88] It is important to note that the procurement prices offered by the government are the most important prices affecting the production of wheat, as the government buys approximately 30 percent of the total locally produced wheat. Egypt Food & Agribusiness Section. CFH Private Equity, April 2012.

89 The MALR price setting is based off of the international market and Egyptian price for food.

[90] A seed company interviewed stated that when the MALR announces the price of a crop at the beginning of the season, it produces (by 30 percent on average) more and thereby generates more profits. Interview with Omar Adel El Maghawry, Cairo Financial Hold, April 5, 2012.

[91] http://www.reuters.com/article/2011/09/28/us-egypt-food-idUSTRE78R2SD20110928

sold by millers and bakers on the open market at a healthy profit.[92] But the financial pressure is not the only cost of the subsidy system; subsidies have distorted Egypt's agriculture. For example, bread is so cheap that it is often used as animal feed. Egyptians consume about 180 to 200 kg of wheat a year, compared to an estimated 51 kg for Mexicans, mainly due to the price distortions. In total, Egypt consumes about 14 million tons of wheat each year but must import about 60 percent of that amount. [93]

When the prices offered for local seed cotton had dropped in line with international prices, Egyptian cotton farmers were beginning to talk of large scale demonstrations in response. Therefore, the GOE approved financial subsidies for farmers and spinners to bridge the price gap between the international and local prices. Cotton production was up 37 percent in 2011 due to high prices in 2010 and GOE announcing high indicative pricing before planting season. Most US upland cotton and Greek cotton were restricted during this time. The ban impacted the local Egyptian textile industry which uses short/medium staple cotton for their products. However, on March 18, 2012, MALR permitted the importation of cotton from all origins. During the ban, most of the locally produced cotton was purchased from farmers.[94]

The GOE manipulates the market so that farmers grow preferred staple crops and its ability to set prices in this sector is burdensome. Consequently, reliance on the public sector services places a heavy financial and administrative burden on the state and results in the limited capacity for land improvement services. In addition, by imposing bans on the export of rice and cotton and not allowing the price of water to be set by markets, the GOE also artificially props up an agricultural commodities in which Egypt does not have a comparative advantage.[95] Subsidies, price guarantees, and barriers to trade are all binding constraints that relate to poor policy. Egypt clearly cannot become "self-sufficient" in food production and such a goal is unrealistic. Egypt rather needs to focus on a few agricultural crops where it has a comparative advantage and rely on open trade to fill the remaining demand. Yet policies are explicitly geared with a goal of "self-sufficiency" in production and distribution polices pursue political rather than economic or need-based goals. Markets cannot effectively operate in an environment with such a high level of policy distortions.

iii. Property Rights

Eighty-three percent of all land in Egypt is not titled. In the old lands, a title may have existed many generations ago, but when the land changed hands (i.e. to a relative), the title was never updated. Most people have a piece of paper that says or proves somehow that they own the land; however, this document is not generally recognized by major banks and so one cannot take out credit against the land, except at PDAC. The reason for this is that there is no streamlined process to acquire land. There are different ministries at the national level that handle titles, as well as governorates who issue titles. There are different ways to acquire a title, which complicates the process, corruption and organization further hinders the process.[96] Policies and regulations to receive titles to land are unclear and result in waiting periods of up to 10 to 15 years.[97]

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[92] Mills produce subsidized flour for the government for as little as LE 160 per ton, while its market value has been around LE 2,000.

[93] http://www.aljazeera.com/indepth/opinion/2012/03/201237104725536741.html

[94] US Department of Agriculture, 2011 & 2012.
http://gain.fas.usda.gov/Recent%20GAIN%20Publications/Cotton%20imports%20banned%20in%20Egypt_Cairo_Egypt_10-27-2011.pdf
http://gain.fas.usda.gov/Recent%20GAIN%20Publications/Egypt%E2%80%99s%20Imports%20Cotton%20Ban%20Lifted_Cairo_Egypt_3-20-2012.pdf

[95] Soheir Aboulenein, Heba El-Laithy, Omneia Helmy, Hanaa Kheir-El-Din and Dina Mandour. "Impact of the Global Food Price Shock on the Poor in Egypt." Egyptian Center for Economic Studies, May 2010.

[96] Interview with Omar Adel El Maghawry, Cairo Financial Hold, April 5, 2012.

[97] *Egypt: Smallholder contract farming for high-value and organic agricultural exports.* International Fund for Agricultural Development, 2006.

Hernando De Soto (2004) documented the burdensome procedures and high costs associated with land tenure in Egypt and argued that insecure property rights and informality was the most pressing constraint to Egypt's economy. Informality dominates Egypt's SME sector, as non-registered firms account for an estimated 82 percent of business units. [98] Despite their large numbers, SMEs account for only 10 percent of total capital accumulation in Egypt,[99] demonstrating their relatively low contribution to Egyptian GDP, currently estimated at 25 percent.[100] Many of these informal firms are concentrated in the agribusiness sector. Without secure title to land, incentives for investment are greatly reduced and access to finance becomes near impossible without this source of secure collateral.

However, even though their titles may not be secure, most small holder farmers have owned their land for generations, and their ownership, while not entirely formal, is generally well recognized by the authorizes. For agribusinesses in the reclaimed lands, while acquiring a formal title may take years, once the auction for the land is won, it is generally considered safe to invest in the development of the property while waiting for the title. Therefore, while likely a significant deterrent to private investment in the sector, given the "workarounds" developed by investors and general acceptance of ownership in the smallholder "old lands", we don't consider property rights to be binding on this sector at this time.

iv. Contract Enforcement

Contract enforcement is a major binding constraint in the agricultural sector that inhibits commercialized farming. This problem is well documented in the case of Egypt. According to the World Bank's *Doing Business* indicators, Egypt ranks close to last in "Enforcing Contracts" (currently 147th of 183 countries).[101] According to these indicators, it takes over 1,000 days on average to enforce a contract in Egypt's court system, compared to a Middle East/North Africa average of 658 days and an Organization for Economic Co-operation and Development (OECD) average of 518 days. Enforcing a contract also costs over a quarter of the total claim, compared with a regional average of 24 percent and an OECD average of 20 percent.

Larger farms, at times, make agreements with small farmers to purchase their crops. However, if the market price of the crop changes and either farmer believes that they can benefit elsewhere, then they can break the contract with no consequence. The inability of the GOE to enforce contract agreements inhibits the commercialization of the agricultural sector. New institutional arrangements should be developed that are able to enforce disputes between farmers and agribusinesses.[102] Such institutions would contribute significantly to the rapid development of contract farming and the establishment of farmer associations.[103]

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[98] OECD, *Business Climate Development Strategy, Egypt*, June 2010

[99] According to a survey conducted by the (NILEX) (Nile Stock Exchange for growing medium and small companies).

