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# An Agricultural Policy Review of Egypt

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## First Steps Towards a New Strategy

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## ACRONYMS AND ABBREVIATIONS

ARC	Agricultural Research Center
CASP	Central Administration for Seed Production
EGP	Egyptian Pound (divided into 100 Piasters)
GASC	General Agency for the Supply of Commodities
GARPAD	General Authority for Reconstruction Projects and Agricultural Development
MALR	Ministry of Agriculture and Land Reclamation
PBDAC	Principal Bank for Development and Agricultural Credit
USD	United States Dollar

## 1. INTRODUCTION

The latest population census in Egypt shows that there are more people now living along the narrow strip of land by the Nile than ever before, 95 million (CAPMAS 2017). The country's rapidly growing population, its limited water resources, and its dependence on food imports all reinforce the importance of an integral agricultural policy. With the recent series of economic reforms that saw the flotation of the Egyptian pound, the imposition of a value-added tax, and decreases in energy subsidies, Egypt has a unique opportunity to focus on sector-level policies, including those within agriculture.

In broad terms, agricultural policies look at the laws that govern agricultural activity, including domestic agriculture and agricultural imports (Monke and Pearson 1989). Governments define and decide what needs to be done in the agricultural sector, often with the purpose of achieving certain goals. These may include the maximization of agricultural output in line with consumer demand, achieving self-sufficiency in the production of specific types of food, raising farmers' living standard perhaps via equity and income distribution considerations, the conservation of agricultural resources and inputs, or correcting market failures (Van Tongeren 2008). Agricultural policy combines with policies of other sectors such that the policies of one sector will have an impact on the others. Agricultural policy, therefore, is of particular importance for its repercussions on other domains, such as food security, water, environment, jobs, and the economy.

Reviews of agricultural policy in Egypt has been done by several teams over the years, each focusing on a specific policy dimension. For instance, Tellioglu and Konandreas (2017) highlighted the interlinkages between agricultural policies targeting self-sufficiency and Egypt's agricultural trade balance. Cassing et al. (2009) analyzed procurement and price policies within the agriculture sector, while Gutner (2002) and Ghoneim (2012) both examined the political economy around the food subsidy system. Egypt's long history of food subsidies has been the focus of many studies over the years, including Alderman et al. (1982) and Ecker et al. (2016). Several studies have also highlighted the interrelationship between natural resource management and the development of the agriculture sector. Barnes (2010; 2014) and Abdel-Gawad (2007), for example, reviewed water distribution policies in Egypt with an emphasis on the irrigation system.

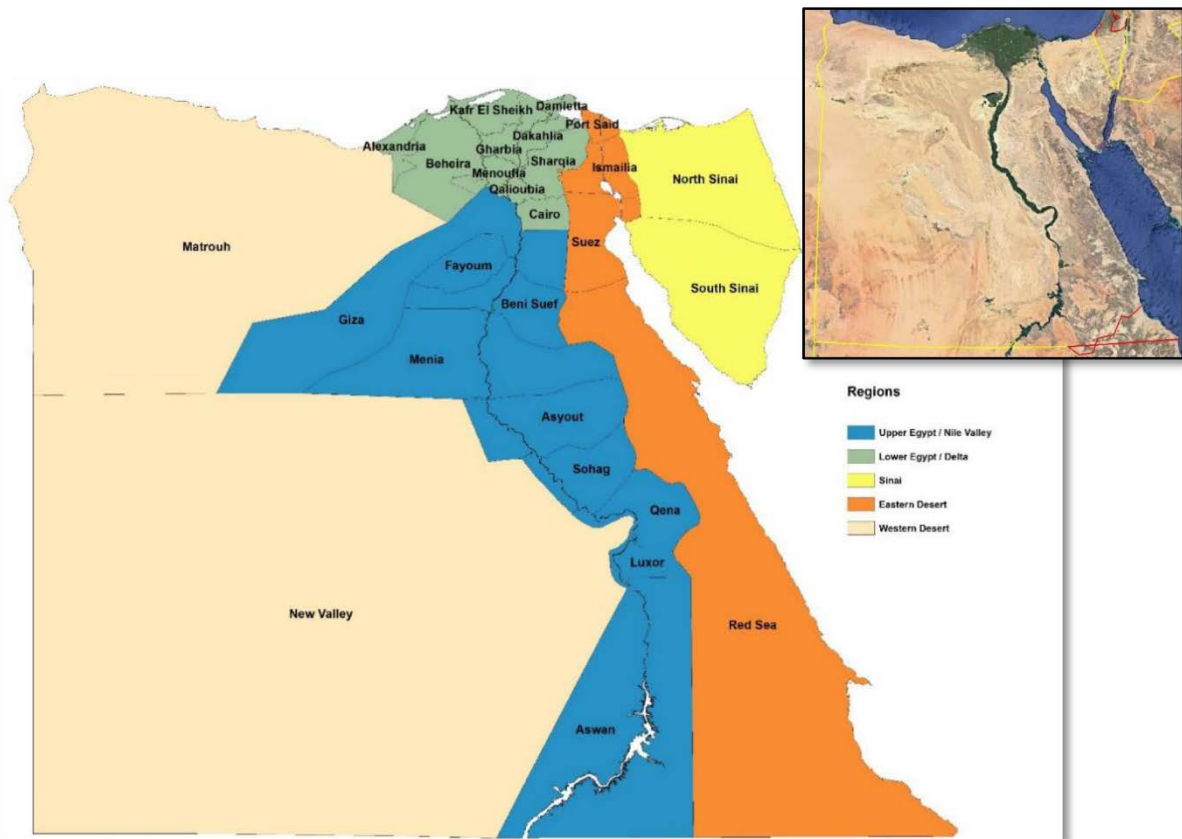
This paper reviews agricultural and other related policies and their impact on the overall economic performance of the agricultural sector in Egypt. This stocktaking of policies is to serve as the basis for developing a more comprehensive agricultural strategy and policy framework that aligns sectoral policy objectives with policy measures in an effective and consistent manner. The paper is intended to serve as a reference for policymakers, researchers, and institutions. It highlights agriculture's place in the Egyptian economy and examines water and irrigation policy and the provision and distribution of agricultural inputs, research, and extension, and reviews the price and procurement policies for key crops. Other public policies and their impact on agriculture are also evaluated via a look at the food subsidy system, land rent and tenure, land reclamation, and trade policies. The concluding section of the paper presents a summary of key messages and proposed questions for further research.

### Geography

Egypt's geographic structure is key to understanding the constraints and possibilities for the agricultural sector. The Nile river provides 96 percent of Egypt's water (Sims 2015). Over 90 percent of the population inhabits lands directly adjacent to the Nile, an area comprising less than 5 percent of the total land area of Egypt (Ibrahim and Ibrahim 2003; Gouda 2016). More than eighty percent of

Egypt's water supply contributes to agriculture. Most of which is reliant on Nile water, although groundwater is also rising in importance as a source of irrigation water for the country. Most settlement and development occur in the Nile Valley and between the branches of the river that fork out in the Nile delta before pouring into the Mediterranean<sup>1</sup>. Sparse settlements also exist in desert oases sustained solely by groundwater. Agricultural policymakers have repeatedly sought – with mixed success – to expand agriculture into the deserts east and west of the Nile to increase the amount of land used for cultivation

**Figure 1 – Map of governorates and regions of Egypt, with satellite map**



Source: Authors' contribution, utilizing base map from the Central Agency for Public Mobilization and Statistics. Satellite map via Google Earth.

Egypt has 27 administrative governorates and can also be divided into the Upper and Lower Egypt regions, the Western and Eastern Deserts, as well as the Sinai (Figure 1). The southern highlands of Upper Egypt cover the Nile Valley area from the southern border with Sudan to the northern boundary of Beni Suef. North of Giza, Lower Egypt, or the Delta, extends to the Mediterranean Sea. These regions differ in culture, climate, urbanization, level of economic development, levels of agricultural output and employment, and income per capita. Currently the urban population accounts for 43 percent of the total population (United Nations Population Division 2016). El Enbavy et al. (2016) further highlight the structural variance apparent across

1 The path the Nile follows from south to north splits the country lengthways into the Western Desert, the Nile Valley and Delta, the Eastern Desert, and the Sinai. Mostly flat lands, the distance between the southernmost point of the Valley and the northernmost point of the Delta is just over 1,000 kilometers, while variance in elevation is only about 550 meters, with the North generally being lower than South ("Geocontext-Profiler" 2017).

Egypt's regions with regards to manufacturing, services, construction, and agriculture's shares of GDP, levels of employment in these sectors, as well as their value added.

