

Political Stability and Agriculture: A Case Study of Egypt

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Abstract: Climate change is at the forefront of national discussion regarding the future of global stability; however, the role of environmental changes in political stability, including the extent to which the political systems rely on the natural world for stability is relatively underexplored. In recent studies of nations in the Arab Spring, scholars focused on the causes of the uprisings with very little focus on long-term stability factors (Hussain et al., 2013; Weidmann et al., 2019). To investigate the role of environmental factors in political stability, my research compares the 1920s to 1950s with the 1960s to 2010s in Egypt using a qualitative approach to gain a more in-depth understanding of stability changes over time. This paper is markedly different from previous scholarship because most studies on environmental challenges and political implications in the Middle East focus on international conflict instead of domestic relations, such as the large body of work on 'water wars' (Postel et al., 2001; Gleick and Peter, 1993). Exploring intra-national changes can give insights into another realm of critical research on the effects of climate change. Increasing our awareness of how environmental changes have impacted states in the past can help to prepare for future challenges. The results of the research in this paper indicate that arable land and agricultural production do affect political stability since declining conditions for arable land and agricultural production in both case studies contributed to the revolutions by putting pressure on the social and economic systems.

Introduction

Millions of Egyptians flowed into the streets to demonstrate against the government in the Egyptian Revolution of 2011. The wide-scale protests resulted in the resignation of President Hosni Mubarak, who had presided over the country for thirty years and corresponded with a series of civil

uprisings across the Middle East. This series of uprisings, referred to by scholars as the Arab Spring, brought our current understanding of political stability into question. The causes of the uprisings drew great speculation among scholars who were focused on the primary factors leading up to the revolution with very little focus on long-term stability (Hussain et al., 2013;

Weidmann et al., 2019). Indeed, the Egyptian Revolution of 1952 suggests similar dynamics and comparisons with the Egyptian Revolution of 2011 to elucidate how the stability of the nation changed over time. In both revolutions, civil unrest and public discontent leading up to the transitions of power were closely tied to the decline in the availability of arable land and agricultural production¹ because of environmental degradation during the decades preceding the revolutions.

Notwithstanding their significance, current research on the uprising in Egypt lacks a strong focus on the long-term factors that contributed to the revolution as well as qualitative approaches to provide a more comprehensive analysis of the declining conditions for political stability. To address the gaps in our current understanding, my research will focus on political stability by comparing the 1920s to 1950s with the 1960s to 2010s in Egypt using a qualitative approach to gain a more in-depth understanding of stability changes over time. My research sheds light on the role of environmental changes with specific attention to arable land and agricultural production. Agriculture is especially pertinent to the study of political stability in Egypt because a high percentage of the country's population is dependent on agriculture for subsistence and income.

By researching the role of agriculture in government stability, this paper connects scholarship on political stability with environmental research to expand upon our understanding of how the environment can impact political stability over time. My research uses a qualitative approach to determine if changes in arable land and agricultural production affected the political stability of Egypt during the time periods studied and contributed to the Egyptian

Revolution of 1952 and the Egyptian Revolution of 2011. In this way, my research provides a comprehensive analysis of how the environment connects with social and economic systems to affect political stability in the long run through a close examination of how these factors interacted in Egypt over two separate periods.

If the conditions for arable land and agricultural production declined over the periods studied, then I would expect the decline to negatively impact the social and economic structures of political stability leading up to the transitions of power. On the other hand, if the conditions are favorable for arable land and agricultural production, then I would argue that there is less pressure on the social and economic structures, thereby diminishing the possibility for large-scale revolutions. This paper is markedly different from previous scholarship because the majority of studies on environmental challenges and political implications in the Middle East focus on international conflict instead of domestic relations, such as the large body of work on 'water wars' (Postel et al., 2001; Gleick and Peter, 1993). Exploring intra-national changes can give insights into another realm of critical research on the effects of climate change. Increasing our awareness of how environmental changes have impacted states in the past can help to prepare for future challenges.

Review of Existing Literature

My research primarily builds upon three branches of existing literature that examine the role of political stability and the environment in the context of the Middle East. Political stability research is dedicated to understanding how and why political systems remain in power with a focus on government transitions and revolutions. Political systems refer to both the formal-

legal and institutional structures and the informal-social and economic structures that determine the process of decision-making within a state. As part of the conceptual framework of political stability, my research works at the intersection of how environmental factors impact these formal and informal structures that comprise the decision-making process. Previous research on the role of the environment in political stability has been focused on larger events of political crisis and environmental disasters, while my research examines long-term degradation and decline in arable land and agricultural production. Arable land is areas of land that are capable of producing crops, while agricultural production is how much the land under cultivation produces in a given period. Arable land and agricultural production can function differently to capture multiple effects of environmental change: for example, arable land can increase despite declining agricultural production because the land may be of lower quality. In this intersection, my research is focused on Egypt to build upon the scholarship on the role of the environment in political stability in the Middle East.

Political Stability

The concept of political stability remains problematized among scholars despite the wide body of literature on the topic and exigency of understanding destabilization in heed of recent uprisings in the Arab Spring and climate change. Political stability is often defined by what variable the researcher uses in determining comparative stability between states, focusing on major events like revolutions or violence. For example, scholars often turn to stability indexes that focus on one or more factors like scores of violence, regime support, coalition changes, etc. to surmise the level of political stability in diverse regions (Russett et al.,