[100] GAFI (2008). Available at: *www.gafinet.org/English/.../SMIs%20GAFI%20Website.pptx*

[101] www.doingbusiness.org

[102] Contract farming is used by the GDA as one of the key tools to strengthen linkages between downstream value-chain (processors) and upstream value-chain (farmers) in Upper Egypt and Nubaria area. GDA promotes the concept of contract farming through trainings and town hall meetings with the smallholder farmers. The smallholder farmers are keen to owner their commitments of the contract and deliver tomatoes to the processors even when market prices are higher than the contract prices. Several hundreds of tons shipped to the processing facilities regardless the level of market prices of tomatoes. To encourage farmers to owner their contracts GDA introduced flexible contracting system where the small farmers is used to supply only 50 percent of the yield to the processor while they can hedging with the other half. This flexible system was successful. According to the contractual mechanism the processors supply smallholder farmers with seedlings as advance credit and to ensure the quality (conversion ratio and color) of the final product. We extended the system to use the contract as financial instrument (collateral) to access finance from the non-traditional financial institutions (Assyut Business Association - ABA) where they access more than LE 3 million credits. Total area under contract farming is up to 6,000 Feddans over the course of the project.

[103] *Egypt: Smallholder contract farming for high-value and organic agricultural exports*. International Fund for Agricultural Development, 2006.

We believe this to be a significant binding constraint for both agribusinesses and small-holder farmers. Both can withdraw from contracts without any repercussions. To create strong linkages between small-holder farmers and agribusinesses, contracts need to be enforced. Only through this enforcement, will the agricultural sector expand and develop.

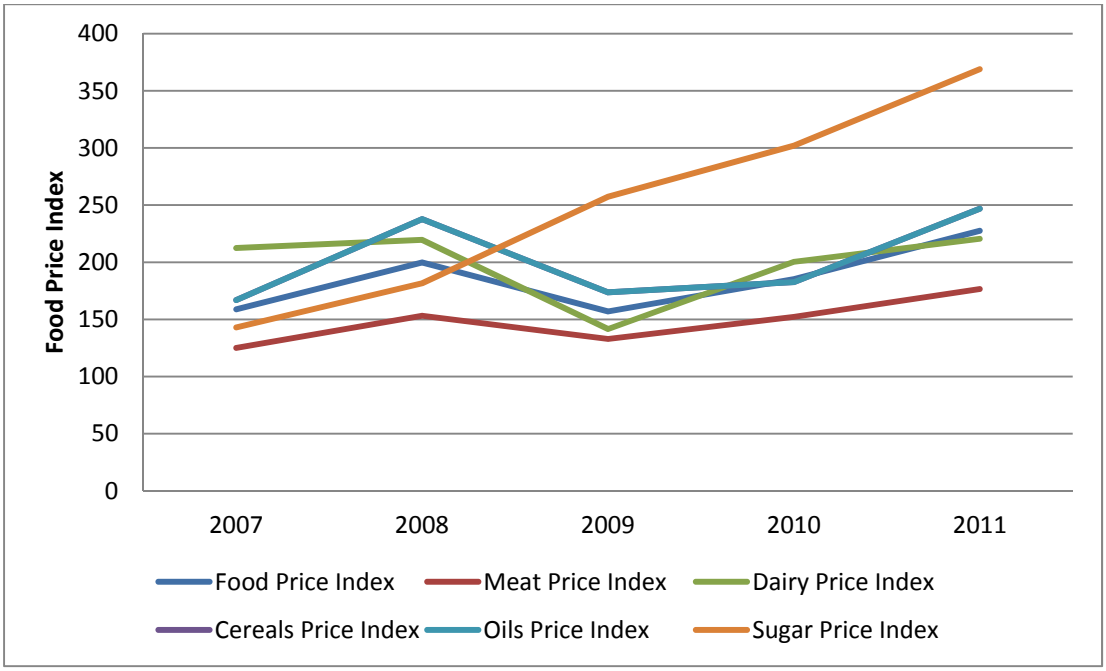
2. Macroeconomic Risks

a. Food Price and exchange rate risks

International crop prices in recent years have risen, in part, spurred by historically flat agriculture production rates in combination with rising demand for food. Growth in food demand is primarily influenced by the growing incomes of populations within heavily-populated emerging economies, such as China and India. It is also influenced by the coupling of the agriculture sector with the energy industry, instigated by the use of agricultural produce as an alternative source of energy. A food price index maintained by the FAO, shows that since 2000, food prices have been increasing (Figure 3). From 2007 to 2011, the FAO food price index has increased by 43 percent from 158.7 in 2007 to 227.6 in 2011.

While generalized increases in food prices should be expected to attract private investment in the agriculture sector, the volatility and cyclicality in agriculture crop prices and unpredictable weather conditions throughout the world can be expected to lead to reduced investment in the sector worldwide. While the general trend is that international food prices are going up, there was a decrease in prices in 2009, followed by sharp price increases again in 2010 because of crop production shortfalls in key producing regions among other factors. If there is one factor that deters private investment, it is volatility and instability.

Figure 3: Annual Food Price Indices



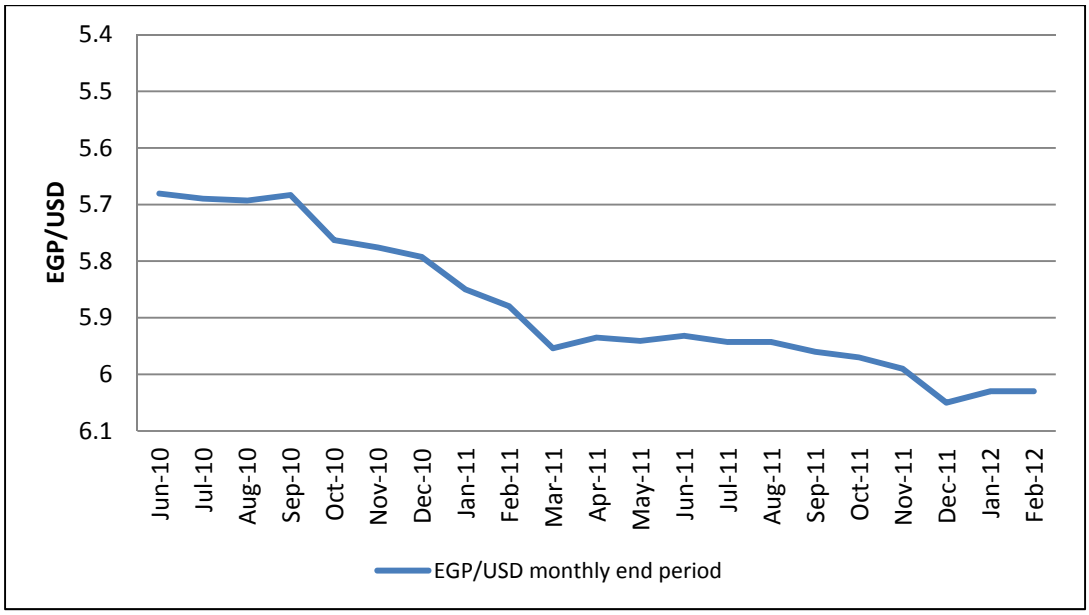
Source: FAO, http://www.fao.org/worldfoodsituation/wfs-home/foodpricesindex/en/

Specifically for Egypt, macroeconomic instability has been a major problem and key constraint to private investment in all sectors. The Egyptian pound has been steadily declining against the dollar (Figure 4).