About 9 million feddan (3.8 million hectares) of land is available for cultivation in Egypt (Osama, Elkholy, and Kansoh 2017)<sup>2</sup>. Cropping in both Nile-irrigated and groundwater-irrigated areas is distributed across the three agricultural seasons: winter, from November to May; summer, from March to August; and *Nili*, from July to November (Sims 2015; Barnes 2014). Major crops include rice, maize, wheat, cotton, and sugarcane (Ibrahim and Ibrahim 2003; Tellioglu and Konandreas 2017). The cultivation of these crops is relatively evenly distributed across the regions, with some differences. The cultivated area and yields in general are much higher in Lower Egypt, especially for wheat, rice, maize, clover, cotton, fruits, citrus, potato, sugar beet, and tomato. Upper Egypt's yields of wheat, sugar cane, sorghum, vegetables, tomato, and onion are also relatively high (MALR 2016).

### Agriculture in the economy

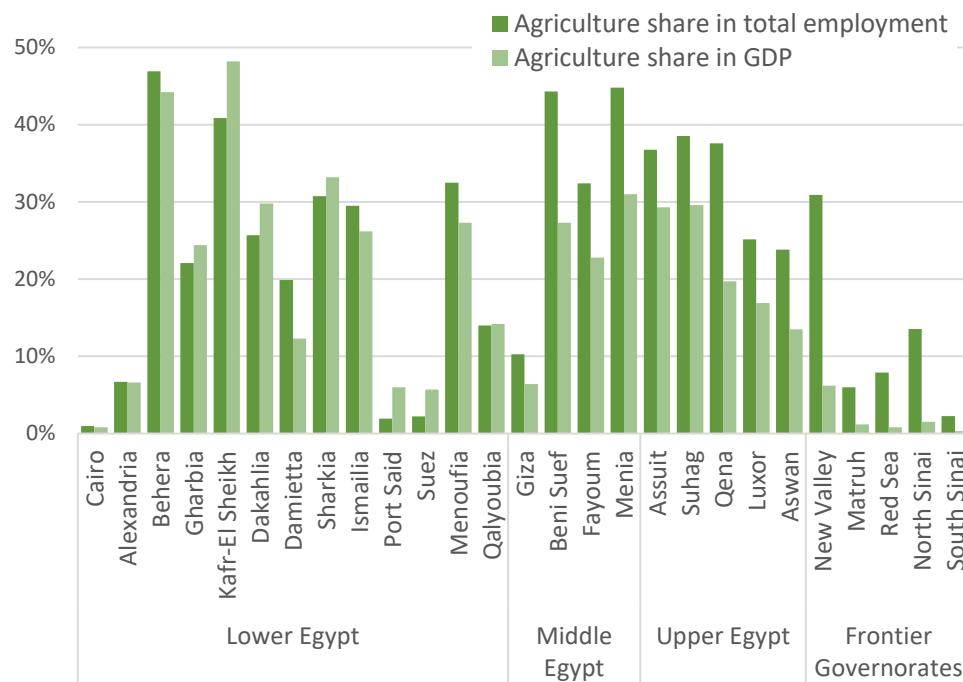
As Egypt progressed from a largely agricultural country to a country with a more diverse economy, agriculture itself slowly declined in prominence as a pillar of the Egyptian economy. Trends in the contribution of agriculture to national income give an indication of this. Between 1970 and 2000, agriculture's contribution had fallen from 29.0 to 16.5 percent of GDP, with output falling at an annual average of 2.8 percent between 1960 and 1980 (Ibrahim and Ibrahim 2003; Owen and Pamuk 1998). This slow progress is also reflected in high unemployment and poverty levels. Nevertheless, today, agriculture is still expected to generate hard currency revenue via high-quality products for export and to provide food security for the country's population via the cultivation of enough staple crops (Ibrahim and Ibrahim 2003). That is, agriculture is to provide income, employment, and food for the Egyptian population.

Agriculture remains an important sector in the Egyptian economy and a key pillar for food security. The Ministry of Planning, Monitoring, and Administrative Reform's databases reveal that investment in agriculture for fiscal year 2015/2016 amounted to EGP 16.3 billion, including 2.8 percent of overall public investment (MPMAR 2016). Agriculture's contribution to GDP averaged 13.2 percent between 2000 and 2017, while employment in agriculture averaged 29 percent over the same period (World Bank 2017). This is down from 58 percent in 1960 and 34 percent in 1990, according to Owen and Pamuk (1998:273). Across governorates, the share of agriculture in total employment and GDP varies considerably because of differences in agro-climatic conditions as well as degree of economic diversification (Figure 2). Regionally, Upper Egypt governorates have a higher share of employment in agriculture, while Lower Egypt has a relatively higher share of GDP stemming from agriculture.

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<sup>2</sup> A feddan is local unit of measurement for agricultural land (1 feddan = 1.038 acres/0.42 hectares)

**Figure 2 – Agriculture share in total employment and GDP, by governorate**



Source: Authors’ calculations based on CAPMAS 2017 and Ministry of Planning 2016.

Food self-sufficiency has long been a key policy goal of Egypt. Article 79 of the 2014 constitution, for example, notes:

“Each citizen has the right to healthy, sufficient amounts of food and clean water. The state shall provide food resources to all citizens. It also ensures food sovereignty in a sustainable manner, and guarantees the protection of agricultural biological diversity and types of local plants to preserve the rights of generations” (Constitute 2015:26).

However, it may be argued that that full self-sufficiency in food is an elusive goal and not a necessary condition for food security. As defined by the FAO, “food security exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food which meets their dietary needs and food preferences for an active and healthy life”. As such, local production of food can be complimented by imports and, thus, is not essential. A country can be considered food secure if it has enough resources, particularly foreign exchange, to import sufficient food.

## 2. AGRICULTURAL POLICY

### A brief history

In the 1960s, agriculture was pivotal to Egypt’s development policies, with the rural citizen and the factory worker at the center of post-independence national Egyptian identity (El-Kouny 2018). The period was characterized by Nasser’s “Arab Socialism” stemming out of the 1952 revolution, the 1956 nationalization of the Suez Canal that followed, and the birth of mega-projects in the name of breaking out of colonial reins and structures. Policy focused on levelling the playing field via a more equitable distribution of income and the provision of affordable food to urban areas from peri-urban and rural areas, while strengthening the connection between rural and urban areas.

Crop rotation schedules<sup>3</sup>, crop area allocations, mandatory quantity delivery quotas at prices fixed below international market rates, and subsidized consumer prices were all put in place during this period. Agricultural cooperatives were tasked with monitoring inputs, production, and marketing at the village level, while also coordinating credit provision and output quotas with agricultural credit banks. This interventionist institutional structure eventually caused agricultural stagnation as farmers became frustrated, yields dropped, cropping patterns became distorted, exports (such as cotton) fell, crop self-sufficiency gaps grew wider, the food subsidy system imposed a heavy burden on the government's budget, and the urban-rural income gap expanded as taxes took up a higher portion of what farmers gained via artificially low producer prices (Cassing et al. 2009).

In response, subsidies on farm inputs were increased, food subsidies were extended to rural areas, and land reform laws tackled redistribution of land ownership. Starting in 1986 and through the 1990s, a reversal of these interventionist policies began with a sweeping wave of liberalizing economic reform policies, giving the private sector a larger role in the agriculture sector and reducing that of the government<sup>4</sup>.

Two agricultural policy reform programs were implemented between 1987 and 2002: The Agricultural Production and Credit Project (1987-1995); and the Agricultural Policy Reform Program (1996-2002). The Agricultural Production and Credit Project included reduction of subsidies in some agricultural inputs, as well as the removal of controls on area allotments and price and marketing restrictions for some major crops (Baffes and Gautam 1996; Cassing et al. 2009). It also paved the way for the privatization of state-owned firms through the introduction of a new law reorganizing public firms into holding companies in which the government is a joint stakeholder (Ender and Holtzman 2003). The Agricultural Policy Reform Program which followed was broader in context and included the privatization of public firms.

In parallel, the launching of the Economic Reform and Structural Adjustment Program in 1991, with the International Monetary Fund and the World Bank, had an indirect impact on the agriculture sector. By shifting government policy from a state-controlled to a market economy, the structural adjustment program accelerated the liberalization of markets and encouraged the private sector to play a greater role in agriculture trading. This was done in part through the removal of most subsidies on agricultural inputs, lifting the mandatory crop rotations, and removing pricing and marketing controls (Cassing et al. 2009; Gouda 2016).

In the following section, we describe key agricultural policies that are now in place in detail.

### **Water and irrigation policy**

Over 80 percent of Egypt's water supply is used in agriculture. This supply comes from the Nile. A 1959 bilateral agreement with Sudan determined Egypt's share as 55.5 billion cubic meters annually. A significant supply also comes from groundwater via the Nile Aquifer and the Nubian Sandstone Aquifer, while less than 2 percent of Egypt's cultivation is rain-fed.<sup>5</sup> Nevertheless, despite these supplies, Egypt now faces substantial water management efficiency issues.

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<sup>3</sup> Generally typical for wheat, clover, and sugar beet to be cultivated in the winter, and maize, tomato and cotton to be cultivated in the summer (Ouda and Zohry 2015; Ibrahim and Ibrahim 2003).

