

Egypt: Wheat and War

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Egypt: Wheat and War - Stabilizing the World's Largest Wheat Importer through Sustainable Controlled Environment Agricultural Production

Introduction

In 2010 a young Tunisian street vendor trying to support his mother and six siblings by selling fruits and vegetables out of his wheelbarrow was approached by three government officials who demanded bribes from the unlicensed young man. When Mohamed Bouazizi refused, they forcibly took his things and beat him. After attempting and failing to see the governor to address his grievances, the young man bought a can of gasoline, doused his body, and lit himself on fire. The social and political flames of that fire ignited Tunisia in a massive social and political movement that became known as the Arab Spring, which spread across the region. One month later in Egypt's capitol Cairo, a man identified as Abdou Abdel Monaam Hamdeh torched himself over a government policy to bar restaurant owners from buying subsidized bread, requiring them instead to purchase regularly priced bread at five times the amount. Nearly five years later, the results of the Arab Spring movement are wildly divergent—from successful political change to some countries still embroiled in deadlocked conflicts.

There are many underlying causes and contributors to the Arab Spring movement, such as the oppression of personal and political rights, high unemployment, and corruption. There is also a demonstrable link between food insecurity and the periods of instability of the region. In this report, I have chosen to focus on Egypt, specifically the relationship between Egypt's dependency on food imports, fluctuations in world food prices, and the impacts felt by the rural poor of that country. It is no coincidence that the Egyptian protests in 2011 adopted the motto "Bread, Freedom, and Social Justice". "All North African countries, in particular Egypt, are reliant on food imports because they struggle with climate change and water scarcity issues. They are therefore very sensitive to food price shocks" (Subrahmanyam, 2014). Sustainable agricultural technologies such as hydroponics, aquaponics, and aquaculture may be implemented as part of the solution to reduce Egypt's dependence on food imports. The reduction on the reliance of food imports reduces the risk of social and political instability caused by world food price fluctuations and general upward trends. These agricultural systems address key challenges to food production in the region namely a lack of arable land and pervasive water shortages. Successful models like Egyptian Hydrofarms, Bustan Aquaponics, and Nawaya, which offer both scalable production models and opportunities for small-scale/family food security, provide a template for international investment and NGO projects.

Discussion

Daily life in modern Egypt is a tale of contrasts between urban population centers and rural villages. The socio-economic conditions, traditional practices, and factors of family life of these two distinct Egyptian sub-cultures continue to diverge. In the capital of Cairo, life is characteristic of other North African metropolitan areas with high population density, crowded streets, and an ever-increasing Western influence. However in the rural villages of Egypt, daily life often still resembles the traditions, manner of dress, farming practices, and family-centric patriarchal social structures which date back for centuries. "They inhabit the rural villages along the Nile, [many] living in mud brick houses or goatskin tents, and tilling the soil with the same tools of pharaonic times. The men wear a long flowing robe called a galabiya and many women wear the veil" (All about Egypt n.d.). Even as the traits that define the urban

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and rural populations diverge, one common social issue affects them both: Egypt's inability to feed its population without significant dependence on food imports and the resulting vulnerability to global food price shocks that impacts Egypt's stability.

Life is hard for the rural Egyptian family. The typical agriculture production unit is a small family farm, with about 75 percent of farms being less than one hectare, or about 2.5 acres. Family members typically have multiple activities: agriculture, animal husbandry and off-farm employment (wage labor). "Most farm families have cows or water-buffalos, with an average of two animals per family" (Ghanem 2014). According to the International Fund for Agricultural Development (IFAD) - Near East and North Africa Division (2003), "During the 1990's, it was estimated that in the Near East and North Africa region which includes Egypt, the rural population consisted of 40% smallholder farmers, 20% landless people, 5% nomadic pastoralists, 2% small and artisanal fishermen, and 13% internally displaced refugees" (p. 5). By 2008, the IFAD estimated that a total of 10.9 million rural poor were living in Egypt which equated to over 15% of the total population (International Fund for Agricultural Development, 2008).