The Central Bank has been resisting devaluation and is unsure of how much longer it can afford to defend the currency given the greater than 50 percent decline in foreign reserves in 2011 from USD 36 billion to USD 16 billion. It has been reported that concerns over devaluation of the currency is perhaps the most important risk for foreign investors. In late April 2012, the 12-month non-deliverable forward rate on the Egyptian pound hit LE 7.45/USD 1, its weakest-ever level, suggesting that traders expect a devaluation of nearly 20 percent within the next year.

Egypt is the world's largest importer of wheat, the food that most Egyptians are dependent upon. Egypt imports approximately 40 percent of its food, and 60 percent of its wheat. With a weakened pound, Egypt is in a more favorable position to export goods, but the prices of imported food and agricultural inputs will rise, putting increased pressure on an already high current account and fiscal deficits as well as recently dwindling foreign exchange reserves[104] since Egypt subsidizes wheat bread (as discussed above). More importantly, Egyptian consumers who already spend an average of 41.5 percent of their income on food (and among the poorest, this figure is 70 percent) would be faced with increasing costs of imported food products if the Egyptian pound continues to decline and the GOE is forced to dramatically scale back its bread subsidies. GOE subsidies already absorb at least 28 percent of Egypt's budget outlay of 476 billion Egyptian pounds (USD 79 billion), with about two-thirds going toward fuel and energy and the rest primarily for wheat. Also, since PBDAC subsidizes many agricultural inputs on the market, those subsidies could cease as well and farmers would be faced significantly higher costs of production.[105]

Figure 4: Egyptian Exchange Rate against the US Dollar



While international food prices are volatile, they are so worldwide so this should not affect Egypt disproportionately. However, Egypt's current exchange rate risk is likely detouring many foreign investors' willingness to participate in the sector. Since Egypt is not overly dependent on FDI for its agriculture sector, macroeconomic stability is not a binding constraint at this time, especially since

[104] Egypt's current account deficit for July-December 2011 ballooned to USD 4.05 billion from USD 2.56 billion the previous year. Egypt's FY11/12 budget deficit is forecast to be about 10 percent of GDP.

[105] For example, fertilizers are currently subsidized and this encourages farmers to obtain this lower than market priced input and export it, forcing other farmers to have to re-import it for domestic use, putting an unnecessary burden on the fiscal budget.

conditions are expected to improve in the near future following increased political stability, a rationalization of Egypt's subsidy policies, and recovering foreign reserves.[106] However, if political stability cannot be achieved in the short to medium run, this will begin to affect domestic investors more sharply as well, and the lack of macroeconomic stability will become the most critical binding constraint to private investment not just in the agriculture sector, but in all sectors of the Egyptian economy.

V. Market Failures

A. Coordination Failures

Effective coordination among different value-chain farmers and agribusiness firms as well as government agencies is necessary in order to boost productivity and raise incomes by allowing farmers to discover their own comparative advantages, i.e., answer the question "what shall I grow?" This process of "self-discovery" also involves coordination in designing and implementing laws and regulations affecting these stakeholders, ensuring access to market information, and the creation of resource use and trade strategies. In order to achieve effective levels of coordination, market information needs to be readily available and needs to flow unimpeded up and down the supply chain. However, several factors inhibit this flow of information and effective "demand driven policy" and create coordination failures that cause farmers to grow crops that are not the highest value added given their endowments.

Coordination and access to market information is a major issue for smallholder farmers since Egypt has the ability to produce high value-fruits and vegetables for export, which would increase their incomes. However, most small farmers focus on traditional crops because: 1) their families have been growing those crops for generations; 2) the high cost of high value-inputs; 3) the lack of technical knowledge; 4) farmers use the by-products of traditional crops to feed their animals; and 5) land fragmentation does not allow for growing certain high-value crops (i.e., orchards). Furthermore, it appears that farmers who grow non-traditional crops are more capable of raising their income. Almost 92 percent of cropped area in Upper Egypt under traditional crops yields only 85 percent of the region's net farm income (NFI), while around eight percent of cropped area in Upper Egypt under non-traditional crops generates almost 15 percent of NFI.[107]

Egypt clearly cannot become "self-sufficient" in food production in certain key commodities (primarily wheat) as some government policies have targeted by directing many farmers to grow them through subsidies and other regulations. Rather, Egypt needs to focus on a few agricultural crops where it has a comparative advantage. For example, wheat subsidies encourage farmers to grow more wheat than would otherwise be produced at market prices at the expense of other crops. Revenue generated per acre is on average, LE 4,000 for wheat, LE 20,000 for potatoes, LE 40,000 for grapes, and up to LE 100,000 for strawberries.[108] So growing one ton of strawberries produces exactly the same effect as growing 100 tons of wheat, yet government policies still encourage domestic production of wheat on the mistaken grounds that "self-sufficiency" is an end in of itself. Such poor policies inhibit the "self-discovery" process and prevent many poor farmers from significantly raising their incomes.

However, the cropping pattern in Egypt has recently evolved towards more diversification. Contribution of fruits and vegetables to agricultural production, particularly in newly reclaimed lands, increased at the

[106] Almost all of Egypt's current political parties agree that subsidies need to be rationalized. However, the problem is devising a politically feasible plan for doing so.
[107] Kheir-el-din, Hanna and Heba El-Laithy (2008) "Agriculture Productivity Growth, Employment, and Poverty in Egypt" Egyptian Center for Economic Studies (ECES) Working paper.
[108] Aref, Amr, Agricultural Reform, Again. *Business Times*, December, 2011.

expense of traditional field crops. Cropped area of fruits and vegetables rose from 3.1 and 9.3 percent in 1980 to 8.5 and 13.1 percent respectively in 2007, while the area of field crops receded from 87.6 to 78.3 percent.[109] These numbers are encouraging but the data suggests that such diversification needs to go much further. A major reason for this lack of diversification is a lack of market information on prices and accessible export markets.

B. Access to Market Information

A mix of inconsistent government policies and a lack of price/market data and information on how to export distort farmers' and agribusinesses' access to market information and hence their production decisions. First, there are limited private sector mechanisms that determine that natural local market price for many agricultural products in part because of subsidies, price floors, and the extensive commercial activities of GOE institutions. Second, sector data is limited and difficult to access in a comprehensive and reliable format. There are few sources for reliable current data on the agricultural sector and this inhibits private sector investment.[110] Finally, for exporters, the market often fails at providing information on required standards and documentation to producers and the GOE does not effectively verify and enforce those standards in order to facilitate market access (as discussed above).

Farmers and agribusinesses require information services that facilitate production and allow them to compete in world markets. These market information services affect the value-chain linkages among farmers and agri-businesses. The widely perceived lack of market information represents a significant impediment to market access, especially for smallholder poor farmers, as it substantially increases transaction costs and reduces market efficiency. Market information is needed for small farmers to choose what commodities to produce, what inputs to apply for production, when to produce, for whom to produce, and at what price to sell. Market information also offers the farmer bargaining power for a better price in the marketplace. Without this, the small farmer is greatly disadvantaged against middlemen and traders who often have better access to market information. In addition, market information can bring about stability in product supplies and prices.