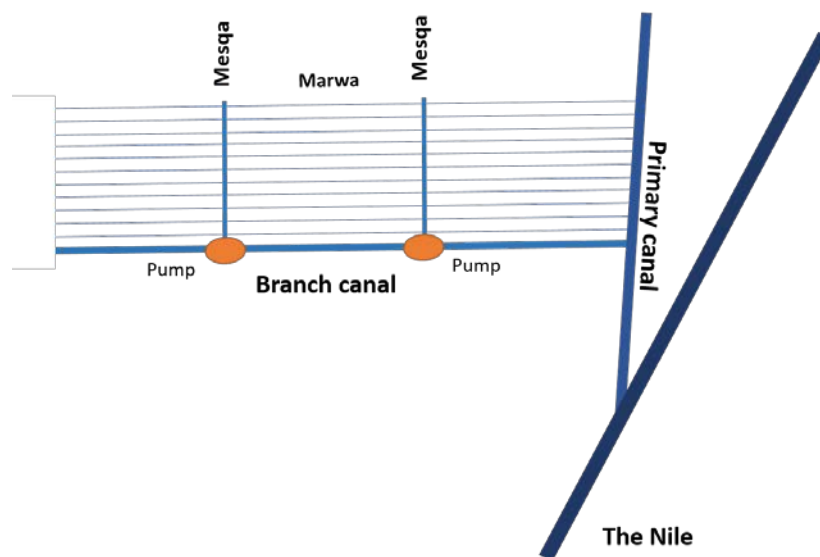
<sup>4</sup> Crop prices were liberalized as delivery quotas and input subsidies were relieved and the market was opened to private investment. This evolution of policies impacted agricultural output and trade. Cotton has previously come at the top of Egyptian exports, constituting about 80 percent of all exports in the 1960s. Rice exports followed. Both commodities fell in importance in the export market as oil and gas came to take their place. Imports were also affected as imports of maize, sugar, and wheat came to hold a seemingly irreplaceable grip at the top of the list (Cassing et al. 2009).

<sup>5</sup> Rain-fed cultivation is only significant, though highly variable, along the Mediterranean coast and in the Sinai.

The completion of the Aswan High Dam on the Nile in 1971 allowed a transition to perennial irrigation and longer-term water storage. The Lake Nasser reservoir accompanying the dam has a storage capacity of 132 km<sup>3</sup> (Ibrahim and Ibrahim 2003). The dam effectively put an end to the floods that sent much unused water into the Mediterranean, guaranteed a minimal annual water flow, allowed further reclamation of land to the east and west of the Nile valley, and permitted the production of significant hydropower. However, the dam also prevented the passage of silt that regenerated soils and caused the deterioration of agricultural drainage systems (Gouda 2016).

With the introduction of the Open Door Policy<sup>6</sup> in the 1970s and the imposition of the Economic Reform and Structural Adjustment Program in the 1990s, came a restructuring of the institutional apparatus surrounding irrigation water. Law 12/1984 declared water as a public good delivered by the government to farms at no cost. It gave the Ministry of Water Resources and Irrigation responsibility over Nile water resources and the accompanying canal system and its maintenance down to the *mesqa*, the tertiary canal, level (Figure 3). The law also recommended that the flow of water past *mesqas* should be integrated into a private system managed by water users (Kassim 2009). Through this, the government sought to reduce its direct involvement in the operation and maintenance of public irrigation systems and, to a lesser extent, drainage services.

**Figure 3 – Schematic diagram of the irrigation canal network in Egypt**



Source: Gouda 2016 with adjustments by authors

A series of dams, barrages and main canals direct water from the Aswan High Dam through to the Mediterranean. Water released from the Aswan High Dam pours into the primary and branch canals and may then be pumped into mesqas. At the mesqa level, gates are manually opened in turn by farmers at scheduled intervals, e.g., once every 7 to 15 days, to send water into the *marwas*.<sup>7</sup> The intervals at the mesqa level are determined via farmers' water user associations (WUAs), while water user associations at the branch canal level are formed by ministerial decrees (Gouda 2016; Kassim 2009). Law 213/1994 defines the use and management of public and private sector irrigation and drainage systems, including main canals, feeders, and drains. Article 71 of that law recognized and legalized WUAs as specialized associations performing functions related to water management

<sup>6</sup> President Sadat's Open Door Policy was a wave of liberalization after the war years that curb interventions of the state in the economy. In relation to agriculture, a principal effect it had was in allowing farmers to travel to work in oil-producing countries, thus increasing remittances.

<sup>7</sup> Marwa = Field ditch, private property.

at the mesqa level, while Ministerial Decree 14900/1995 reflected the functions, rights, and duties of WUAs in water management activities. Through this legislation, the aim was to work towards optimum utilization of available water through an integrated participatory system that engages farmers in management decisions over water in their hydraulic boundary, leading to more efficient use of water (Law 213/1994; Kassim 2009).

At the primary and branch canal levels, it is the responsibility of the Ministry of Water Resources and Irrigation to ensure that sufficient amounts of water are delivered into these canals. The determination of the quantity of water released from the Aswan High Dam is essentially based on the cropping pattern. Previously, the Ministry of Supply and Internal Trade would inform the Ministry of Agriculture and Land Reclamation (MALR) of the type and quantity of crops to be cultivated that year. MALR, along with the agricultural cooperatives, then designed the crop rotation plan for the year, which then was followed by farmers benefitting from subsidized agricultural inputs. MALR would send the crop rotation plan to the Ministry of Water Resources and Irrigation, which ensured that enough water would be made available on time according to the plan, given that it could take up to 20 days for water to travel to the Delta once released from the Aswan High Dam (Gouda 2016).

With the Economic Reform and Structural Adjustment Program and the removal of most subsidies on agricultural inputs and sharp curtailing of state interventions in the imposition of crop rotations and in agricultural pricing and marketing, farmers gained the right to plant what they pleased and no longer had to deliver their crops to the state. This resulted in increased production of rice, a crop with heavy water demand, and impacted the ability of the Ministry of Water Resources and Irrigation to maintain and fulfil the water delivery system. The Ministry was also unable to maintain irrigation canals as they had previously due to shrinking tax returns and budgets (Gouda 2016). The emphasis on providing at least a minimally sufficient quantity of water to farmers may have resulted in the controversial inclusion of black water (sewage) into Egypt's irrigation system (Kassam 2017).

As participatory water management units, water user associations exist for both farmers in the old agricultural lands around the Nile Delta and Valley as well as in the newly reclaimed lands east and west of the Nile (Kassim 2009; Abdel-Gawad 2007). Egypt's Old Lands have been those cultivated for thousands of years. They constitute around 85 percent of the cultivated area of the country and are largely dominated by small farmers, while the New Lands make up the remaining 15 percent of the cropped area and have both small farmers and large commercial farms (McCarl et al. 2015). The Nubian Sandstone Aquifer System<sup>8</sup> provides groundwater that allows the government to expand their land reclamation efforts into the Eastern and Western Deserts, combating shrinking per capita agricultural land around the Nile and the underlying Nile Aquifer (Sims 2015; Gouda 2016). In these New Lands, water is provided by government at no cost to farmers. However, farmers still must cover the costs of diesel for water pumps and, potentially, the initial installation of a pump (surface or submersible) and even the digging of surface and, to a lesser extent, deeper wells. The cost of pumped irrigation water is therefore indirectly subsidized via fuel subsidies in Egypt. Enforcement by irrigation authorities of regulations on use of pumps is low and the

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<sup>8</sup> The Nubian Sandstone Aquifer System, with a depth of 100 to 2500 meters, provides fossilized groundwater from water-bearing Nubian sandstone rock underlying a plateau where water flows to the surface via artesian pressure (Gritzinger 1990; Viscomi 2010). The aquifer sits underneath Egypt, Libya, Chad, and Sudan and is largely deemed non-renewable. Estimates of its lifespan under current withdrawal patterns is between 20 and 200 years, since recharge is negligible (Viscomi 2010; United Nations Population Division 2016).

bureaucratic complexity of getting a license for new wells mean that there is little effective regulation in practice. Illegal pumping is widespread (Sims 2015).

Overall, the country juggles a dry climate, the water demands of irrigated crops, and an increasing and deeply-rooted dependence on crops irrigated by the Nile. These all highlight a vulnerability to climate change impacts (Ibrahim and Ibrahim 2003; Owen 2005). Fluctuating levels in the flow of the Nile leave crops and yields at risk, especially during the summer season. In addition, sea-level rise threatens low-lying Delta lands with increased sea water intrusion and increased salinity, resulting in lower levels of fresh water supply (McCarl et al. 2015). As Egypt sets itself on course for implementing its Sustainable Development Strategy: Egypt's Vision 2030<sup>9</sup>, as well as in its communications to the United Nations Framework Convention on Climate Change, recognition of the risks of climate change to the Egyptian agricultural sector and to the economy in general have begun to appear in policy rhetoric. The Sustainable Development Strategy (2016:248) for example expresses the following:

“Climate change is expected to have an impact on the water sector, resulting in more demand, especially in the agricultural sector. In addition, the impact of high sea-level on groundwater reservoirs in the Nile Delta increases their salinity and makes the water non-consumable.”