The average Egyptian family size has dropped from just over 9 to 5.2 people per family from 1960 to 2006 (D'Addato, A. V., Vignoli, D., & Yavuz, S. 2015). This decline is largely in part to government Planned Parenthood policies. The demographic impacts of that trend are still at least one generation away and the level of poverty in rural Egypt continues to grow. The resultant food insecurity and a lack of basic services continue to plague the population. According to a report published by the World Food Programme, "The average household spends 40.6 percent of its expenditure on food, rising to more than half for the poorest, who are therefore even more vulnerable to food price fluctuations. They buy less expensive, often less nutritious, foods" (World Food Programme, 2013). In rural areas poor sanitation (among 65 percent of households) is prevalent. Lack of access to health services is exacerbated by cost. In rural areas, only an average of 20% of residents have any health insurance. The health insurance coverage rate drops to under 5% for Egypt's least educated (El-Zanaty 2009). Nutrition trends are also of concern, the most pronounced being steady high stunting rates amongst children under five. According to the World Food Program's Demographic Health Survey, "the rate increased from 23 percent in 2005 and to 29 percent in 2008" (U.N. World Food Programme, Central Agency for Public Mobilization and Statistics, 2013). "Of poor families, 41 percent remain completely illiterate compared to 24 percent for the rest of the population (a 1 percent drop since 2005). Only 1 percent of Egypt's poor have received any form of higher education degrees" (Elmeshad 2011).

Water pollution and lack of access to clean water is a rising problem. Many of Egypt's issues pose a threat to the youth. It is estimated that each year about 17,000 children die from getting sick from unclean water (Ashenafi, 2011). The country is facing the challenge of feeding an increasing population, which reached 83.7 million in 2013 compared to 72.8 million in 2005.

75% of Egypt's water comes from the Nile River. However, The Nile has recently been shrinking in size. "In spite of its great length and large drainage basin (3,000,000 km², or about 10% of Africa, and affecting 9 nations), it carries relatively little water. Yearly flows over the past century ranged from a low of 42 km³ in the drought year of 1984 to a high of 120 km³ for 1916 (University of Texas, n.d.). The construction of the Aswan Dam in the in the 1960's provided control of the Nile's annual flooding cycle and provides electric power for domestic use but has negatively impacted the soil quality of agricultural lands. "In fact, before the Aswan Dam, the Nile River carried approximately 124 million tons of sediment to the sea every year. Now, 98% of that sediment remains behind the dam" (Biggs, D. 2001). Since 97% of Egypt's land is not suitable for agriculture use this reduction in naturally deposited silt from floods has forced farmers to improve soil quality through the use of fertilizers. In 2002, it was estimated that nearly 99% of cultivated land was supplemented by irrigation (El-Nahrawy, 2011). The heavy use of fertilizers adjacent to the Nile River has reduced downstream water quality. While efforts have been made to increase the amount of arable land for cultivation, the simple act of cultivating more and more

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acreage of poorer and poorer quality land cannot correct the food shortages. “Most of the recent gains in agricultural production in Africa have resulted from expanding the area of land cultivated and not increasing the production per unit of land area” (Lewis, 2008 p. 19). According to U.N. World Food Programme’s Central Agency for Public Mobilization and Statistics (2013), “Between 2001 and 2011 [the] total area of land cultivated increased by 0.7 percent annually or 8 percent over the period, that trend changed after the revolution. Between 2010 and 2011 the total area cultivated decreased by 1 percent” (p. 4). “The implications are not just a decline in per acre production efficiency but a use of more marginal land with ever increasing negative impacts on the natural resource base” Lewis, 2008). According to Lewis (2008), “Increases in efficiency per acre are the result of improved technologies and access to inputs. The sustainable way to increase efficiencies is to create Africa’s capacity to generate new technologies; that is building the human capacity and build the institutions that generate that capacity” (p. 19).

Importing the needed food supply is an unsustainable stop-gap measure, not a solution. Unfortunately, Egypt’s government has been unwilling or unable to solve the problem. “In food importing countries with widespread poverty, political organizations may be perceived to have a critical role in food security. Failure to provide food security undermines the very reason for existence of the political system. Once this occurs, the resulting protests can reflect the wide range of reasons for dissatisfaction, broadening the scope of the protest, and masking the immediate trigger of the unrest” (Lagi, M., Bertrand, K. Z., Bar-Yam, Y., 2011 p. 2). In a 2011 broadcast, National Public Radio host Tom Gjelten noted the recent political instability and uprisings in Egypt came just as world food prices hit a record high. “Many governments in the Arab world subsidize the purchase of food already, but not nearly enough to counteract higher prices..... If those governments now increase those food subsidies again in response to the rising discontent, they will be hard-pressed to improve delivery of other public services” (Tom Gjelten, (2012). There is some evidence that the instability of global food prices do in fact affect the stability of countries with developing economies or those countries which depend heavily on the import of food. Quoting Schneider, M. (2008); Bush, R (2010); Berazneva J. and Lee, (2011); and Ciezadlo (2011), Bellemare M. (2011) states:

The first food crisis took place in 2007-2008. Although food prices increased by 3 percent between January 2007 and December 2008, they increased by 51 percent between January 2007 and March 2008. This rise in food prices was associated with food riots in several developing and emerging countries across Africa, Asia, Europe, and the Americas (Schneider, 2008; Bush, 2010; Berazneva and Lee, 2011). The second food crisis, which began at the end of 2010 and saw food prices increase by 40 percent between January 2010 and February 2011, is still ongoing, but it appears to have culminated in the current famine in the Horn of Africa. Once again, a rapid rise in food prices was associated with political unrest throughout the world, but it was perhaps most prominently associated with the so-called Arab Spring of 2011—a series of events that began with food riots in Algeria and in Tunisia in early January 2011 (p. 4-5).

How can Egypt—with its limited agricultural resources, a depressed agricultural economy burdened by government food prices controls, and a shrinking water supply—distance itself from the negative political and social impacts of the increasingly upward trend and wild short-term swings in global food prices? One solution may lie in the introduction of hydroponics.

Hydroponic crop production has gained global attention in the past few decades, particularly in regions with limited arable lands or with a shortfall of available water for agricultural use. Hydroponics in the United States has largely been limited to specialty crop production and large-scale production by relatively high energy costs associated with initial capital investment of large hydroponic operations in comparison to traditional food production. Other regions with less available agricultural land and with

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access to necessary power at affordable costs have embraced this technology. To Egypt's west, her Mediterranean neighbor Spain has embraced hydroponics. The Almería region of Spain was known as recently as 50 years ago as a desolate, unproductive desert. A region known for forests and a wide range of fauna during Roman times was transformed by human modification into an arid landscape. This former no man's land is now home to over 80,000 acres of productive greenhouses, many of which employ hydroponics. "Almería provides a regional example of the impacts of greenhouse agriculture. New technologies that recycle water, use recycled growing mediums (substrate), encourage integrated pest management systems, and use renewable energy sources like wind and solar to power these greenhouses offer opportunities and examples of possible solutions to current industrial agriculture woes" (Wolosin R. T. 2008. p. 3).

Hydroponic crop production is not only beneficial in isolation. Aquaponics, a method of crop production in combination with fish farming has proven to be effective in providing both fish and produce. The Nile Tilapia is the world's fastest growing tilapia species and is excellent in converting feed to flesh, using just 1.5 lbs of feed per lb of edible fish compared to 8 lbs of feed for 1 lb of edible beef (Africa Aquaponics Associations, n.d.). Given that Egypt's diet is historically based on fish as the primary protein consumed, the tilapia produced would be a familiar source of nutrition to the population. Would the rural farming population of Egypt accept the replacement of traditional family small acreage farming and fishing practices non-traditional methods? The answers to that question may in part be found by looking at current Egyptian sustainable agriculture endeavors.

Outside of Cairo, entrepreneurs Amr Bassiouny and Adle el-Shentenawy have created the company Egyptian Hydrofarms. They raise lettuces, kales, herbs and a variety of other greens in a Nutrient Film Technique re-circulating system (Sarant 2014). Producing 600 heads of lettuce each day, the farm has grown into an important supplier for high-end grocery stores. According to the company's website www.egyptianhydrofarms.com, the water consumption used in production is 80-90% less than conventional farming methods. The farm occupies a feddan (4,200 m²) of previously barren land. In addition to reclaiming otherwise unsuitable land for food production, the company creates jobs. Egyptian Hydrofarms employs 10 workers compared to the average of two workers that would be required to farm a feddan of land through traditional means (Sarant 2014). In addition to providing a successful commercial model for hydroponics, according to Sarant (2014) ventures are also underway to make such farming techniques available to individuals and more affordable. Ziad Abou el-Nasr, a sustainable agriculture consultant, is working on small hydroponic and aquaponic home units for rooftops, balconies, and kitchens. "Vertical farming's perk is that you can grow a good quantity of fresh produce in a small space since it's leveled" (Sarant 2014).

Faris Farrag is the owner of Bustan Aquaponics, Egypt's first aquaponics farm. Combining tilapia farming, lettuce and herb deep channel hydroponics, duckweed and olive trees into an integrated system, Farrag produces lettuces 20% faster with 95% less water (Sarant 2014). According to Sarrant (2014) Farrag turned to aquaponics because of his concern with water conservation in an area with water quantity and quality issues. Farrag is planning on adding three more aquaponics units and introducing chickens to feed on plant compost to fertilize his soil.