In addition to market information, support to establish market linkage mechanisms is critical to enable the farmer to actually sell her produce or purchase needed inputs on time and at competitive prices. In the absence of market information and market linkage mechanisms, it is common to find situations of artificial food scarcities, as food surplus areas co-exist with areas of food deficits. This has the effect of lowering farm gate prices in surplus areas, resulting in reduced incomes for farmers, and raising consumer food prices in deficit areas, leading to food insecurity for the poor in those areas. [111]

In Egypt, the inefficiency and in many times the lack of market information services is a serious obstacle to growth and productivity improvement. Local market information is almost nonexistent and unreliable and is often distorted by inconsistent government policy pronouncements and market interventions. For example, guaranteed prices are not set in line with the profitability of competing crops and a delay in announcing them *before* the due date for cultivating crops result in an ineffective pricing policy (see above). Hence, a consistent, transparent and effective pricing policy for key staples, including a well-defined floor price for wheat and maize (possibly with regional differentiation) is central to national food security and for maintaining a certain level of price stability.

[109] MALR (2009)
[110] Interview with private stakeholder agribusinesses. Midwest Universities Consortium for International Activities. Cairo, Egypt, March 28, 2012.
[111] Adrian Mukhebi - Linking Farmers to Markets through Modern Information and Communication Technologies in Kenya.

While agribusinesses have access to international prices, they often do have sufficient information on the steps required in order to export. For example, information on SPS standards and trade agreements are not readily available to agribusinesses with the potential and ability to export (yet these issues relate back to lack of enforced standards discussed above). Lack of available market information is therefore considered to be a binding constraint for small holder farmers and a serious, but not binding, constraint to agribusinesses.

VI. Cost of Finance

A. Costly Financial Intermediation

According to Nasr (2009) "Various financial indicators put the Egyptian financial sector at a moderate level in financial intermediation compared to other developing countries. Although mobilization of savings in Egypt is high by international standards, the banking sector is not intermediating efficiently." The fact that households and the private sector, particularly SMEs, have very limited access to credit and other financial services, is well known and has been well documented. *Moreover, "the Egyptian banking sector remains concentrated in urban areas has not expanded its branch network and its branch density is extremely low particularly compared to most other developing countries with lower per capita income levels."*

More than 37 percent of Egyptian firms consider access and cost of finance a major obstacle to growth. The large majority of Egyptian manufacturers rely exclusively on their own funds; only 17.4 percent have access to finance from the financial sector. This is especially striking for small firms; only 13 percent have access to finance, as opposed to 36 percent for large firms. While the average for Egypt is comparable to the other countries in the Middle East and North Africa (MENA), it is significantly below that in other developing countries.[112]

The reasons for costly financial intermediate are generally categorized as 1) low competition and 2) high risk. Each is discussed below, with specific application to the agricultural sector.

1. Low Competition (sources of finance)

Formal agriculture finance has for a long time been dominated by PBDAC. PBDAC is the only agricultural bank in Egypt, with 1,223 outlets branches and village banks, 4.4 million m2 of storage facilities, 29,000 employees, and some 3 million customers covering most villages in Egypt. [113] PBDAC is affiliated with the MALR as per law 117/1976. Since the passage of this law, PBDAC became the sole formal agricultural bank, the official distributor of agriculture inputs (mainly Upper Egypt and desert areas), the channel for Ag subsidies, and the lead government institution responsible for agricultural development. As mandated by the GOE, PBDAC's loans are offered at subsidized interest rates and it lends to farmers, cooperatives, and firms, covering almost all agricultural activities, including agro-businesses.

On top of its lending activities, PBDAC engages in commercial activities. It owns warehouses for farm inputs and agricultural products, it buys crops from farmers, manages importation and sale of Ag inputs,

[112] Nasr, Sahar and contributors, Access to Finance and Economic Growth in Egypt, World Bank, 2009.
[113] http://www.rabobank.com/content/news/news_archive/upgradingtheonlyagriculturalbankinegypt.jsp

and provides fee-based services to farmers and small firms. [114] For some crops, PBDAC provides seeds as part of its loan to farmers. If these are lower-yield seeds than the farmer could purchase elsewhere, they effectively reduce yield, production and income.

To be able to compete with commercial banks and informal finance, PBDAC had to diversify its loan portfolio to include consumer, youth, micro, SME, and Islamic loans. PBDAC provides business development services to small agro-business firms and has established three investment funds that farmers and rural households can invest in. Islamic finance has become one of the main products provided by PBDAC. Eleven existing branches (and an additional new 13 branches) in different governorates are dedicated exclusively to Islamic finance.[115] This type of finance is usually associated with trading agriculture inputs and production.

PBDAC is the most available source of formal finance in the agriculture sector, especially for small farmers. However, a relatively small portion of formal finance is provided by public commercial banks (mainly the National Bank of Egypt) and very few private banks (such as Credit Agricole Bank). These offer agriculture loans to small farmers, mainly through agriculture cooperatives and associations. Direct lending to small farmers and small firms is not normally offered by these banks due to the very high risk associated with them. Most of the clients working in the agricultural sector are big farmers growing cash crops, livestock, and poultry, as well as firms engaged in agri-business and agro-industrial activities. In 2011, NBE's outstanding loan portfolio for agriculture amounted to LE 1.035 billion. This is small when compared to PBDAC's outstanding loan portfolio of LE 15 billion.

A third source of finance, which is considered the most popular, is informal finance. This mainly comes from family resources or from buying inputs on credit. With the reduction of GOE/PBDAC control on the sale of farm inputs and mandatory purchase of agriculture production in the 1990s, agriculture markets have become less controlled and more dependent on market forces. This stimulated the emergence of non-farm rural agri-businesses such as small manufacturing facilities, wholesale agents, retail stores distributing farm inputs, transportation services, etc. Some of these firms rely on their own funds for finance but a portion of them are clients to PBDAC for both investment loans and deposits. These small agro-business firms provide informal lending to farmers, selling their commodities on credit.[116]

These three major sources of finance for private investment in agriculture are widely considered inadequate. Lack of access to finance remains a serious problem for small farmers and small agri-business firms, and greatly affects the development and growth of the sector. Most small farmers have not adopted advances in agricultural practices partly due to lack of financing for capital investments, such as drip irrigation and tunnels, and adequate or improved inputs, such as proper chemicals and certified seeds. Although PBDAC offers relatively lower, subsidized cost of finance compared to other commercial banks, credit availability and cost of finance are still major constraints to agriculture growth. Farmers who do not have registered title to their farmland cannot obtain loans from formal channels, such as PBDAC and commercial banks, due to lack of collateral. Those who do have registered title may be restricted by the maximum loan amounts offered by PBDAC or other credit suppliers that are usually insufficient to finance their demand for inputs. Furthermore, there is a limit on the total amount of borrowings a farmer can obtain from PBDAC for farm improvements such as irrigation. For those who have registered title to their land, the maximum allowable is 50 percent of the total expenditure and the interest rate is higher than for crop loans.[117] Although farmers can also borrow from cooperatives and other suppliers, this is

[114] Adams and Kamel, *Financial Reforms and Rural Credit: The PBDAC's Evolving Role*, Egypt's Agriculture in a Reform Era, pp. 254-266
[115] http://www.pbdac.com.eg/arb/activity/bank_act_spend.htm
[116] Ibid
[117] http://www.egyptianagriculture.com/egypt_future.html

usually associated with buying inputs on credit, hence constrained by the low size of loans available and the type and quality of input offered.