1964; Blondel, 1968; Harmel and Robertson, 1986). In these cases, political stability is defined by the presence or absence of the factors chosen by the study, so a stable country is one with minimal coalition changes, while an unstable country has a high turnover. While this approach is valuable for large-scale international comparisons, the studies overlook more marginal changes and nuances of political stability in at-risk regions. This is the case with one of the most recognizable political stability studies by Seymour Lipset on the durability of democracy that compares European and English-speaking countries with Latin American countries. Lipset argues that the comparison correlates education—primarily literacy—and wealth with stable democratic regimes (Lipset, 1959; Kim, 1997). However, critics argue the correlation is more likely an effect of his focus on European-centric measures and is less accurate in states outside of the Western sphere. Over time, quantitative indexes of political stability have improved to overcome the more blatant forms of biases seen in the Lipset study, but the focus has remained on emergent events, often conflating the absence of violence with political stability as in Asongu and Nwachukwu's research on Africa (2016). In my research, I seek to provide a more nuanced understanding of political stability that encompasses stability changes outside of these binaries. This approach to political stability is in line with previous research that has diverted from the more traditional approach by shedding light on the formal and informal structures that compose political stability. Leon Hurwitz identifies competing conceptualizations offered by earlier scholars, namely, "the absence of violence, government longevity/duration, the existence of a legitimate constitutional regime, the absence of structural change, and a multifaceted societal attribute" (1973,

p.449). He critiques the factors in isolation by arguing that each factor cannot adequately embody a stable political system without the others in tandem. For example, the absence of violence in a state neglects peaceful revolutions that, nevertheless, have historically disturbed states.

Ake (1975) offers an alternative to Hurwitz's explanation of political stability, arguing political behavior is a key indicator, meaning instability is seen through irregular behavior of the population violating norms and customs. Ake's argument is weak, as Dowding and Kimber (1983) assert since the norm of the state could be frequent restructurings and uprisings that could be viewed as stable given its apparent normality to the people. Political stability not only includes the poignant factors of violence and structural changes within the government but political behavior that violates state norms.

For the purpose of this paper, I will rely on Margolis' new model of political stability that incorporates four factors to assess 'gaps' in the formal and informal political structures. Margolis conceptualizes political stability as "the health of authority, resilience, legitimacy, and replacement in a political object" (2010, p.11). Within the context of the model, authority encompasses the ability of the state to coerce its citizens through institutional power structures. If the state does not possess the structures to adequately coerce its citizens into conforming to state norms, then there is considered to be a 'gap' that signifies instability. Legitimacy is the informal norms and structures that give consent to be governed and can also result in a 'gap.' Resilience is the state's ability to respond to the gap through institutional changes, while replacement is responding to the gap through changes in authority, such as an election or a

coup. The success of the model is in capturing a broader array of changes in stability by looking at gaps instead of only capturing the presence or absence of violence, uprisings, or the length of a government's duration. The method allows for scholars to examine these gaps in both the formal spaces of institutions and informal spaces of political behavior to see broader structures that are impacting political stability.

Margolis' new model of political stability rectifies many of the challenges of previous scholars to incorporate formal structures and informal behavior into one operationalized concept that sees more in-depth changes in political stability.

Environment and Political Stability

Previous scholarship has illustrated how environmental change can spark violent conflict and social unrest. Homer-Dixon et al. (1993) use a theoretical approach to establish causal links between resource scarcity and increased violence, arguing that resource scarcity increases rural poverty, migration, and economic deprivation leading to social unrest. Wischnath and Buhaug expand on the relationship between the environment and violence, finding that loss of food production in India corresponded to higher severity of violence in the following year (2014). Similar to the results of Wischnath and Buhaug, Bellemare's study on rising food price levels and social unrest finds that there is a small correlation that indicates increasing food price levels increase the likelihood of food riots (2015). However, some scholars challenge the connection between violence and environmental changes. Theisen et al. (2011) and Ide (2015) argue that politics in the former and ethnic marginalization in the latter are more significant factors in intra-state conflict than environmental changes such as drought and

resource scarcity. The way that environmental factors impact a region and society depends on a range of factors, but even marginal differences in violence can have far-reaching implications. Further research is needed in order to fully explore the varying causal links that can shape how the natural world affects society.

In case studies of regions experiencing persistent natural disasters such as drought, political stability declines as the social and economic structures are affected. In Mali, national sentiment and uprisings rose in tandem with the collapse of the pastoral life and agricultural sector due to persistent drought (Lecocq and Belalimat, 2012). Correspondingly, the Sahil region of Sudan experienced five years of extremely low rainfall, resulting in thousands starving and a dramatic increase in poverty rates across the country. The government and foreign aid efforts repeatedly failed in missions to provide relief, contributing to extreme instability and frequent internal conflict (Burr and Collins, 1995). In the case of Syria, prolonged drought in the early 2000s, potentially linked to climate change and misallocation of water resources, increased the likelihood of uprisings through increased anti-government dissent, economic stress, and forced migration (Ash and Obradovich, 2020). Drought increases the likelihood of government instability by increasing pressure on the political system to relieve the state's population during economic distress and social changes.

Scholars have also argued that countries that have experienced environmental changes related to decreases in agriculture and arable land are prone to political instability. Countries with lower levels of development and a high rate of workers in the agricultural sector are more vulnerable to conflict over environmental

changes. Groups that are unable to transition away from agricultural labor have a decreased ability to cope during poor growing seasons, which increases the likelihood of resorting to violence in the face of environmental challenges (Uexkull et al., 2016). According to Berazneva and Lee's research on unrest in Africa, "fourteen of 53 African countries saw mass disturbances following abrupt spikes in food prices in 2007–2008, which became known as 'food riots'" (2013). Many of the food riots were connected to environmental changes, including in Nigeria, where an extended period of drought and then heavy rainfall destroyed local crops and led to sharp increases in food prices (Berazneva and Lee, 2013). Correspondingly, the state is more vulnerable to food insecurity and, therefore, unrest when either the pattern of increased or decreased participation threatens the normal agriculture of the land (Jones et al., 2017). Environmental changes that impact agriculture increase the susceptibility of agriculturally dominant states to political instability.