'Nawaya,' meaning 'seed,' "nucleus," and 'intention' in Arabic, is a learning network that applies good practices in the fields of sustainable land use, agriculture, waste, and wastewater management by organizing workshops and trainings courses [sic] for farmers. Through this new project, 20 farmers from the area of Abusir, located to the west of Cairo, will be trained on every step of the supply chain, from growing to selling. In the second phase of the project, each of the farmers will train ten apprentices, with the goal of creating jobs for youths while enhancing organic farming practices (Sarant 2014).

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While Almería Spain, Egypt Hydrofarms, and Bustan Aquaponics demonstrate the capabilities of growing hydroponic and aquaponic produce, commercial hydroponic agriculture in the developed world has not, in large, focused on cereals and grains. The Egyptian Arab Spring motto started with the word ‘bread’ rather than ‘lettuce,’ so it is important to consider not only whether hydroponics and aquaculture can produce food but whether can it produce the primary food of the population as well. Will cereal grains like wheat grow hydroponically? Many U.S. dairy farmers, organic food enthusiasts, and the North American Space Administration (NASA) say yes.

On a small scale, many Americans raise cereal grains in derivations of hydroponic systems for the nutritive value the grasses produce. Wheat grass is raised and juiced as a form of low calorie nutrition. Recently, there has been a large move by dairy farms to investigate the use of hydroponic fodder crops to offset rising cattle feed costs. When the results of growing cereal grains for the nutritional value of the vegetative matter of cereal grain plants is mixed when compared to the price of traditional livestock feeds, the concept of producing cereal grains through hydroponics was proven. Even NASA has investigated the production of cereal grain from hydroponics. Envisioned as a sustainable method to feed astronauts on extended space travel, NASA performed experiments in producing wheat in an intensive hydroponic system and found that wheat could be grown and harvested after 72 days (Mackowiak, C. L., Owens, L. P., Hinkle, C. R., Prince, R. O., 1989).

Providing education and financing for these sustainable farming technologies is not enough. Local Egyptian producers also face a myriad of challenges in selling their products. The country’s infrastructure shortfalls and predominant Patriarchal values can impede the poorest from participating in the marketplace. The World Fish Center’s efforts serve as an example in addressing these issues. By conducting activities like a community theater to inspire women fish retailers, the World Fish Center empowers local producers to petition local governments for additional rights. Magda, a female participant in the program, stated, “Before the project, women retailers were working individually. Each one of us only cared about selling our fish. But now after joining the training, we have learned to work as a group. With support, a woman can stay safe in the market and have the power to sell her fish like any other retailer. I have realized my rights in the community and how to go to the officials to ask for my rights” (World Fish Center, n.d.).

Conclusion

Egypt, once the breadbasket of Africa and ancient Rome, is on the doorstep of a food security crisis. Many would argue that the high rates of anemia and malnutrition suggest that the country has already crossed the threshold. The compounding factors of lack of growth of internal agricultural production, the increase in population, the limited arable land, and the diminishing supply of water for agricultural use, has placed Egypt at the mercy of the price variations of the world food market. The Egyptian government is at a crossroads: Find new local and sustainable ways to feed the Egyptian people (especially it’s poorest) or be prepared for more cycles of civil unrest and violence that history would suggest are sure to follow.

Establishing hydroponic, aquaponic, and aquaculture food production in Egypt is a viable option in meeting the Millennium Development Goals of eradicating extreme poverty and hunger and of ensuring environmental stability (United Nations 2015). More Egyptian farmers must follow the example of Egyptian Hydrofarms and Bustan Aquaponics in choosing non-traditional sustainable food production methods.

Progress in food security within the region will require coordinated effort from local and national government agencies and Non-Governmental Organizations to ensure the poorest of the poor benefit. . The Egyptian government must enact policies that support foreign investment and create a stable and safe

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investment environment. Local ordinances and policies must be amended to allow access to the marketplace for the poor and disadvantaged. World organizations must shift focus from an approach of supplementing food supply to the introduction of new food production technologies that can be grown into self-sufficient and locally produced food supplies. More projects that demonstrate successful scalable models (like Egyptian Hydrofarms and Bustan Aquaponics) should be supported. NGOs must steer investments, available resources, and money into educational programs like Nawaya and the World Fish Center's Community theater project to make sustainable practices attainable and empower the poorest to participate in the marketplace. Additional research into scalable hydroponic cereal grains in the region should be undertaken.

It is these focused efforts at improving the self sufficiency of the Egyptian people to feed themselves that will improve Egypt's resilience to global food price fluctuations and allow their future to be full of wheat, not war.

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