As irrigation water is delivered free-of-charge to the canals, there are few incentives for farmers to invest in water conserving technology, though drip and sprinkler irrigation are slowly becoming more common practice in the New Lands given how they save on pumping costs and have a low-labor requirement. Aquaponics and hydroponics also are slowly gaining momentum within both small enterprises producing fruits and vegetables and within larger integrated water management strategies. Most farmers, nonetheless, still use flood irrigation techniques via the *marwas*. However, the efficiency of Nile water use is quite high as the water lost to drainage mostly returns to the river to be used downstream, with the main loss going to evapotranspiration. To maximize the return of drainage water, the government has invested in subsidizing leveling of fields and the improvement of the canal system to reduce water losses (CEDARE 2011). There are also ongoing attempts to modernize and automate the water distribution system to allow a continuous flow of water instead of the rotation system (Allam, El-Gamal, and Hesham 2005).

### Provision of agricultural inputs

#### Agricultural cooperatives

Following the Egyptian revolution of 1952, agricultural cooperatives were established in each village in order to control the distribution of farm inputs, such as chemical fertilizers, seeds of strategic crops, and pesticides (Saad 2002; Cassing et al. 2009). During the 1960s and 1970s, government relied on agricultural cooperatives in the implementation of the country's development policy through ensuring crop rotation schedules (Abdel Aal 2008). Cooperatives were also responsible for the procurement of crop quotas as well as the marketing of major crops.

Membership of farmers in agricultural cooperatives has been mandatory since 1961 with annual membership fees being automatically deducted from farmers' transactions with the cooperatives. Agricultural cooperatives also played a role in the provision of credit to farmers in collaboration with the Principal Bank for Development and Agricultural Credit (PBDAC). However, this changed after the shutdown of cooperatives between mid-1970s and early 1990s (Saad 2002).

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<sup>9</sup> The Government of Egypt is currently in the process of re-writing the Egypt Vision 2030 and the Sustainable Development Strategy plans.

Since then, credit services and storage facilities owned by cooperatives were fully transferred to PBDAC.

After the restructuring of agriculture cooperatives in 1992, their role shifted towards the dissemination of information to farmers. Currently, the main role of cooperatives is linking farmers in rural areas to information about markets, technical assistance, and supply chains for exports (Christiansen et al. 2011). However, the effectiveness of cooperatives in playing this role is questionable. One of the major limitations of the existing cooperatives structure is inflexibility in allowing cooperatives to develop independent marketing activities (World Bank 2014). As of 2013, there were 6,000 agricultural cooperatives in Egypt with more than 4 million members (CAPMAS 2015).

### Seed

The Egyptian government continues to play a major role in the production and distribution of seed for staple crops, even though the policy reforms of the 1990s have reduced government monopoly in the seed sector. Starting with Agriculture Law 53/1966, the Agriculture Research Center (ARC) of MALR was made responsible for the "control and regulation of seed multiplication and production, domestic seed trade, and seed imports and exports" (Delouche 1998). In the early 1990s, the national seed industry policy was directed towards minimizing the involvement of ARC in seed multiplication and marketing, and replacing it with the Central Administration for Seed Production (CASP) (Abd El-Wanis, Salah and Weisbecker 2001). CASP was restructured in order to implement the new policies for reforming the seed industry. Particularly, CASP's role was to support the transfer of public seed production plants to private centers.

Nevertheless, ARC continues to play a major role in the processing, storage, and distribution of foundation and registered seeds with coordination from CASP. CASP's structure contains a general directorate for seed marketing and distribution as one of its four main departments. The role of this directorate is to set prices and market seeds produced by CASP. As of 2000, the seed market share of CASP was 100 percent for cotton, barley, and lentil, 82 percent for fava bean, 67 percent for wheat, and 65 percent for rice (Abd El-Wanis, Salah and Weisbecker 2001).

At the retail level, the structural reforms of the early 1990s included the transfer of seed distribution from the Principal Bank for Development and Agricultural Credit (PBDAC) to agricultural cooperatives and the private sector (Abd El-Wanis, Salah and Weisbecker 2001). In IFPRI's 1998 Egypt Wheat Producer Survey, cooperatives were the most important source for modern seed varieties, with 55 percent of farmers in the survey purchasing seeds from cooperatives (Gruhn et al. 2000).<sup>10</sup>

### Pesticides

The Agricultural Pesticide Committee has been the main government entity responsible for the assessment, evaluation, and registration of agricultural pesticides in Egypt since 1966 (Abdel Megeed 2017). The subsidy for pesticides was phased out as part of the 1986 reforms. This ended the government monopoly over the provision of pesticides to farmers (Baffes and Gautam 1996; Ender and Holtzman 2003; Cassing et al. 2009).

Starting from 1999, government allowed agricultural cooperatives to provide pest management services and to sell pesticides to farmers located in their villages. However, the

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<sup>10</sup> International Food Policy Research Institute, 2000, "Egypt Wheat Producer Survey, 1998", <https://hdl.handle.net/1902.1/17087>, Harvard Dataverse, V1.

government still controls pest management through the provision of guidelines and standards for registration and licensing of private pesticide companies (Ender and Holtzman 2003).

In 1998, the government introduced new registration procedure for pesticide companies as part of an integrated pest management strategy. Nevertheless, concerns remained over the exposure of farmers and agriculture workers to hazardous substances due to limited enforcement of regulations (Fleischer, Waibel, and Walter-Echols 2002). In 2017, a ministerial decree was issued by MALR giving the Agricultural Pesticide Committee additional control over the licensing and regulation of the pesticide industry in Egypt (MALR 2017).

## Fertilizers

The Government of Egypt has a history of direct intervention in the fertilizer market with a general impact of increasing access by farmers to fertilizer and holding prices below world levels. As a result, fertilizer use in Egypt is generally high on the global scale.

The monopoly of MALR over the distribution of fertilizers lasted for about three decades starting from the mid-1960s. The Principal Bank for Development and Agricultural Credit (PBDAC) was the primary institution within MALR responsible for the provision of fertilizer for each crop until the early 1990s. Then, the government began to break up PBDAC's monopoly. In 1992, the fertilizer subsidy was phased out (Gruhn et al. 2000).

The production of fertilizers was completely managed by the government until the early 1990s. Starting from 1991, government policy was directed towards privatization of public sector companies, including fertilizer factories. However, many fertilizer factories remained organized as joint-ventures. By 2001, around three-quarters of nitrogen fertilizer production and all phosphorus fertilizer production were transferred to companies organized under the private sector law (Saad 2002).

Since 1992, private traders have been allowed to compete with PBDAC and agricultural cooperatives in the distribution of mineral fertilizers (FAO 2005; Cassing et al. 2009). Private traders include wholesale distributors that deal directly with fertilizer factories and smaller retailers located in villages, some of them not even licensed (FAO 2005). The government previously set quotas for wholesale distributors based on their storage capacity and past transactions with manufacturers. However, there were important interruptions to this new system, particularly in 1995 when the government intervened by instructing PBDAC to take over the distribution of all domestic production due to substantial shortages in supply. PBDAC's quota in the distribution of fertilizers then fluctuated between 10 percent in 1998 and 50 percent in 2002. It is popularly believed that the government tends to change the quota for private traders from year to year in order to reduce fertilizer exports at times when there are shortages in the local market.

The government obliges factories to supply these quotas to PBDAC at a price set below market price (Werr 2017; Ghoneim 2012). Two factories, Abu Qir and Delta, are supposed to supply three-quarters of the required quantities (Elgerzawy 2014). According to the Ministry of Investment and International Cooperation, there are twelve major fertilizer producers in Egypt, only three of them are state-owned, while the rest are shareholder companies (El-gabaly 2015). In some cases, however, the government still holds the majority in shareholder companies, which can be considered parastatals.

PBDAC in turn sells fertilizer to cooperatives at only a small mark-up. Farmers obtain fertilizer from cooperatives at the artificially low price and are only allowed to purchase an amount that is

determined by their landholding size and type of crop produced. Experts explained during field interviews that this distribution system tends to prioritize wheat cultivation over other crops

Problems associated with the fertilizer subsidy scheme include a poor distribution system, lack of supervision, and sometimes a lack of sufficient fertilizer entitlements for farmers (Ghoneim 2012; Elgerzawy 2014). As a result, a black market is a major drawback of the subsidy scheme.

A second distortion to the fertilizers market is the imposition of import taxes at some points, including high levels in the 1970s, which artificially constrains further the supply in Egypt. These tariffs were likely implemented for the benefit of the fertilizer industry rather than as part of a comprehensive agricultural policy (Cassing et al. 2009).