However, some scholars disagree with instability as a result of environmental changes arguing resource misallocation and pre-existing vulnerabilities as the ultimate cause of unrest. In De Chatel's case study of the Syrian revolution, she asserts that the regime was to blame for the severity of the drought because of mismanagement and that a greater cause of the revolution was the ineffectiveness and corruption of the Assad regime (2014). Nevertheless, her argument is not inconsistent with that of stability researchers who argue environmental challenges contribute to overall instability and can act as a pressure point or trigger unrest. Environmental conditions can become a strong contributing factor without being the only source of contestation. On the

other hand, Buhang et al.'s study on the correlation between agricultural output and violent conflict findings indicates a relatively weak relationship in Sub-Saharan Africa (2010). The results of the study are not conclusive to overall political stability research since scholars have argued the absence of violence does not necessarily indicate stability. Using Margolis' model of political stability, my research can ascertain the role of agricultural production and arable land with greater accuracy.

Environment and Political Stability in the Middle East

My research seeks to contribute to the discussion of the relationship between political stability and environmental changes by exploring the role of arable land and agricultural productivity in the case of Egypt. Existing research has established a connection between food insecurity and water scarcity in the Middle East with revolutions and international conflict but neglects to study how domestic agricultural changes impacted political stability. In recent years, the Middle East has been considered one of the most food-insecure regions of the world, as countries have become increasingly dependent on food imports while large swaths of the population are unable to afford the high prices of the goods (El-Said and Harrigan, 2014). Joffe stresses how the global food crisis became critical to the revolutions as prices surged in 2010: "maize increased 74%; wheat went up by 84%; sugar by 77%, and oils and fats by 57%" (2011, p.509). The food security crisis became a significant factor in dissatisfaction with the current political regime since a large portion of the population was unemployed and living in poverty (Joffe, 2011).

Current research has tied the food crisis and dissatisfaction with global climate

change but lacks a comparable focus on domestic agricultural changes in Egypt. Werrell et al. argue that food insecurity in Egypt was exacerbated before the uprisings by global climate change events like droughts in China that raised global wheat prices. In the Syrian uprising, the findings demonstrate that domestic climate changes, including increasing water scarcity, contributed to the nation's fragility and stress on the current regime (2015). The impact of domestic environmental changes in Egypt that could have contributed to the uprisings is significantly underdeveloped, despite evidence for food insecurity and climate change being critical factors in the Egyptian Revolution of 2011.

Instead, the majority of scholarship dedicated to the political implications of environmental changes in the Middle East focuses on international conflict due to water scarcity as opposed to the domestic implications. Falkenmark coined the term "water stress" to codify the water needed to support a population including agriculture viability with increased risk of social and economic problems as water stress is increased (1989). Water and natural resources are vital to secure a nation and can threaten the state if they become degraded, leading to armed conflict (Myers, 1993). In analyzing conflicts due to water scarcity, scholars mainly focus on the Middle East for evidence of armed conflicts driven by water scarcity, including the Arab-Israeli war and conflicts over the Nile as well as the Tigris and the Euphrates rivers (Cooley, 1984; Starr, 1991; Gleick, 2014). Water scarcity and environmental changes are capable of causing international conflict because states must secure resources to support their population, but a larger focus needs to be taken to understand the results of a state not securing access to those resources. Water

scarcity is shown to spur international conflict in the Middle East, yet the domestic implications of the water stress remain underexplored.

Methodology

In this paper, I utilize two case studies of the 1920s to the 1950s and the 1960s to the 2010s in the same country, relying on secondary accounts and quantitative environmental studies to study how arable land and agricultural production affect political stability. The periods of the 1920s-1950s and 1960s-2010s were chosen in order to account for long-term environmental changes and demonstrate change in political stability over time. I chose to compare two case studies within the same country to control for outstanding variables such as region, culture, historical legacy, and environment that could limit the results of my research. The two case studies together also allow for this paper to provide a more comprehensive account of how these factors not only changed within the period of each study but also how they changed between the cases.

To illustrate the nature of environmental changes in destabilizing the region, I will draw on historical accounts and previous peer-reviewed studies to compare government stability with environmental changes during the time period. While the basis of my research is qualitative, I will utilize the World Bank's dataset for arable land to illustrate changes in arable land over the period of my study. The World Bank provides a dataset for arable land in Egypt defined as "land under temporary crops (double-cropped areas are counted once), temporary meadows for mowing or for pasture, land under market or kitchen gardens, and land temporarily fallow," beginning in 1961 until 2016 (2021). The

dataset from the World Bank will be used in tandem with environmental studies of Egypt to analyze the role of environmental challenges in political stability.

I choose two case studies for my research approach because I want to explore in-depth the causal mechanisms for how environmental change impacts political stability. The concept of a relationship between arable land and agricultural production and political stability in Egypt during these periods is rather new, so case studies are a more effective method of gaining insight into causal mechanisms (Gerring, 2011). The Egyptian revolution and a focus on its historical instability are particularly critical because the literature is relatively underdeveloped in comparison to other uprisings in the Arab Spring and the role of environmental factors. Existing research for understanding the role of the environment in the Arab Spring neglects to explore destabilizing trends through the degradation of arable land that could contribute to the dependence on international sourcing, as seen in Joffe's study (2011). The role of climate change in Egypt is particularly underrepresented when compared to accounts of domestic factors in Syria (Fermia and Werrell, 2012; De Chatel, 2014; Selby et al., 2017). My research will use case studies to examine the ways in which the causal mechanisms function in each period.

The case studies also allow for greater depth in exploring varying ways that arable land and agriculture contributed to political instability and the eventual transitions of power. In the field of comparative politics, case studies support the multimethod approach to research that uses the combination of case studies, natural experiments, and statistical analysis as opportunities to understand causal models

(Crasnow, 2012). By relying on case studies, my research can effectively trace the causal relationship of the effects of environmental changes to support or challenge existing theories of how environmental change affects society. The Egyptian case studies are pertinent to this field of research because existing research on climate change in Egypt finds long-term evidence of declining arable land due to climate change, including increased salinization because of rising sea levels since the 1950s (El-Raey, 2010). Egypt has also witnessed rising temperatures that are believed to threaten food security due to lower agricultural yields (Domroes and El-Tantawi, 2005). In understanding how environmental changes have impacted government stability in the past, my research can provide insights into political instability that may become critical in the future.