The main and probably the only available formal entity from which farmers can borrow is PBDAC. Although it is mandated to offer loans at subsidized (seven percent) interest rates, PBDAC lends at relatively high implicit interest rates, due to its high transaction costs and inefficient management and poor mobilization of savings. PBDAC demands collateral which small farmers and small firms do not have and sells agriculture inputs in association with its loans to reduce the cost of the loan. This actually results in higher costs of production and constitutes a higher than documented "shadow price" of agricultural finance. Commercial banks, on the other hand, offer unsubsidized credit at about 15 percent interest rate, which are generally not affordable for small farmers.

Low competition in agriculture financial markets, unmet demand for credit and high cost of formal finance encourage farmers to depend on self-finance. Informal finance is very widely spread in the rural community and is one of the main sources of finance in the agriculture sector, especially with the increase in remittances. Demand for credit that is not met by PBDAC, family resources, or commercial banks, is usually met by brokers, wholesaler agents, cooperatives, and input suppliers. These sources charge 1.5 percent or more per month, which when compounded are much higher than formal channels.

2. High Risk

Economy wide, banks in Egypt remain highly liquid and lending has been extremely cautious. The loan to deposit ratio is low at around 50 percent, indicating that banks would rather invest in government treasury bills (with a current yield of about 14 percent on a one-year bond) than absorb the additional risks of lending to the private sector, especially SMEs in the agricultural sector. [118] There are high risks associated with the supply and demand of finance in agriculture. The first is the risk associated with PBDAC's credit availability and whether this can be considered a sustainable source of agriculture finance. PBDAC is faced with credit and economic risks when lending to farmers and the rural community. The price variability of agriculture crops and GOE interference in the credit policy of PBDAC in times of shocks and/or recessions sometimes make it difficult for PBDAC to recover its loans. GOE interference also negatively impacts the efficiency of the Bank. The excess capacity of employees and facilities lead to high admin costs (about LE 1 billion per year), high transaction costs, and lower profitability of the Bank.

PBDAC responds to high risks by demanding high collateral on its loans and increases the implicit costs of the loans by bundling them with the provision of inputs, which has been found to be inefficient. This high shadow price of loans reduces credit availability in the agriculture sector and PBDAC current business model is not sustainable for a long time without GOE finance. Especially with the current GOE fiscal deficit problem, PBDAC will not be able to be self-sustained unless it reforms its credit policy and business practices.

B. Domestic Savings Available for Agriculture Development

Economy wide, most loans from banks, particularly the state-owned banks, go to state-owned enterprises, other large and well-established firms, and increasingly for the purchases of government securities. The GOE has run chronic budget deficits for the past decade averaging over 6 percent of GDP, and in FY11/12 many analysts expect it reach 10 percent of GDP or higher.[119] According to one analyst, "forty

[118] Financial Times, Tuesday March 27, 2012.
[119] World Bank, World Development Indicators.

percent of deposits in local banks are going to government treasuries."[120] Egypt's budget deficits are driving up interest rates and crowding out lending to SMEs and other productive purposes by channeling domestic savings away from private investment.

Specifically for the agriculture sector, PBDAC mobilizes a good portion of farmers' and rural households' deposits. Deposits at PBDAC amounted to LE 28 billion in 2010.[121] PBDAC's loan portfolio amounted to LE 14 billion in 2010,[122] with loan to deposit ratio of about 57 percent. This indicates that PBDAC possess liquidity and can expand its agriculture loan portfolio.

The Egyptian Post Office is the logical competitor to PBDAC in mobilizing rural savings due to its large network of branches in all governorates provides broad-based, low-threshold access to financial services through more than 9,000 outlets, 40 percent of which are in rural areas. It mobilizes small deposits with low minimum deposit requirements and has more than 12 million savers (30 percent of adult population)—more than the number of individuals served by the entire banking sector.[123]

The Post Office mobilizes savings of the poorer population, but does not provide credit because it is an economic authority that is not supervised by the Central Bank of Egypt (CBE). This is a lost opportunity with respect to availability of finance, especially for rural households and small farmers. The post office could become Egypt's first chain of convenience stores, providing basic financial services, communications, and retail trade if restructured.

In 2009, savings in the Post Office amounted to LE 74 million[124]. Compared to total deposits at the banking sector in 2009/10, LE 892 billion, PBDAC and the Post Office together, mobilize only about 3 percent and 8 percent of total national savings, respectively. As such, savings mobilized to invest in the development of agriculture and agri-business activities (which depend on small farmers and small firms) is as low as 3 percent of national savings. Furthermore, if allowed to provide credit to small farmers and agri-businesses, about 8 percent of national savings could be invested in the development of the Agriculture sector.

1. Costly Foreign Finance

If domestic savings are not available in sufficient quantity, then private investors can turn to international savers to finance their activities. In Egypt, foreign investment in the agricultural processing, food and inputs industries has increased significantly, rising from some USD 577 million in 2000 to USD 3.680 billion in 2008. Land reclamation and agricultural production attract 38.3 percent of foreign investments, with a predominance of poultry production projects. The food processing industry ranks second in terms of international investment, especially the processing of agricultural crops (8.9 percent of investment) and prepared food projects (4.96 percent).[125] 37 percent of investment in the food processing industry originates from foreign companies including prominent multinationals operating regional manufacturing bases in Egypt (including Heinz, Tetrapak, Unilever, Cadbury, Danone and Coca-Cola, all of which have made successful investments and acquisitions).[126]

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[120] http://www.thedailynewsegypt.com/credit-downgrades-put-egypt-economy-in-greater-risk.html
[121] http://www.pbdac.com.eg/arb/money/money_pos.htm
[122] PBDAC Website
[123] http://siteresources.worldbank.org/EXTINFORMATIONANDCOMMUNICATIONANDTECHNOLOGIES/Resources/PostalFinSvcesCountryStudies.pdf
[124] http://www.capmas.gov.eg/pdf/Static%20Book/PDF/10-%20%D8%A7%D9%84%D9%85%D8%A7%D9%84%D9%8A%D8%A9%20%D9%88%20%D8%A7%D9%84%D8%A8%D9%86%D9%88%D9%83/10-12.pdf
[125] http://www.fao.org/fileadmin/templates/est/PUBLICATIONS/Comm_Working_Papers/EST-WP31.pdf
[126] GAFI, "Invest in Egypt: Agribusiness" (2010)

But Egypt had economy wide FDI outflows of USD 482.7 million in 2011 compared with inflows of USD 6.4 billion in 2010.[127] This massive withdrawal of foreign savings is certain to have a significant and negative impact in the agricultural sector, raising the cost of finance further for small farmers. FDI is important not just for access to finance reasons, but also because it enables technology transfer and the introduction of more efficient methods of production. At the time of this writing, however, it is unclear how badly the agricultural sector has been affected by the macroeconomic events in terms of withdrawal of foreign finance. As long as Egypt remains open to foreign participation and the macroeconomy stabilizes following political stability, access to foreign finance should not be considered a binding constraint.