In addition to direct intervention in the fertilizer market, the government also subsidizes nitrogen fertilizer production indirectly by subsidizing natural gas, a main input in producing nitrogen fertilizers. The fact that the government is gradually reducing natural gas subsidies is pushing the official price of nitrogen fertilizer up over time (ElNoubi 2017). Moreover, restrictions on imports of liquified natural gas by fertilizer factories is further limiting their production. It is estimated that in 2016 private fertilizer factories on average were running at 70 percent of their capacity (Werr 2017). Kassam and Dhehibi (2016) suggest that this indirect subsidization of nitrogen fertilizers relative to phosphate fertilizer is another way in which the government prioritizes wheat production over other crops, several of which do not require nitrogen fertilizer to the same degree as wheat.

#### Agricultural credit

While official agricultural policy has long provided subsidized access to credit for agriculture, in practice formal loans have been inaccessible for the vast majority of farmers. Reforms in 2016 may somewhat increase the share of farmers who can access credit, but the impact of these reforms is not yet known.

The Principal Bank for Development and Agricultural Credit (PBDAC), established in 1931, is the most important financial institution with strong presence in rural areas. Prior to the restructuring of PBDAC in December 2016, it was classified as a special bank under the supervision of MALR. Hence, PBDAC was exempt from the Central Bank's reserve requirements. Most of its deposits were owned by cooperatives and other agricultural organizations, while loan funds were mostly financed by commercial bank loans at subsidized interest rates (Baydas, Bahloul, and Adams 1995). The credit subsidy provided through PBDAC was universal, which implied that both large agriculture corporations as well as smallholder farmers can benefit from subsidized loans (World Bank 2014).

PBDAC accounted for 70 percent of all formal institutional lending to the agriculture sector in 2014. However, the agriculture sector's access to credit is still inadequate. It received only one percent of total lending compared to 38 percent and 26 percent for the industry and services sectors, respectively (World Bank 2014).

A study by Baydas, Bahloul, and Adams (1995) demonstrates that demand for credit in the agriculture sector is primarily met through the informal sector. This study showed that, even among employees of PBDAC, rotating savings and credit associations (*gam'eyas*/ جمعية in Arabic) played a significant role in the provision of informal credit. In some cases, informal finance provides financial services that are not offered by PBDAC, but for which there is a high demand, such as small, short-term loans.

Female farmers in particular are more limited than men in terms of access to formal credit; only 7 percent of women farmers have an account at a formal financial institution, compared to

12 percent for men. This is the case despite the major role played by rural women in the production of food for household consumption and sale in local markets – accounting for about 60 percent of food production (World Bank 2014).

Recent reforms to PBDAC aim at improving the bank's efficiency and transforming it into a "commercially run agriculture-focused bank serving rural Egypt" (World Bank 2014). In November 2016, PBDAC was renamed the Egyptian Agriculture Bank and its supervision was transferred from MALR to the Central Bank (Werr 2016). Under Central Bank management, the bank will be required to adhere to reserve ratios and capital requirements on par with other commercial banks. The World Bank has also recommended the restructuring of PBDAC to include reform of interest rate subsidies in order to improve subsidy targeting (World Bank 2014).

According to the chairperson of the Egyptian Agriculture Bank, the bank is planning to expand its client base from its current level of approximately 3 million clients to reach 7 million clients, which is still a small number relative to the population (Mounir 2017).

## Research and extension services

### Extension

The Central Administration for Extension and Environment is the primary extension organization providing technical supervision on agricultural extension services at the national level (Fleischer, Waibel, and Walter-Echols 2002). It is one of the seven central administrations under the Agriculture Extension Sector in MALR.

The extension system grew quickly in the 1960s and 1970s as the size of the public sector expanded, generally following Egypt's national public employment guarantee for university and technical school graduates (Assaad 1997). However, this rate of increase was unsustainable, and the extension system was subject to a hiring freeze in 1984 following a government policy introduced in the midst of a balance of payments crisis (McDonough, Nuberg, and Pitchford 2015; World Bank 2009).

By the mid-1990s, the public extension system was perceived to be overstaffed and poorly organized. Besides overstaffing, a major limitation of the extension system in this period was the inefficiency of its centrally managed administration. Lack of communication between researchers, extension agents, and farmers made the extension system ineffectual, particularly at a time when small farmers were moving towards agro-exports (McDonough, Nuberg, and Pitchford 2015).

The resulting void in effective public extension was partially filled by outreach units of private sector companies (Christiansen et al. 2011). The transfer of some extension services to the private sector was supposed to contribute to the development of new extension models needed for enhancing export-oriented agriculture (Ender and Holtzman 2003). However, a major drawback is that private sector companies only provide product-specific information and are not incentivized to provide impartial advice to farmers.

The hiring freeze for extension agents has persisted over time, meaning that most permanent staff are now near retirement age. MALR has attempted to circumvent this freeze by hiring temporary staff on renewable contracts. Nevertheless, the number of village level workers is decreasing rapidly; falling from 3,274 in 2011 to around 800 in 2014 (El-Shafie et al. 2015). Moreover, there is a conflict between the duties assigned to extension workers at the field level. Specifically, extension workers are also responsible for reporting illegal construction on agricultural land, which usually results in mistrust between farmers and extension agents (Christiansen et al. 2011).

MALR acknowledges the weak performance and "continual erosion" of the agricultural extension system as manifested in the Sustainable Agricultural Development Strategy 2030 (McDonough, Nuberg, and Pitchford 2015). Moreover, the Ministry of Planning's Sustainable Development Plan 2017-2020, places the development of the agricultural extension system at the top of planned agricultural projects to be funded by the government for the fiscal year 2018/2019 (MPMAR 2017).

### Research and development

The Agriculture Research Center (ARC) represents the principal agency within MALR dedicated to research and development. ARC has 16 research institutes and eight central laboratories with 56 experimental research stations throughout the country (Stads et al. 2015). In addition, other public institutions, such as the National Research Center, the National Water Research Center, Desert Research Center, Food and Agriculture Council and University Agricultural Faculties, also conduct agricultural research.

The primary focus of agriculture research in Egypt is crop improvement and crop variety development (Stads et al. 2015). The agricultural research system in Egypt is considered to be "among the world's largest in terms of human resource capacity" (Stads et al. 2015). At the same time, expenditure on salaries represented 87 percent of the ARC's total expenditures in 2012. Researchers at ARC, thus, lack sufficient funding to conduct research and the quality of their training is also in need of revitalization, modernization, and general improvement. Consequently, MALR's Sustainable Agricultural Development Strategy towards 2030 prioritizes human resource development, particularly in agricultural research and extension.

ARC expenditure data shows that research programs are "severely underfunded", with agricultural R&D representing 0.4 percent of agriculture GDP in 2012, "well below the 1 percent target recommended by the United Nations and the New Partnership for Africa's Development (NEPAD)" (Stads et al. 2015).

As with extension, private companies are substituting for government investment in research and development. Private seed production companies have been involved in developing and testing foreign bred varieties since reforms to the seed industry in the 1990s (Abd El-Wanis, Salah and Weisbecker 2001). The private sector has also become increasingly involved in the development of new seed varieties, especially for self-pollinated crops, such as rice and wheat. When Law 82/2002 was introduced to govern all intellectual property rights in Egypt, it included a section on plant variety protection. The law gives exclusive intellectual property right to breeders of new varieties for a limited period of time and under certain controls (Ahmed 2010).

### Price and procurement policy for key crops

The Egyptian food subsidy system, which dates back to 1941, has strongly influenced agriculture policy in Egypt (Alderman, von Braun, and Sakr 1982). The political significance of the bread subsidy in ensuring stability has motivated strong government intervention in the wheat sub-sector in particular. However, government policy has encompassed other major crops as well, such as cotton, rice, maize and sugar cane.

During the 1960s, Nasser's regime adopted a socialist policy characterized by central planning and price controls. The government imposed crop rotation schedules, crop area allocations, and compulsory procurement for most major crops, usually at prices lower than the market price (Scobie 1981; Cassing et al. 2009). The intuition behind such policy was to transfer agricultural surpluses to the government in order to finance industrial growth.

As mentioned above, the agricultural policy reform process that began in 1987 partially liberalized these policies. However, the state remains heavily involved in setting the prices farmers receive for key crops.

## Wheat

Wheat is important for Egypt's national security due to the importance of subsidized wheat bread in Egypt's food security. Wheat is the most widely cultivated crop in Egypt in terms of growing area, comprising 50 percent of the cultivated area during the winter season<sup>11</sup>. In 2014 alone, wheat production amounted to 9.24 million tons grown over 3.54 million feddan (MALR 2016). Cultivation of wheat is also generally less water intensive than rice and maize with a 2014 average water use of 1,440 m<sup>3</sup> per feddan (Nin Pratt et al. 2018). Wheat is often paired with rice in crop rotations (Cassing et al. 2009).