Theoretical Argument

I argue that the degradation and decline of arable land and agricultural production negatively affect political stability as a result of the way the environmental changes disturb the social and economic structures of the state. The impact on political stability is because of changes to the environment, meaning the social and economic structures are simply the means by which the effects occur. For the purpose of this paper, the behind reason why arable land and agricultural production change is not the primary concern. Instead, I focus on the result of the environmental changes on political stability. Arable land and agricultural production may degrade and decline as a result of overproduction, climate change, policy decisions, and a range of other factors that I will include as relevant to the case studies for contextual purposes but not as a part of my main argument. However, the cause of the environmental changes may

shed light on areas for future research, such as a study on how climate change or agricultural policy affects political stability.

I argue that arable land and agricultural production impact political stability through their effect on social and economic structures. Similar to the Ash and Obradovich case study on Syria, I expect the decline in environmental conditions to cause forced migration and economic distress (2020). When arable land and agricultural production decline, the rural population that relies on the land for subsistence loses its livelihood and may be forced to migrate in search of employment. For instance, when Sudan experienced a decline in rainfall, a decline in agricultural production and arable land occurred, causing food scarcity and high poverty rates (Burr and Collins, 1995). Domestic inequality may increase as a higher portion of the population is in poverty, while the industrial sector would benefit from lower wages and more workers. The economy may also suffer from unemployment, inequality, and the loss of agricultural output. There is a multitude of ways that arable land and agricultural production can impact political stability through the social and economic structures, so the causal mechanisms I explore will be constrained by the historical accounts available and time constraints.

The effects of the change in arable land and agricultural productivity on the social and economic system contribute to political instability. This effect on political instability will be viewed through Margolis' model to bring attention to 'gaps' in legitimacy and authority created by the decline and degradation of the environmental factors. For instance, a decline in agricultural productivity can cause a gap in legitimacy, as a large portion of the population is impoverished without agricultural income

and becomes dissatisfied with the political system. Previous research on government stability in the Middle East has focused on the variables of regime type, religion, and corruption. In understanding these variables, I do not argue their relationship to the immediate causes of the uprising and the timing of regime change. The exact tipping point in destabilization is difficult to predict and explain with certainty, leading to the large variety of explanations given in the region. Instead, I contend that the more important variable is what weakens the government to the point that they no longer carry legitimacy in exercising power or resisting calls for change. The decline and the degradation of arable land and agricultural productivity destabilize the foundation of the state, leading to a higher likelihood of its eventual fall. For example, if people call for democracy because the economy declined under an authoritarian regime, then the regime could be the immediate cause, but the economic decline would be the larger issue regardless of the regime. I will explore the long-term factors for destabilization that made the uprisings more likely without arguing against the importance of the other variables in the manifestation and timing of regime change.

My research will utilize Margolis' conceptual framework of political stability in order to operationalize how political stability is affected by the change in arable land and agricultural production. Political stability, as modeled by Margolis, will be viewed through the factors of authority, resilience, legitimacy, and replacement of political objects to include both formal structures and informal behavior in the analysis (2010). The framework looks for 'gaps' in power and/or legitimacy and how the state responds to these gaps by implementing institutional changes and/or replacing political objects. For example, a state could lack coercive power over citizens seen through widespread uprisings and respond to the gap by implementing reforms in the legal structure to close the power gap.

Historical Overview

Before Egypt became an independent state, the region was controlled by the Ottoman Empire and supported the majority of the empire's agricultural production. In the 15th century, the location of Egypt between the Red Sea, Indian Ocean, and Sub-Saharan Africa caused the region to expand greatly in terms of population, wealth, and comparative power within the Middle East and North

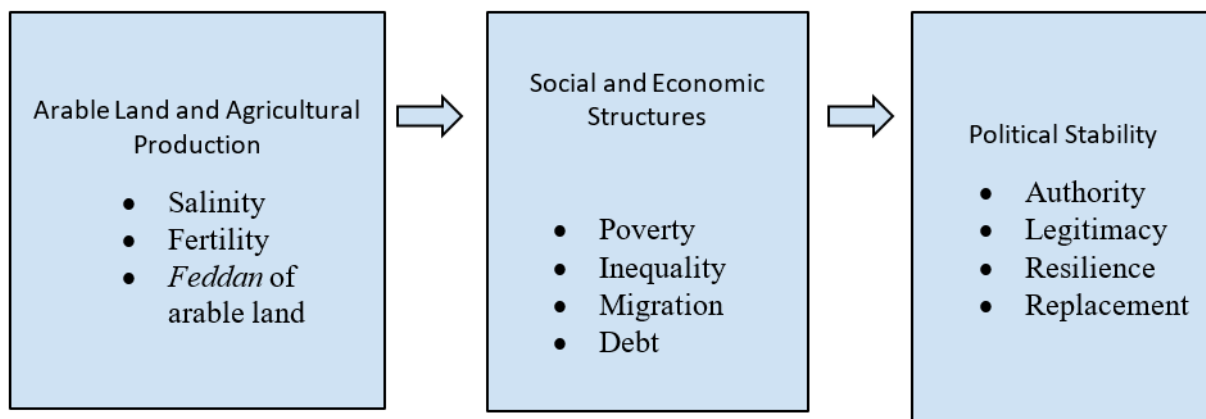


Figure 1: Political Stability Model

Africa (Mikhail, 2011). The land transformed into the center of agricultural production due to the rural irrigation network and rich soils in the western desert known as the *Fayyum*, fed by the Ethiopian highlands and the fertile soil of the Nile River Valley (Mikhail, 2010). The Ottoman Empire relied heavily on the region's exports and stipulated law codes to guarantee high production, including that "peasants were required to plant irrigated land so that no land with access to water was left uncultivated," with consequences for violations of the law being potentially lethal (Mikhail, 2011, p. 11). The Ottomans also invested in the land through frequent repairs of the irrigation system and the development of local infrastructure (Mikhail, 2010). The waterways and fertile land in the region led to Egypt's rapid development under the Ottoman Empire.