C. Conclusion for Cost of Finance

According to the economy wide growth diagnostic done by Dobronogov and Iqbal (2007) "In short, we can be reasonably confident that Egypt's economic growth rate over 1986-2003 is significantly affected by the growth rates of government consumption (negatively), OECD GDP (positively), and credit extended to the private sector (positively)."[128] They go on:

> This leaves us with the possibility that the binding growth constraint in Egypt is related to the shadow price of finance, and the evidence supports this hypothesis best among the alternatives. There is a high correlation between GDP per capita growth rate and the rate of growth of domestic credit extended to the private sector (0.67 for 1994-2003). When macroeconomic stabilization efforts cut down the growth of credit extended to the government (15-25 percent in 1987-1990, below 5 percent in 1992-99), leaving more resources for the private sector, there was a clear upward trend in the growth rate of the credit to the private sector (from 5.0 to 14.1 during 1993-98). When growth of credit extended to the private sector tightened after 1998, the economy stalled as well. Hence, there is evidence that growth responds to relaxation or tightening of the financial constraint. Comparison of trends in the private investment rate and the real lending interest rate suggest that the latter was among the factors holding back the former.

Egypt is currently experiencing significant public sector "crowding out" of the private sector in terms of access to finance, with an estimated forty percent of deposits in local banks going to government treasuries.[129] Interest rates are continuing climb, with the yield on treasury bills rising to their highest levels in years, which encourages local banks to purchase these securities instead of lending to the private sector (Figure 9). Total domestic government debt increased to LE 1058.5 billion (67.4 percent of GDP) as of end December 2011 up from 64.8 percent of GDP from the end of 2010 due to increases in the cost of public sector salaries (27.3 percent), interest payments (23.3 percent), and subsidies/social benefit costs (37 percent). [130]

Consistent with the analysis of Dobronogov and Iqbal (2007), we expect that the current macroeconomic instability and rising government debt levels are a key factor preventing sufficient credit to the private sector in Egypt and hence choking off increased levels of private investment. Our findings that are specific to the agricultural sector support these economy wide findings of the importance of the access to finance for the Egyptian economy.

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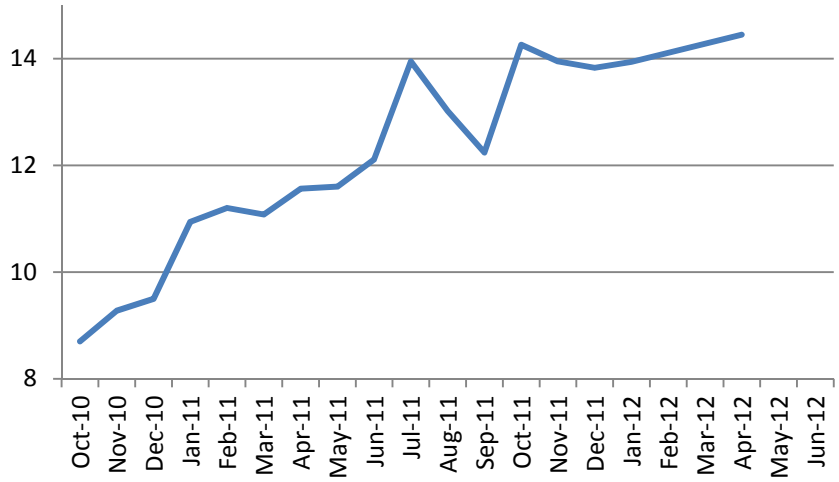
[127] http://www.bloomberg.com/news/2012-03-25/egypt-had-fdi-outflows-of-482-7-million-in-2011-correct-.html
[128] Dobronogov, Anton and Farrukh Iqbal, Economic Growth in Egypt: Constraints and Determinants, *Journal of African Development* (Spring 2007).
[129] http://www.thedailynewsegypt.com/credit-downgrades-put-egypt-economy-in-greater-risk.html
[130] Butterfield, William and Lotfi, Nevine "Egypt Macroeconomic Briefer" May 2012.

Figure 9: 3-Month T-Bills Auction rates, end period



Source: Ministry of Finance

The outflow of FDI can also be considered a major constraint for the economy of Egypt and for the agricultural sector in particular. Yet Egypt first must improve access to its own domestic sources of finance first in order for access to foreign sources of finance to be sustainable.

We conclude that a binding constraint for private investment in the agricultural sector is access to domestic finance which is driven in large part by a lack of competition in this area and public sector crowding out. Furthermore, we find that PBDAC's commercial activities create a significant level of market distortions. Unless PBDAC fully separates its commercial banking activities from input distribution, negative effects on production in this sector will continue. The liberalization of this sector through an appropriate bundle of reforms could significantly alleviate this constraint.

VII. Conclusion

Private investment is key to generating sustainable growth in the agricultural sector, which has been the main engine of poverty reduction in Egypt and the world over. No country has ever enjoyed sustained productivity, employment, and output growth in any sector without the active participation of the private sector. This assessment has analyzed constraints to private investment in the agricultural sector in order to identify those that are most binding. This assessment took into account both the small-holder farmers (who are mostly subsistence farmers) and agribusiness (medium and large-farmers and businesses in the agricultural sector). While the analysis is predominantly focuses on crops, some of the binding constraints identified also affect livestock and fishery agribusinesses. Moreover, small-holder farmers and agribusinesses have different needs and therefore, the binding constraints for each group are different. This does not mean, however, that a binding constraint for small-holder farmers does not affect agribusinesses.[131]

[131] This GD was done taking into account the agricultural value-chain and its linkages. For example, contract enforcement will strengthen linkages as small-holder farmers are able to access new markets by working with players in the value-chain. Another example is with regard to harvesting equipment, cold storage trucks, and cooling facilities. If farmers have access to such

Binding Constraints in the Agricultural Market		
Sector Wide	***Smallholder Farmers***	***Agribusinesses***
1. Poor Policy/Extensive "crowding out" by Government activities 2. Time and Cost to enforce contracts 3. Low Competition in Finance	1. Weak Farmer's Associations/Water Users Associations 2. Land Fragmentation 3. Lack of available Market Information	1. Compliance with Standards to Export/Traceability Issues 2. Lack of available Human Capital

The most binding constraints in the sector relate to identified government failures, in that the GOE appears to be trying to do too many things best left to the private sector and not effectively filling its role as a facilitator of private exchange in agricultural markets. Particularly, there appears to be significant public sector "crowding out" of private investment given the extent of government involvement in the sector. Inefficient commercial activities (e.g. PDAC as a supplier of inputs), the indirect control and politicization of farmer's associations and cooperatives, poor public policies that promote land fragmentation, and a lack of coordinated mechanisms to facilitate and enforce international standards for export are all examples of identified binding constraints that relate back to government failures. Meanwhile, the ineffectiveness of government institutions reflected in the high time and cost to enforce contracts is also a binding constraint to the increased commercialization of the sector. Access to finance is a binding constraint that affects both small holder farmers as well as agribusinesses, and government crowding out through PDAC as well as chronic budget deficits at the macroeconomic level contributes to this problem.