In 1955, a compulsory delivery policy for wheat was instituted with the intention of ensuring more equitable distribution of food and income. The growing area dedicated to wheat was also reduced (Gruhn et al. 2000). The delivery policy entailed the sale of a quota of wheat by each wheat farmer as a specific fraction per feddan at a fixed price that was lower than the international price (Gruhn et al. 2000; Cassing et al. 2009).

In 1960, the onset of the United States Public Law 480 made it easier for countries to import wheat from the U.S. in their own currency, while also serving to relieve the U.S. of grain surpluses (USAID 1983). Egypt thus began importing wheat for the first time. Due to political concerns about food security, the government took control of wheat and flour imports by nationalizing all foreign trade in 1961 (Gutner 2002; Scobie 1981). The government also nationalized large-scale wheat storing and processing facilities and established the General Organization for Mills, Silos, and Bakeries in 1965 (Alderman, von Braun, and Sakr 1982). Attempts at raising bread prices with the Open Door policy by removing subsidies were met with often violent riots (Ibrahim and Ibrahim 2003).

This highly centralized system proved unsustainable. In 1976, the compulsory delivery requirement was replaced with an optional delivery requirement with fixed prices offered by the government. As part of the overall agricultural reform program in 1987, government then switched from a policy of fixed prices to guaranteeing floor prices, which were set at approximately the level of international prices and announced at planting time every year (Cassing et al. 2009). Instances of floor prices being set higher than the international market price occurred several times in the late 1980s. This encouraged wheat cultivation such that production and yields grew.

Nevertheless, demand continues to outpace supply and self-sufficiency remains an issue as driven by rapid population growth, high consumption of subsidized, and therefore cheap, bread, controlled local production and trade, and a reduced growing area dedicated to wheat. Egypt has consistently imported more than 40 percent of its wheat consumption since the early 1980s and is considered one of the top four wheat importers in the world (Cassing et al. 2009).

The General Agency for the Supply of Commodities (GASC), affiliated to the Ministry of Supply and Internal Trade, is the key body involved in the wheat procurement process, while agriculture cooperatives play an important role in linking Egyptian farmers with the government. Currently, wheat farmers have the option to sell their harvest directly to GASC or to private traders. Even though private traders often act as a middleman buying wheat from farmers then selling it again to GASC, some farmers prefer to deal with private traders who offer complementary services, such as

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<sup>11</sup> Authors' calculation based on data provided by MALR, 2014.

loans to finance the purchase of agricultural inputs and free transportation from the farm gate to silos (Coelli 2010). While farmers are not required to sell to the government, the government price is influential as it is the largest buyer in the market (Ghoneim 2012).

The procurement price offered by government has usually been set above the world price in order to encourage domestic production, reduce imports, and improve the balance of payments (Coelli 2010). The government is considering a change to its procurement policy by setting the price for local wheat harvests on the international price, but this has not yet been enacted (Wally 2017a).

In the 2016/2017 fiscal year, Egypt produced 8.1 million metric tons of wheat. Of that amount, 3.4 million metric tons were purchased by the government at prices slightly higher than the international market price (USD 210 to 218 per metric ton depending on quality, compared to an average of USD 205 per metric ton for imports). The government and private sector were projected to import an additional 11.4 million metric tons of wheat to meet consumption needs (Wally 2017b).

### Maize

Maize is the most commonly grown crop in the summer season, grown on 26 percent of the farmed land in the season and equally distributed between the Delta and the Nile Valley. Eight million metric tons of maize are produced annually (MALR 2016). The average yield of maize has tripled between 1952 and 2002 (Ibrahim and Ibrahim 2003).

Both white and yellow maize are of importance to the Egyptian food subsidy system. Yellow maize is largely used as feed for livestock, which has grown in importance as demand for red meat has increased. White maize is used in producing maize flour, which complements wheat flour in the production of subsidized *baladi* bread. Since maize flour is less expensive than wheat flour, mixing the two reduces the cost of subsidizing bread (Cassing et al. 2009; Ender and Holtzman 2003).

As with wheat, maize production has been heavily regulated since the 1960s, with farmers subject to cropping restrictions, delivery quotas, and administered prices lower than the international market price. Via this system, maize was heavily subsidized to consumers, yet production was limited. With the 1987 reforms, there was a switch to actively incentivizing maize production through higher procurement prices, usually on par with the price of rice, in order to increase the availability of maize for animal feed to support beef production (Ghoneim 2012).

Pursuant of the goal of domestic self-sufficiency for maize and other crops, the government set targets of domestically producing 78 percent of the maize Egypt requires by 2017 and 92 percent by 2030 (Tellioglu and Konandreas 2017). This is to be met by increasing the maize growing area, increasing yields, introducing improved seed varieties, and dedicating newly reclaimed land to the cultivation of maize.

### Rice

Rice is the second largest crop in terms of area cultivated during the summer season, grown on 21 percent of cultivated land. Almost all rice is grown in the Nile Delta and Fayoum, where more water is available to cater to the high-water demanding and relatively salt-tolerant crop. Approximately 5.5 million tons of rice are produced every year (MALR 2016).

Because it is water intensive, the government of Egypt has historically limited the areas where rice can be grown. Rice consumes around 20 percent of Egypt's Nile irrigation water supply, or about two and a half times more water per feddan than is required for maize, at a rate of 7,300 m<sup>3</sup> per feddan (Nin Pratt et al. forthcoming). Law 71/1953 allowed rice cultivation only in the Nile Delta, Fayoum, and land with artesian irrigation and infrastructure for drainage. The law also introduced a fine for those found to be in violation, which later was reinforced by Law 250/1956 (Fahmy et al.

2000). Law 31/1961 gave the Minister of Water Resources and Irrigation the right to determine areas where rice may be grown (Fahmy et al. 2000).

High-yielding rice varieties introduced in the 1970s and 1980s required even larger amounts of water, fertilizer, and pesticide. As a result, the restrictions on where rice could be grown remained in place even throughout the liberalization period in the late 1980s and 1990s. However, the private sector was allowed to trade, mill, and export rice, such that 36 percent of rice was being milled by private sector commercial mills by 1997 and further privatization has followed since then (Barnes 2010; Ender and Holtzman 2003).

In the early 2000s, government lowered the area permitted for rice production in the Delta by about half in order to save irrigation water (Ibrahim and Ibrahim 2003). Egypt continued to export rice, but simultaneously began to import cheap lower-quality rice to meet local demand (Ibrahim and Ibrahim 2003). By March 2008, an export ban on rice was imposed to counter rising food prices and discourage extensive rice cultivation. The ban resulted in the price of rice dropping by about 13 percent (Barnes 2010). The ban was reversed in 2015, but re-imposed in April 2016 (Reuters 2016).

A controversial new water resources and irrigation bill was issued in September 2017, further fining and potentially imprisoning farmers that grew rice outside the boundaries of the 1.7 million feddan area defined in eight governorates where rice cultivation was authorized. This area had decreased from the year before, when 2 million feddan were authorized during 2016. Representatives of farmers argue that the new sanctions are too stringent and farmers do not have alternative crops to rice in areas with high soil salinity (Hussein 2017).

## Cotton

Cotton was Egypt's leading export in the late 19<sup>th</sup> and early 20<sup>th</sup> century, with the area of land dedicated to cotton cultivation peaking at 2 million feddan in 1961 (Ibrahim and Ibrahim 2003). However, the agriculture policy in the 1960s and 1970s favored wheat and maize production over export crops, such as cotton. The result has been a steady decline in cotton exports and cultivation.

The government deliberately aimed at decreasing the country's economic dependence on cotton, which represented about 80 percent of commodity exports in the early 1960s, in favor of being more self-sufficient in meeting local food demands (Scobie 1981; Cassing et al. 2009). Nationalization of the cotton industry, also in 1961, then saw the development of the Egyptian Cotton Organization, which took over all activities involved in cotton production and exportation (Baffes 2001). Government decided on the varieties to be planted each year, the cultivation area, farm price, and export price and quantity. In the local market, low administered prices helped in providing the textile industry with subsidized cotton, but at the same time, coupled with heavy taxation and rising wages, it led to considerable reductions in cotton cultivation as farmers started to abandon the crop in favor of more profitable crops (Baffes and Gautam 1996). Throughout the 1960s and 1970s, Egypt produced about half a million tons of cotton, annually.

Rice cultivation benefited from a relative price advantage over cotton as well as an indirect subsidy in the form of free irrigation water (Cassing et al. 2009). Both cotton and rice are summer crops and are considered complementary to wheat cultivation in crop rotations, so rice production increased as cotton production fell.

Cotton procurement prices were gradually increased between 1986 and 1991 to reflect border prices and were deregulated later in 1997. Area restrictions for cotton cultivation were also lifted in the early 1990s. However, low profitability resulted in contraction of the total area planted to cotton

by 50 percent between 1980 and 2000 (Cassing et al. 2009). By the early 2000s, the area dedicated to cotton production had drastically decreased to only about 720,000 feddan (Ibrahim and Ibrahim 2003). In 2014, only 5 percent of cultivated land in the summer season was planted with cotton.