In the early 19th century, Muhammad Ali came to rule the region of Egypt under the authority of the Ottoman Empire and became known as the founder of Modern Egypt. Muhammad Ali worked to centralize the region through military prowess in order to expand the territory and increase the government's control over the inhabitants. In the pursuit of centralization, the taxation and agricultural systems were restructured. The *iltizam* land revenue system that placed power in the hands of local elites to collect endowments was transformed into private property taxes requiring the creation of the land register to prove ownership (Holt, 1966). The property taxes, along with a period of high inflation, led to farms needing to turn to cash crops, including rice and sugarcane, to generate a profit (Sayyid-Marsot and al-Sayyid, 1974). Muhammad Ali also changed the water irrigation system in Lower Egypt by transitioning from the basin irrigation system that utilized floodwaters to summer canals that allowed water from the

Nile to reach the fields (Tignor, 2015). Egypt's exports and the capital generated through taxation made the country extremely wealthy, the richest in the Near East by some estimates (Holt, 1966). The restructuring of the land policies led to impressive increases in exports and tax generation that transformed the region of Egypt during Muhammad Ali's reign.

Muhammad Ali was succeeded by Isma'il, who sought to follow Ali's legacy; however, the British invaded in 1882 and occupied Egypt for the next 72 years. The perennial irrigation system of the summer canals developed by Ali was expanded under

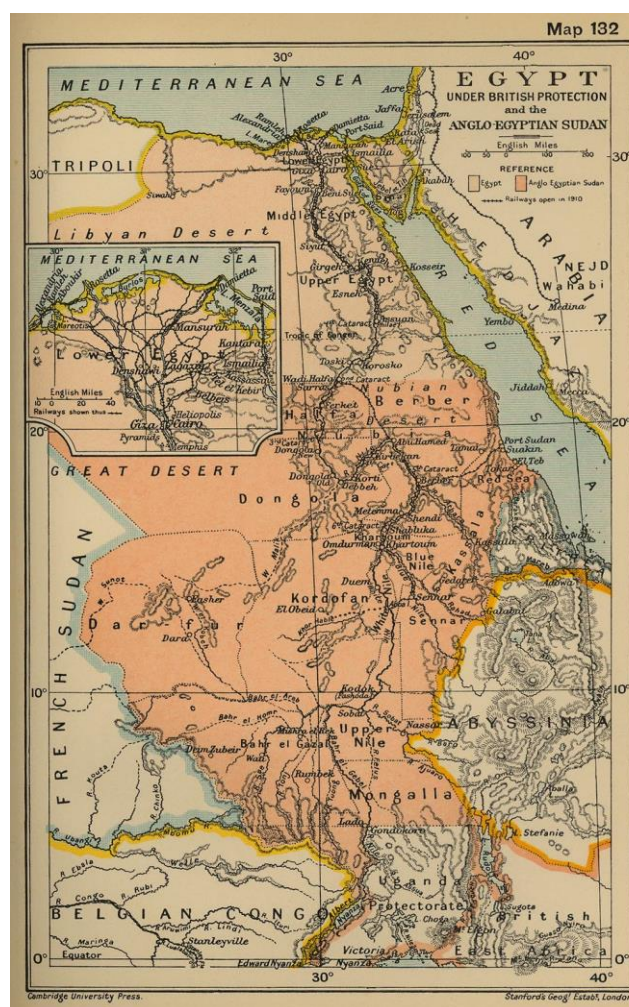


Figure 2: Egypt Under British Protection and the Anglo-Egyptian Sudan (“Cambridge Modern History Atlas”)

the British occupation to rural areas of Egypt (Holt, 1966). The British sought to modernize the hydraulic system because “it would increase the wealth of the country, enable the government to balance its budget, and keep the populace reasonably contented” (Tignor, 2015, p. 90). The success of Egypt as an agrarian region depended on the irrigation system, and the reforms undertaken during the occupation are believed by scholars to have had a lasting impact on modern Egyptian society (Holt 1966). Additionally, the colonial government implemented further reforms in the land tax system in order to equalize the rates between *kharaj* land, primarily owned by peasants, and *ushr* land, owned by wealthy elites (Tignor, 1966). The combination of investing in irrigation and bringing wealth to the lower class allowed for major increases in production and development.

In the early 1900s, the First World War brought turbulence as the British government changed Egypt’s status into a protectorate of the empire. The British and Ottoman empires were on opposing sides during the First World War and fought over control of the Suez Canal in Upper Egypt (Hoskins, 1935). The Ottomans withdrew from the war in 1918, removing Ottoman presence from the Middle East, and in 1922 Egypt declared independence from the British, ending the protectorate (Holt, 1966). The newly independent state formed a constitutional commission under the supervision of Great Britain, which maintained control of foreign relations and the military, creating the liberal constitution of 1923 that framed the Kingdom of Egypt's constitutional monarchy (Goldschmidt et al., 2005). During the interwar period, Egypt maintained control over its economy and domestic development, but it was not until after World War II that the country became

fully sovereign (Davis, 2014). The early 1900s were a period of dramatic change in the state as Egypt became independent from the British protectorate and developed its own national identity and system of governance.

Case Study: Revolution of 1952

The early development of Egypt as an agrarian region served as the foundation of the nation's stability, meaning threats to the arable land had a direct impact on the state. The natural environment in the region became the driving force behind its industrialization as the Ottoman and later British empires invested in the irrigation system to increase agricultural production and trade exports. As Egypt removed itself from colonial rule, the newly independent nation became responsible for continuing the development of the local industry. However, the government quickly came to experience challenges as the rate of arable land and capacity to produce agricultural products declined while the population experienced changes due to industrialization. The challenges in Egypt to increase the capacity of the arable land during the period 1922 to 1952 resulted in gaps in government legitimacy and authority. These gaps increased the likelihood of political objects being replaced and diminished the resiliency of the political system, ultimately leading to the Revolution of 1952.