Poorly functioning FAs and cooperative along with land fragmentation are binding constraints for smallholder farmers because they could help build economies of scale that would increase efficiency and investment and hence reduce poverty. Effective farming associations could provide smallholders with improved access to the following: 1) finance; 2) market information; 3) extension services (thereby improving human capital skills, including technical and vocational training); 4) access to markets (contracts with larger agribusinesses); and 5) access cold storage trucks, cooling facilities, machinery, drip irrigation, and other capital equipment. Unclear and inconsistent government purchasing and pricing policies on top of an inability to access timely market data are also a binding constraint to investment by smallholders because it directly increases risks associated with choosing what to grow and when to grow it.

The most significant binding constraints for agribusinesses are standards enforcement and human capital. In international markets, the lack of information regarding individual country standards for agricultural exports and lack of an effective government certification mechanism makes it difficult to operate in the sector. Better coordination and enforcement on traceability is needed along the entire supply chain. Agribusinesses also need to be able to attract the best human talent in order to be internationally competitive. The poor state of Egypt's educational system overall, with agricultural technical schools no

equipment it will also strengthen the value-chain upstream and downstream. Downstream, because if through the use of on-farm machinery and proper storage facilities, farmers can bring more and improved quality products to the market, it will strengthen demand for the efficient allocation of inputs. Upstream, because there is a demand for better quality produce that the farmers can then meet. By removing important binding constraints, the value-chain will benefit and linkages will strengthen; thereby generating growth in agriculture and subsequently, a demand for more productive employment.

exception, presents a binding constraint to expansion and improved competitiveness of Egypt's agribusinesses.

Rather than move on all identified constraints at once as donors are often fond of trying to do, this diagnostic approach has attempted to identify the constraints that are the most problematic for the sector, are most likely to affect other constraints, and those that, if mitigated, would elicit the largest positive response of private investment. Undertaking this exercise will hopefully provide USAID with clear priorities for intervention in the agricultural sector and provide empirical justification for the enhanced focus of our limited resources in order to achieve the largest possible impact for Egypt's development.

Appendix A: Crop Production Data

Table 1: Production of Main Crops in Egypt					
	2006/07	**2007/08**	**2008/09**	**2009/10**	**2010/11***
Wheat	7,279	7,976	8,523	7,169	7,574
Maize	6,374	6,243	6,543	6,169	6,212
Rice	6,744	6,868	7,240	4,330	4,327
Cotton (seeds)	600	621	318	281	431
Sugar Cane	16,611	17,015	16,470	15,482	18,618
Sugar Beet	5,459	5,582	5,333	7,840	6,960
Total Production of Main Traditional Crops	43,067	44,305	44,427	41,271	44,122
Vegetables	20,349	20,300	23,639	17,510	23,215
Fruit	8,503	9,100	8,630	10,073	10,117
Note: Production is in '000 tons.					
Source: CBE and Egypt Food & Agribusiness Section. CFH Private Equity, April 2012.					

Table 2: Production of Select Non-Traditional Crops					
	2006	**2007**	**2008**	**2009**	**2010**
Potatoes	1,303	1,628	2,029	2,005	N/A
Tomato	8,576	8,639	9,204	10,279	8,545
Aborigine	1,180	1,160	1,243	1,290	1,230
Green Pepper	685	652	703	793	656
Marrow	699	725	652	625	658
Cantaloupe	745	830	758	655	865
Strawberry	128	174	200	243	238
Carrot	134	170	186	176	139
Fresh Peas	223	263	285	262	224
Artichoke	128	173	176	252	216
Sweet Potato	352	364	259	357	371
Cabbage	586	617	639	740	691
Note: Production is in '000 tons. Production figures for cotton and clover are expected numbers.					
Source: CAPMAS					
http://www.capmas.gov.eg/pdf/Static%20Book/PDF/5-%20الزراعة/5-6.pdf					

Appendix B: Physical and Chemical Analysis of Soils

Egypt currently applies the 4th largest amount of fertilizer per hectare in the world (724 kg/hectare).[132] This is mainly due to:

- The introduction of new high yielding varieties which need higher rates of fertilizers.
- Additional cropped areas
- The construction of the High Aswan Dam which reduced the quantity of suspended materials deposited on the soil during floods, which permitted for thousands of years the restoration of the fertility of Egyptian soils.

Urea is produced domestically and part of this production is exported. No potash fertilizers are produced in Egypt due to the lack of resources, although it was reported recently that some local potash deposits had been found.

Organic fertilizer tends to be available in the form of compost derived from the production of smallholders or through small one-woman enterprises in almost every village. To assess the effectiveness of organic manures, a series of field trials were conducted by MALR. The results showed that organic manures increased rice and wheat yields directly. Pigeon refuse gave the highest values, while compost and farm yard materials resulted in the lowest values. As regards the residual effect, pigeon refuse, FYM and composted bean straw had almost the same effect on rice, while composted rice straw showed superiority over the others on the cotton crop.

Appropriate fertilization is one of the most important agricultural practices for achieving increased crop productivity and quality. Evaluation of the best source of nutrients, optimum rates of fertilization, suitable timing and proper fertilizer placement are necessary for efficient fertilizer management. For example, the overuse and misuse of fertilizers and pesticides negatively impact water quality.

The average results of physical and chemical analyses of soils are presented in Table XX. In general, the organic matter content is low and so, accordingly, is the concentration of total nitrogen. As regards the alluvial soils (clayey and loamy clay), available phosphorous is generally moderate, available (soluble and exchangeable) potassium is high, and this is characteristic of most Egyptian alluvial soils. Micronutrients are above the critical limits, as determined by the DTPA method. Levels of available phosphorus, potassium and micronutrients are fairly low on calcareous and sandy soils.

[132] http://data.worldbank.org/indicator/AG.CON.FERT.ZS\).