In January 2015, the government ended subsidies on cotton. In 2016, cotton production came in at a record low of only about 38,000 tons. The subsidy was then reinstated at a different rate – originally 1,400 EGP per feddan – that is linked to the selling price to the local spinning industry (Abaza 2016). In July 2017, the Egyptian Ministry of Trade and Industry, in cooperation with the United Nations Industrial Development Organization and the Italian Agency for Development Cooperation, started a new project for improving the quality and performance of local cotton producers (MTI 2017).

### 3. OTHER PUBLIC POLICIES WITH IMPACT ON AGRICULTURE

#### Food subsidy system

As seen in the previous section, the Egyptian food subsidy system was a driver of significant interventions in the agricultural sector. As part of the socialist policy adopted by the Nasser regime, the food subsidy program was expanded in the 1950s and 1960s to provide basic commodities at subsidized prices to all Egyptians.

A universal subsidy of *baladi* bread was the cornerstone of the subsidy system. Until recently, government had directly intervened at every level of bread production from wheat procurement to flour milling to bakery production so as to maintain production quotas at the subsidized price. There was a high rate of leakage in the system as economic incentives were misaligned. In consequence, government was forced to procure more wheat than would have been demanded even at the subsidized price.

The number of subsidized commodities increased gradually until the early 1970s, reaching 18 food items (Cassing et al. 2009; Ecker et al. 2016). After an unsuccessful attempt to remove the subsidies in 1977 was met with riots, in the 1980s and 1990s, the government gradually reduced food subsidies in order to ease the growing fiscal burden of the subsidy bill (Löfgren and El-Said 2001). A few food items, such as meat, chicken, and fish, were removed from the subsidy system between 1990 and 1992. Government also increased the prices of the remaining subsidized food items incrementally (Abdalla and Al-Shawarby 2018). However, this trend was reversed in the 2000s, as government attempted to contain public discontent about high inflation and high food prices, in particular, by providing subsidies on more food items, such as beans and lentils, and increasing the quantities consumers received of some rationed goods, such as rice, sugar, and cooking oil (Ecker et al. 2016).

During the 2008 global food price crisis, Egypt sought to address the problem of bread distribution and leakage in two ways. First, Egypt's military employed its bakeries for the mass production of bread (Ghoneim 2012). Second, the sale of subsidized bread was no longer exclusive to the bakeries in which it was produced (Ghoneim 2012; Coelli 2010). Distribution outlets, run by local governments, were built to administer the sale of bread, with a home delivery service being introduced in some areas. The World Bank (2010) estimated that about 60 percent of subsidized bread sales happen through these outlets.

As a result of the economic contraction in the aftermath of the 2011 revolution, food subsidy costs represented 25 percent of total public expenditure and about 8 percent of GDP between the years 2011/2012 and 2013/2014 (Abdalla and Al-Shawarby 2018). In addition to the high cost of

food subsidies, the system was perceived to be poorly targeted, with 88 percent of Egyptian households having access to a ration card allowing purchases of food at subsidized prices. Starting from 2014, the government introduced comprehensive reforms to the food subsidy system with the aim of increasing efficiency, minimizing leakages, and improving targeting.

The *baladi* bread subsidy became limited to ration card holders and shifted to a direct subsidy of production costs for bakeries, rather than supplying bakeries with quotas of subsidized flour. Advantages of this new system included interrupting leakages of subsidized flour to the black market and incentivizing bakeries to improve the quality of subsidized bread rather than attempting to minimize the use of flour. In addition, instead of only fixing a limit per capita on how many loaves of bread can be purchased at the subsidized price, the new system allows beneficiaries to substitute other commodities for *baladi* bread. For every loaf of bread less than the maximum used by the beneficiary per month, EGP 0.10 are transferred to the smart ration card, which can then be used to purchase other commodities under the ration card system (Abdalla and Al-Shawarby 2018). In 2017, the sale price for *baladi* bread was EGP 0.05, or less than one tenth of production cost, so the opportunity cost introduced by this reform is expected to reduce household bread consumption and waste.

In parallel, the new system expanded the basket of subsidized goods to include more food items, such as pasta, lentils, milk, and frozen beef, as well as non-food items, such as soap (Ecker et al. 2016). Beneficiaries must contribute an out-of-pocket cash co-payment in addition to the amount that is deducted from their smart ration card. On average, the out-of-pocket co-payment ranges from 5 to 10 percent of the card deduction amount for all commodities. The price of subsidized commodities, i.e., the amount deducted from the ration card plus the cash co-payment, is fixed at below market prices, while government pays for the difference between the subsidized price and the market price from the fiscal budget. The monthly allowance for each person registered on the ration card increased from 21 to 50 EGP in June 2017, and is expected to increase further to compensate for increases in prices following the energy subsidy cuts introduced in June 2018 (Al-Masry Al-Youm 2018).

The reform program also includes a national project to upgrade wheat storage facilities to further reduce leakage of domestic wheat. Consequently, about 40 percent of the open-land barns have been upgraded with proper ventilation and improved storage capacity. Additional silos have also been built to increase the government's storage capacity of wheat (Abdalla and Al-Shawarby 2018).

### Land rent and tenure

Laws formulated in 1952, 1961 and 1969 as part of land reform efforts were pivotal for the redistribution of feudal land. Under these laws, a cap was placed on the amount of land an individual could own. The amount shrank with each successive law; starting at 200 feddan, then falling to 100 feddan, and settling at 50 feddan per individual and 100 feddan per nuclear family. Before 1952, 65 percent of arable land was owned by only 5.7 percent of the population (Ibrahim and Ibrahim 2003). Between 1951 and 1970, about 12.5 percent of all arable land (87,000 feddan) was sold at below market prices to 342,000 farmers, predominantly in plots of less than five feddan.

The laws also made the rights of tenants more robust against landlords. Cancelling of land leases became easier, and tenants had the right to pre-emption in cases where landlords wanted to sell their lands. (This was done, in part, to reduce the prevalence of absentee landowners.) The laws have exacerbated the fragmentation of agricultural landholdings in the country. This arose due both to increased sales of land to smallholders and to Islamic inheritance partitioning. Egypt's plethora of

smallholders originates from this. The average landholding is now between 0.8 and 0.9 feddan (Ibrahim and Ibrahim 2003; Sims 2015).

In 1992, government raised rents for land more than threefold, which impacted smallholders' ability to pay their annual per feddan rent. With the New Land Reform Law of 1997, landowners were further able to evict current tenants and rent the land to new tenants at the higher rental rates set in 1992 (Ibrahim and Ibrahim 2003; Adriansen 2009). About one million tenants lost their land, as a result, becoming sharecroppers instead. They came to be known as *El Mutadareerin* ("The Affected") which later land reclamation initiatives would attempt to compensate (Sims 2015). Today, an annual change of tenants on rented agricultural land is not uncommon, which could have adverse effects on soil quality.

### Land reclamation

As Egypt began to face a water supply deficit, its policy outlook turned towards expanding arable land into the desert outwards past the lands adjacent to the river. The presence of groundwater in the desert made this a possibility. As a result, land in Egypt is described in two separate categories; Old Lands and New Lands, as discussed earlier in the section on water and irrigation policy.

Reclaiming land involves several phases, including land surveying, clearing of soils and removal of impervious hard-pan layers, grading and leveling of the soil, preparing and installing drainage and irrigation infrastructure, and applying soil treatments, if needed. The cultivation phase then follows with further soil treatment, crop selection, and rotation determination, as well as fertilizer and pesticide application. On a policy-level, land reclamation involves another sequence of phases, including planning, transition, economic and social development, handing over, and incorporation (Adriansen 2009).

Efforts to expand outwards from the Nile Delta and Valley have been in place since the early 1900s. However, the period beginning in the 1970s, following the completion of the Aswan High Dam, is notable for a series of government desert development megaprojects. Megaprojects are large-scale, with broad visions (usually accompanied with political dimensions), multiple objectives, and extremely high costs. Their impact is often large enough to be irreversible. Today, between one-quarter to one-third of cultivated lands are classified as New Lands by the Ministry of Agriculture and Land Reclamation<sup>12</sup>. In addition, MALR estimated that one million feddan had been reclaimed informally by 2010 by peasants expanding into the desert on the edges of cultivated area (Sims 2015).