Prior to the 1900s, Egypt experienced rapid growth in agricultural production and land under cultivation due to the advancement of irrigation systems and summer canals. However, the growth in agricultural production began to decline at the turn of the century because of the quality of the soil and the limited success of projects to expand arable land. While Egypt became known for its highly fertile soil due to key nutrients in the mud brought by the Nile River, the soil only contains enough nitrate, a limiting factor in agriculture, to compensate for a single crop, yielding only about 400 kg *feddan* (unit of area measure equivalent to 1.038 acres) (Ruf, 1993). As agricultural production increased in Egypt during the colonial period, the crops produced per *feddan* began to outpace the replenishment of nitrate from the Nile River, resulting in a steady decline in land quality. The loss of the soil's fertility is demonstrated by the decline in crop yield witnessed from 1900 to 1914 and the subsequent decline in exports of cash crops like cotton (Tignor, 1984). Egypt began importing nitrate from Chile starting in 1903, but the nitrate was expensive and only utilized at a limited capacity (Ruf, 1993). As a result of overproduction, Egypt experienced

agriculture threatened agricultural productivity as the yield per *feddan* declined.

The problem in agricultural production was exacerbated by the implementation of the new hydraulic irrigation system, and the projects to expand the amount of arable land were only marginally successful. The irrigation system built by the British caused floodwaters from the Nile River to leave the delta region where the fertile mud would previously replenish agricultural land with nutrients. After the creation of the irrigation system, the landowners began utilizing alternative fertilizers, primarily *sebakh* and *koufri*, but the reserves of the local fertilizers quickly depleted and even became damaging to the land because of their high salinity (Ruf, 1993). During the economic downturn in the 1930s-40s, a large portion of the population began to experience landlessness, as peasants could no longer afford to maintain their land for cultivation and production (Botman, 1991). When the new state sought to update the irrigation system and expand arable land with new projects, the new infrastructure required was highly complex and expensive. Projects to advance the irrigation system, such as dams on the Nile

Period	Population	Cultivated Land in feddans	Average per person
1896-1900	9860905	6871696	0.69
1911-1915	12145200	7646705	0.62
1931-1935	15260200	8539306	0.54
1945-1949	19087857	9132471	0.48

Figure 3: Increasing Land Shortage as Experienced by the Population, 1896-1949 (Botman, 1991)

lower crop yields and declining exports in the early 1900s. The loss of key nutrients for

and construction projects on Lake Tsana, required major investments, which were

incredibly challenging for the new state experiencing a growing economic crisis (Tignor, 1984). The soil quality and agricultural output per *feddan* declined prior to the 1950s while the investment required for increasing the amount of arable land increased. The expensive investment projects increased the amount of arable land, but the quality of the land was lower, and the surrounding areas suffered from a lack of nutrients and salinity.

The problems associated with arable land and agricultural production in the period before the revolution destabilized the social and economic systems responsible for political stability. The degradation of arable land resulted in greater social division and the decline of the lower class that put increased pressure on the government. The vast majority of national income and employment for Egyptians relied on agriculture before the 1950s, despite attempts to industrialize the nation (Botman, 1991). However, the agricultural expansion slowed because of the challenging environmental conditions as the population increased, causing the amount of land per person to rapidly decline: .64 *feddan* of cropped land per person 1910-1914 compared to .44 in 1950-1954 (Tignor, 1998). In addition to the decline in *feddans* of arable land per person, the composition of landowners underwent a transformation, resulting in greater social division and inequality. As the peasant population could no longer afford the increasing prices associated with the cultivation and were forced to sell their land, the size of landed estates dramatically increased, and large landlords became dominant in the industry. By the 1950s, extreme inequality prevailed in Egypt, shown by 71.6 percent of landowners owning only 13 percent of the land. Meanwhile, .1 percent of landowners owned

20 percent of the land (Botman, 1991). Furthermore, rates of poverty and the size of the landless population also rose: 24 percent of the rural population was landless in 1929 compared to 44 percent in 1950 (Tignor, 1998). From the 1930s to the 1950s, the changes in land production and the amount of available arable land directly affected the economic system as it transformed with the rise of inequality shown by landowners and the poverty of the newly landless population.

At the same time, arable land and agricultural production disrupted the social system as the rural population migrated to urban areas and power structures shifted with politicization. In the face of landlessness and rising levels of poverty, peasants from agricultural regions flocked to urban areas in search of economic opportunities. Unfortunately, the massive scale of peasant migration led to a fall in average wages in urbanized areas and factories due to competition for a limited number of positions (Botman, 1991). The increase in the size of the factory workers from 247,000 in 1937 to 756,000 in 1947 created "an unequalled opportunity for the growth of trade unionism" and the politicization of the working class (Botman, 1991). In the 1940s, the trade unions allowed the working class to coordinate and demand specific social and economic reforms, even forming political organizations to improve their living conditions (Baer, 1962). The migration of rural workers from agriculture to the urban workforce depressed wages and caused an overall increase in calls for economic intervention on behalf of the lower class. In forming trade unions and expressing political demands, the workforce became increasingly powerful, which upended social structures.