Table 1: Physical and Chemical Analysis of Various Soil Types					
Item	**North Delta**	**South Delta**	**Middle & Upper Egypt**	**East Delta**	**West Delta**
Soil texture	**Clayey**	**Clayey**	**Loamy clay**	**Sandy**	**Calcareous**
pH (1:2.5)	7.9-8.5	7.8-8.2	7.7-8.0	7.6-7.9	7.7-8.1
Percent total soluble salts	0.2-0.5	0.2-0.4	0.1-0.5	0.1-0.6	0.2-0.6
Percent calcium carbonate	2.6-4.4	2.0-3.1	2.6-5.3	1.0-5.1	11.0-30.0
Percent organic matter	1.9-2.6	1.8-2.8	1.5-2.7	0.35-0.8	0.7-1.5
Total soluble N (ppm)	25-50	30-60	15-40	10-20	10-30
ppm available P (Olsen)	5.4 -10	3.5-15.0	2.5-16	2-5.0	1.5-10.5
ppm available K (amm. acetate)	250-500	300-550	280-700	105-350	100-300
Available Zn (DTPA) (ppm)	0.5-4.0	0.6-6.0	0.5-3.9	0.6-1.2	0.5-1.2
Available Fe (DTPA) (ppm)	20.8-63.4	19.0-27.4	12.4-40.8	6.7-16.4	12-18
Available Mn (DTPA) (ppm)	13.1-45	11.2-37.2	8.2-51.6	3-16.7	10-20

In Egypt, there are several traditional practices that are commonly implemented and which play a major role in restoring and maintaining soil fertility. Among these practices are:

- Planting berseem clover as a winter fodder crop before the cotton crop and as a green manure.
- Incorporating farm yard manure into the soil during seedbed preparation.
- Including legume crop in the crop rotation, such as: faba bean, clover and soybean.
  The recommended rates of N, P_2O_5 and K_2O for all the crops, on a national level, are issued by MALR each year through an annual Ministerial decree.

Table 2: Recommended Rates of Fertilization, 2003/04 Compared with 1979/80						
Crop	**N (kg/ha)**		**P_2O_5 (kg/ha)**		**K_2O (kg/ha)**	
	1979/80	**2003/04**	**1970/83**	**2003/04**	**1980/83**	**2003/04**
Cotton	90-145	145-170	40	55	0	60
Faba bean	20	40	40	70	0	60
Maize	145-160	215-290	0	55	0	0
Potatoes	215	300	15-30	145	115	115
Rice	70	95-145	40	40	0	0
Sugar cane	140-300	380	40-70	40-110	115	115
Tomatoes	215	300	40-70	110	115	115
Wheat	110-140	160-180	40	40	0	0

Source: MALR, 2003.

Fertilizer use recommendations are based on experiments carried out by the MALR. The rates recommended by the MALR are averages, not tailored to specific crop needs in a specific area. In practice, neighboring farmers use different rates of fertilizers for the same crop. *An estimation of the fertilizer requirements of the country is crucial not only for the development of agriculture but also to permit correct investment decisions in the fertilizer manufacturing industry.* Incorrect forecasts might result either in shortages for the farmer or in excess capacity and low profits for the producers.

As regards nitrogen, field experiments indicate that calcium nitrate and urea are of nearly equal value. On rice, sulphur coated urea and urea super granules were found to be superior to urea and ammonium sulphate, while iso-butidylin di-urea was the least effective (M.R. Hamissa *et al.*, 1997). The phosphate fixation process in alkaline soils and the presence of calcium carbonate result in a low recovery of added phosphatic fertilizers. A number of field trials have been carried out to study the effectiveness of phosphate sources on clover, wheat, faba bean, alfalfa and maize. The data obtained revealed that phosphate fertilizers containing phosphorous in water soluble form, such as single superphosphate, triple superphosphate and polyphosphate, were the most effective, followed by those containing phosphorous soluble in ammonium citrate or two percent citric acid, such as dicalcium phosphate and basic slag. Rock phosphate was the least effective source.

Regarding micronutrients, studies on some field crops indicated that the foliar application of micronutrients in mineral or chelated forms was more effective than soil application, except in some special cases such as the application of zinc sulphate or zinc oxide on rice.
The main types of fertilizers used in Egypt are:

Nitrogen
- urea (46.5 percent N)
- ammonium nitrate (33.5 percent N)
- ammonium sulphate (20.6 percent N)
- calcium nitrate (15.5 percent N)

Phosphate
- single superphosphate (15 percent P2O5)
- concentrated superphosphate (37 percent P2O5)

Potassium
- potassium sulphate (48 to 50 percent K2O)
- potassium chloride (50 to 60 percent K2O)

Appendix C: Output of Main Crops and Productivity per Feddan

Table 1: Output of Main Crops and Productivity per Feddan

		2006/2007			2007/2008			2008/2009			2009/2010			2010/2011(Expected)		
		Prod.	Ave. Produc-tivity/ Feddan	Area	Prod.	Ave. Produc-tivity/ Feddan	Area	Prod.	Ave. Produc-tivity/ Feddan	Area	Prod.	Ave. Produc-tivity/ Feddan	Area	Prod.	Ave. Produc-tivity/ Feddan	Area
Wheat		7,279	18.8	2,716	7,976	18.7	2,920	8,523	18.5	3,147	7,169	15.9	3,001	7,574	16.9	3200
Barley		137	14.2	83	133	13.4	84	146	13.4	96	117	11.1	88	417	13.6	255
Maize	Summer Crops	5,708	26.3	1,566	5,572	25.0	1,605	5,623	24.6	1,644	5,365	22.7	1,691	5,365	22.0	1740
	Nile Crops	666	19.6	246	671	20.0	242	920	14.0	309	804	20.7	278	847	20.2	200
Millet	Summer Crops	876	17.2	367	827	17.2	347	858	17.0	364	774	16.6	333	691	15.0	329
	Nile Crops	11	19.5	4	17	17.6	7	8	18.7	3	7	16.9	3	95	16.9	40
Rice		6,744	4.3	1,592	6,868	4.1	1,673	7,240	4.1	1,770	4,330	4.0	1,094	4,327	4.0	1093
Beans		302	9.2	212	244	9.3	170	298	9.5	206	232	8.2	184	372	9.5	225
Lentils		2	5.0	2	1	4.0	2	1	4.5	2	2	1.1	3	17	6.0	18
Cotton (seeds)		600	7.1	536	621	6.9	575	318	6.5	313	281	6.3	284	431	7.4	369
Flax		117	3.9	30	86	4.3	20	55	4.2	13	34	4.3	8	198	4.4	45
Groundnuts		184	18.4	132	218	18.8	155	209	19.1	147	203	17.0	159	202	17.0	159
Sesame		42	5.0	75	42	5.2	76	37	2.1	68	46	4.4	88	46	4.4	88
Soybeans		23	127.0	18	26	1.4	19	29	1.4	21	43	1.2	36	43	1.2	36
Sunflower		38	1.0	37	30	1.0	28	21	1.1	20	37	1.1	35	37	1.1	34
Sugarcane		16,611	51.5	326	17,015	51.3	335	16,470	51.3	324	15,482	48.8	317	18,618	51.7	360
Sugar beet		5,459	22.3	249	5,582	22.3	258	5,333	20.7	265	7,840	20.3	386	6,960	22.8	305
Vegetables		20,349	10.8	1,888	20,300	10.8	1,880	23,639	11.0	2,142	17,510	11.7	1,496	23,215	11.4	2035
Onion		2,002	13.7	112	2,265	13.0	120	2,443	14.2	143	2,246	13.8	134	2,537	11.6	218
Fruits		8,503	7.2	1,207	9,100	7.2	1,300	8,630	6.3	1,350	10,073		1,511	10,177		1450

Note: Production is in '000 tons and area is in '000 feddans.

Sources: http://www.cbe.org.eg/public/All_Monthly_Statistical_Bulletin_PDF/2012/Bulletin_2012_02_Feb/70_49_Output_of_Main_Crops.pdf
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