The General Authority for Reclamation Projects and Agricultural Development (GARPAD) was created in 1975 to manage the entirety of the land reclamation process. According to Sims (2015:78-79), this includes identification of areas to be reclaimed and their "planning, subdivision, provision with infrastructure, pricing, allocation and post-award monitoring and policing". GARPAD also oversees the auction process through which these lands can be sold. In 1987, the Mubarak Youth Program allowed college graduates and landless peasants to respond to newspaper announcements by GARPAD. If they met a certain set of criteria, beneficiaries would be awarded small parcels of land in any of the newly reclaimed Western Desert oases watered solely by groundwater. No Nile water reaches this desert. In many areas, 5 feddan plots of land were awarded to university graduates, while 2.5 feddan plots were allocated to landless farmers. Until the Investment Law of 2002, settlers neither held the titles to their lands nor were they allowed to sell or lease them out until full

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<sup>12</sup> Authors' calculation based on data provided by MALR 2014 and 2015.

repayment to the government had been achieved, usually over a 30-year period. The law also reversed a prohibition on the early settlement of this payment (Bush 2007).

Other notable megaprojects in which the government engaged include the ElSalam Canal and the Toshka project. The ElSalam Canal project sought to find a way to innovatively provide irrigation water to North Sinai. The project planned to divert 4.45 billion cubic meters of water from Lake Manzala from the Nile's Damietta branch into North Sinai for the reclamation of 400,000 feddan and the settlement of 3 million people. It was announced by President Sadat in 1976. The canal would mix freshwater with Nile Delta drainage water and transport it to the Sinai via a siphon that passes under the Suez Canal (constructed between 1995 and 1997). Land was offered for sale to investors by GARPAD starting in 1996. By 2002, the project was announced to be fully operational. As a megaproject, ElSalam Canal had the objectives of reducing loss of Nile water into the Mediterranean and increasing agricultural production by settling people into North Sinai, thus reducing overcrowding and unemployment in the Nile valley (Sims 2015; Tutwiler 2010; Nile Water Lab; Hafez 2005).

The Toshka project, which began in 1997, had the objective of creating a "new delta" in the Western Desert. It sought to reclaim and develop 540,000 feddan of new farmland that would be used to produce fruits and vegetables for export to Europe. The project would pump water out of the Toshka Lakes and Lake Nasser, the reservoir for the Aswan High Dam, via the Mubarak Pumping Station's 24 pumps, which opened in 2005. The water would be transported up the 50 km length of the Sheikh Zayed Canal, which opened in 2002, before diverting it into various areas in the Western Desert (Tutwiler 2010). The project was to rely on private sector investor financing. The Kingdom Agricultural Development Company (KADCO), Al-Dahra, and Sheikh Zayed Al-Nahyan were all Arab Gulf stakeholders that invested in the project along with the Egyptian Armed Forces Engineering Company. The development of the Toshka project however was hindered by high levels of water seepage, which could potentially cause groundwater contamination, as well as high levels of soil salinity due to evapotranspiration. The project, therefore, has yet to reach its goals.

Additional megaprojects include the moderately successful South Tahrir Province project, which started in 1958, and the East Oweinat project, which now successfully includes 115,000 feddan of cultivated land (Sims 2014). Dr. Farouk ElBaz's Desert Development Corridor is a megaproject discussed across several decades, although it so far has not been operationalized. More recently, planning is underway for the 1.5 Million Feddan project, which was announced in 2015, and the New Capital project, which is now under construction.

Overall land reclamation projects have both widespread support and face significant challenges. While privatization and liberalization policies appear to have substantially improved the economic performance of agriculture in the New Lands, the technical performance of agriculture in these lands would improve with continual cultivation and a technically sound approach to long-term improvements (Tutwiler 2010). Government, in the late 2000s, was active in its pursuit of a policy of selling desert land to raise revenues and encourage private investment in land reclamation. There has been and continues to be significant efforts in support of agriculture in the New Lands.

Critics of land reclamation projects question whether the funds invested in these projects could have been better spent on agricultural improvements in the Old Lands. Environmental issues caused by land reclamation projects have also been a point of discussion. These problems include short or long-term groundwater contamination, groundwater depletion, and water quality loss. Additional questions circle around whether there is enough water in Egypt to sustain the New Lands and any further expansion into the desert, as well as how agricultural development in the desert may impact other regions.

## Trade policy

Despite Egypt's agricultural trade deficit, which has been growing since 1974, there is potential for increasing exports of high value crops in order to increase export revenues (Tellioglu and Konandreas 2017b). As explained earlier, the Egyptian government is one of the major global importers of wheat. In general, Egypt is a net importer of cereals and pulses, with a widening gap between domestic production and consumption since 2008. On the other hand, production exceeds consumption for fruits and starchy roots. Indeed, fresh fruits, e.g., oranges and grapes, and vegetables, e.g., potatoes and onions, have recently been the major sources of agriculture export revenues for Egypt.

The value of agricultural export revenues has been increasing over the past decade. Noticeably, the value of agricultural exports as a share of the value of agriculture imports shows an upward trend, which implies an increase in export revenues relative to the costs of imported agriculture products (Figure 4).

**Figure 4 – Trends in value of Egypt’s agricultural exports and imports, 1990 to 2016**



Source: Authors' calculations based on FAOSTAT 2017

The agricultural trade policy of the Egyptian government focuses on increasing production, and hence self-sufficiency, of crops that have high domestic consumption. For instance, the Agricultural Development Strategy 2030 sets self-sufficiency targets for wheat and maize of 81 percent and 92 percent, respectively (MALR 2009). This policy has been criticized for not considering the economic value of scarce resources, such as land and water. The opportunity cost of growing cereals is considerable when compared to fruits and vegetables that have relatively high economic returns.

Land reclamation initiatives are gradually shifting government policy towards promoting the cultivation of exportable high value crops on reclaimed lands (Sims 2015). The fact that production on reclaimed land is characterized by relatively low productivity and high production costs implies that only high value crops would provide farmers with economic incentives to move to and produce on these lands.

The government of Egypt also promotes exports through the establishment of trade zones, especially around major ports such as Alexandria, Suez, and Port Said. Moreover, in 2002 a new export promotion law was adopted, setting the stage for the establishment of an Export

Development Fund and the introduction of an export subsidy program under the supervision of the Ministry of Trade, Industry and SMEs (General Authority for Investment and Free Zones 2002; N Gage Consulting 2015). Agricultural and agri-food products qualify for an export subsidy in the range of one to ten percent, which is financed by the Export Development Fund. The Fund generates part of its budget from import fees.

The main challenges for increasing agricultural exports are quality considerations, particularly pesticide damage and residues that disqualify Egyptian exports from meeting sanitary and phytosanitary requirements of trading partners, especially in the European Union. High humidity during storage and transportation also affect the quality of agricultural products, especially in Upper Egypt due to lack of cold storage infrastructure (USAID 2017). In addition, non-value adding intermediaries that connect farmers to exporters add a price margin in the range of 25 to 40 percent, decreasing the cost advantage of Egyptian exports and reducing farmers revenues (Tellioglu and Konandreas 2017b).

Processed agri-food exports have a high potential in Egypt. The share of processed agri-food products in agricultural exports has increased from 46 percent in 2002 to 53 percent in 2014 (Tellioglu and Konandreas 2017b). However, this figure includes items that are primarily processed without much value addition, such as frozen and prepared fruits and vegetables. Excluding these semi-processed items, Egypt's processed agri-food exports would represent only 31 percent of agri-food exports in 2014.

The quality and safety of agri-food products is being given increasing attention by the Egyptian government. In January 2017, the National Food Safety Authority (NFSA) was established with the aim of adhering to "the highest standards of food safety and hygiene" (Mansour 2017). The procedures and conditions set by NFSA apply to food produced and processed for both the local and the export markets. In addition, government controls the quality of agricultural imports and exports through regular inspections by the Central Administration of Plant Quarantine (Central Administration of Plant Quarantine 2015).

#### 4. CONCLUSION

This paper reviewed developments in agricultural and related policies in Egypt and their impact on the Egyptian agricultural sector.

The government continues to be highly involved in the allocation of water through the Nile irrigation system and the maintenance of the public irrigation system. In policies related to the provision of agricultural inputs, the government has gradually shifted from full control towards greater liberalization with increased involvement of private firms. A historical focus on self-sufficiency in staple crops has led to the adoption of interlinked policies of grain procurement and food subsidies, while a series of reforms – also moving mostly in the direction of liberalization – has sought to address unintended consequences of those policies. Land inheritance practices and tenure laws mean that the average size of agricultural landholdings is low. This has motivated policies to prioritize landless farmers and smallholders in state-sponsored land reclamation projects. Investment in extension and research and development for traditional crops has fallen, while recent reforms emphasize the restructuring of the agricultural sector towards exports and high-value crops, such as by increasing access to credit and linking farmers to export markets.

Economic reforms introduced by the Egyptian government since 2014 represent an opportunity for re-evaluating agricultural policies and reviewing the Agricultural Development Strategy. Key strategic questions for further research include:

- What is a good balance between local food production and food imports?
- Which agricultural products should be produced locally, and which should be imported?
- Should the market decide supply and demand, or should policies be put in place to incentivize/direct producers and consumers?

Once these questions are decided upon at the political level, research can play a vital role in designing evidence-based policies that can help achieving Egypt's development goals by taking into consideration related costs and expected benefits.

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