The change in economic and social structures caused by the environmental decline directly contributed to political

instability. The large population in poverty and the newly powerful workforce created a gap in the legitimacy of the political system, shown by the emergence of agricultural policy in public discussion and critiques against the state. The formation of unions and demands for state reform increased in tandem with extra-parliamentary and anti-parliamentary groups that advocated against the social ills of unregulated capitalism rose in prominence between the 1930s and 1950s (Tignor, 1998). According to Mirrit Ghali, the decline of agriculture and the rise of inequality witnessed throughout the period in Egypt made "the maintenance of a stable economic and social order an impossibility" (Baer, 1962). By the 1940s, the Wafd administration, currently in power, came under immense pressure to reform the distribution of land property, causing the Prime Minister Mustafa Nahhas to push a bill to limit the size of agricultural holdings and to condemn large landowners for causing high poverty rates in Aswan and Qena (Baer, 1962). Additionally, the Muslim Brotherhood began highlighting the religiosity of egalitarianism and coming out against the exploitive aspects of capitalism at the same time as Ahmad Husayn's Socialist Party and a minor communist party became even more critical of worker exploitation (Tignor, 1998). For years leading up to the revolution, the population was becoming increasingly dissatisfied with the political system despite attempts of the parties in power to regain their support.

As the working class and rural poor began to demand social reform and state intervention, the state continued to experience declining legitimacy and authority. The lower classes began to question the government's legitimacy and institutions because of their lack of representation and a new nationalistic

sentiment. Despite the rise of political organizations and the voice of the working class, the leaders of the largest parties remained members of the 'great landowners' that blocked attempts to reform agricultural policy, including the bill to limit the size of land holdings (Baer, 1962). The elites ignored the concerns of the working class because they were "considered by mainstream political parties as a subsidiary resource that could be exploited or discarded at will" (Botman, 1991). The dissatisfaction due to lack of representation led to the militarization of the unions and a rise of nationalism against foreign influence within the government and industry (Baer, 1962). Even in liberal spaces that supposedly represented the interests of the rural poor and workers, the masses became so dissatisfied with the little progress in land reform and economic opportunities that the organizations lost the favor of the lower classes (Botman, 1991). For example, the closest that the Wafd came to land reform was to advocate for "a progressive tax on the large landowners and to prevent the further breakdown of small landholdings" (Baer, 1962). The political system experienced declining legitimacy because of the change in social and economic structures shown by growing discontent with the landowner-ruled political parties.

At the same time, Egypt witnessed a growing number of strikes and protests against the government and institutions that demonstrated a decline in its authority. The urban centers were characterized by food riots in 1942 and "waves of labor disputes, strikes, and demonstrations punctuating the later 1940s" to demand social reform (Baer, 1962, p. 205). The labor movement was highly nationalistic and militaristic, with unions and new political organizations creating revolutionary, underground parties

to counter the elite, statist parties. The unions led to strikes and disputes in sectors such as sugar workers, textile workers, railway workers, government employees, military men, and police officers (Botman, 1991). In the villages, the peasants demonstrated resistance from the state authorities and elites through less official forms, including "isolated murders- of landlords, their agents, overseers, and watchmen, and village *umd*as or local leaders (Baer, 1962, p. 205). In fact, the urban elite had feared for years leading up to the events of the 1950s that the growing social and economic tensions would transform into a complete social revolution (Tignor, 1998). As a result of stagnated agricultural development, the economic and social conditions reduced the legitimacy of the governing authorities and their capacity to assert authority over the lower classes.

The pressures of the agricultural decline and resulting social and economic implications overcame the resilience capabilities of the state to respond to the corresponding gaps, leading to a revolution in the 1950s. To avoid the revolution expected by state leaders, the government pursued economic modernization by attempting to increase the industrial capacity in order to raise the standard of living for the lower class (Tignor, 1998). However, the efforts to modernize the working class resulted in further social divisions and helped spur the impending government transition. The agricultural workers and urban working poor were largely illiterate and unskilled, so the state tried to raise the education level of the workforce in pursuit of development and to avoid economic dissatisfaction. The educational system actually created further problems for the state since the newly-educated faced limited opportunities due to job competition and low

financial rewards creating a new class of "intellectual unemployment" (Botman, 1991). The investment and industrial development required to employ the emerging class of educated workers failed to materialize, demonstrated by industry in 1947, only accounting for 13 percent of the gross domestic product while agriculture remained dominant at 38 percent (Tignor, 1998). The Egypt Youth without economic opportunities became a primary force in the Revolution of 1952. The youth organizations of the 30s and 40s transformed into the Socialist Party and the Muslim Brotherhood in the 50s (Botman, 1962). While the leaders recognized the emerging gaps that threatened political stability, the state did not have the resiliency to respond to the gaps despite attempts at policy reforms and industrialization.

The revolution finally came in 1952, following years of growing discontent among the masses caused by agricultural development challenges and the resulting economic stagnation. On July 23rd, 1952, the Free Officers movement, with the approval of all Egypt's political parties, overthrew the Muhammad Ali Dynasty in a coup d'état, forcing King Faruq to abdicate and go into exile (Roussillon, 1998). According to Abdel Nasser's account of the Egyptian Revolution, the events in 1952 were "the expression of a sentiment long suppressed but harbored in the hearts of the nation" (1955). Nasser attests that the relatively bloodless revolutions occurred because of the widening gap between the government and the people caused by the extreme wealth inequality that made Egypt reflect a feudalistic state (1955). In fact, the new government's first "revolutionary" action was the passage of agrarian reforms in September of 1952 that redistributed land to rural peasants and placed a limit on land ownership at 200 feddans per family (Roussillon, 1998). The

goals of the new regime were primarily focused on developing agricultural land, with the principal project of the government being the construction of the Sadd el'ali Dam, designed to increase the size of arable land by 6,000,000 acres and revitalize an additional 2,000,000 acres of agricultural land (Nasser, 1955). The Revolution of 1952 was an emergent effect of the masses' long-term pressure on the government due to wealth inequality and land-based challenges.

Therefore, in the post-independence period, Egypt failed to keep pace with the agricultural expansion experienced under occupation because of declining soil quality and the high cost of projects to continue increasing land under cultivation. The downturn in agricultural development caused the rural population to become increasingly landless and impoverished. The decline led to a severe economic crisis since agriculture dominated Egyptian production and industrialization remained limited. The rural peasants flocked to urban areas searching for jobs and higher wages. However, the migration resulted in greater competition for the small number of factory jobs and depressed overall salaries for the working class. During this period, the workers and rural peasants became politicized and began to challenge the legitimacy of the governing powers dominated by wealthy elites. The state's power to coerce the peasants into conforming to the nation's agenda also declined, as peasant revolts and strikes became commonplace before the revolution. The efforts of the government to implement reforms and resolve the challenges were largely unsuccessful, and eventually, the gaps resulted in the replacement of the governing power in the coup d'état.

Case Study: Revolution of 2011

After the Revolution of 1952, the new regime sought to revitalize the agricultural sector through land-based reforms and investment in updated infrastructure to increase the amount of arable land. While Egypt experienced short-term gains in agricultural production immediately following the improved policies and projects, the long-term prospects of agriculture in Egypt remained bleak due to more modern challenges of increasing soil salinity and regional climate change, which negatively affected the production capacity of the land. Similar to the events in the Revolution of 1952, the decline in agricultural growth caused economic dissatisfaction among the rural population from high poverty levels and wealth inequality that negatively affected the legitimacy and authority of the current regime. The government attempted to improve the social and economic conditions to remain in power. However, the regime proved unable to resolve the growing challenges culminating in the Egyptian Revolution of 2011.

After the 1952 Revolution, the Egyptian Government invested heavily in agricultural development and implemented intensive land reform policies. The Agrarian Reform Law redistributed land, paying large landowners compensation for the expropriated land and selling the land to smaller farmers in payment installments to ensure accessibility (Gadalla, 1962). The redistribution largely increased land ownership among the lower class and thereby decreased the number of landless peasants in poverty. The number of landholdings with less than one *feddan* changed from 434,200 in 1961 to 1,458,800 by 1978, demonstrating the rise of small farmers (Springborg, 1990). In addition to

Agricultural Land in Egypt 1961-1980 (sq. km)

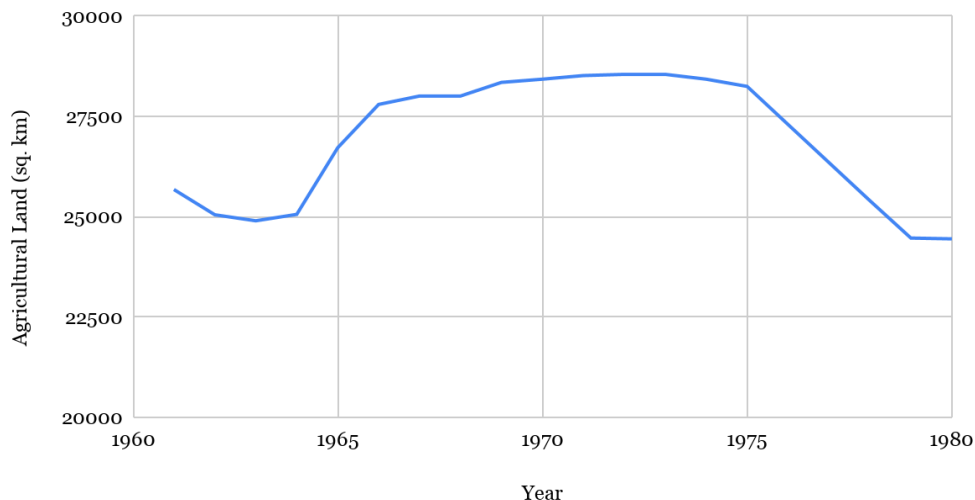


Figure 4: Agricultural Land in Egypt 1961-1980 (World Bank, 2021)

providing land to the lower classes, the law also established Agricultural Co-Operative Societies to supply loads of seeds and fertilizers while overseeing the new owners to prevent a decline in production (Gadalla, 1962). The policies resulted in a redistribution of 12 percent of Egypt's agricultural land to the country's poor peasant population between the 1950s and the 1960s (Bush, 2007). The new government quickly implemented reforms in the agricultural sector to redistribute land from the wealthy class to the lower, landless class addressing inequality concerns and reducing extreme poverty.

The Egyptian government also expanded the amount of agricultural land in the process known as land reclamation to increase agricultural productivity. One of the primary goals of the new government was to develop the desert lands of the country into areas capable of producing agricultural exports through irrigation projects and modern technology (Adriansen, 2009). Nasser's ambitions to build up rural society in the desert areas resulted in limited returns as the

"contribution of desert agriculture to total agricultural production was less than one percent" (Nour, 2019). Nevertheless, from 1952 to 1992, the government spent over three billion (nominal) Egyptian pounds on land reclamation to develop degraded farmland into usable land for agricultural production (Biswas, 1993). In the 1970s, Sadat implemented an open-door policy to encourage foreign and private investors to reclaim desert land. However, the projects were viewed by experts as high cost and low efficiency, meaning that despite the significant investments, the projects only marginally increased the area of cultivated land (Nour, 2019). As shown in *Figure 4*, the governmental policies to develop agricultural land in desert regions resulted in a marginal increase in agricultural land from the 60s to the 70s (World Bank, 2021). The process of land reclamation implemented after the revolution was extremely costly and limited in efficacy.

Despite the early successes of the new government in redistribution and land reclamation, the progress in agricultural

development became increasingly difficult due to declining agricultural production because of the rising levels of salinity. The new land for agricultural production reclaimed from the desert was less fertile than traditional agricultural land: "while official reports estimate that 912,000 feddans were reclaimed between 1952 and 1975, the area which can support independent farming for operations is far short of that figure... of that, 40 percent, or 309,000 feddans, has reached marginal productivity and 28 percent or 216,440 feddans is cultivated but below marginal productivity" (Voll, 1980). The quality of the reclaimed desert land remained low due to production capacity regardless of significant investments in reclamation and official documentation redefining the land as arable. The varying quality of the land during the period makes the simple measure of agricultural land less effective as an indicator of production and development since the majority of people would not be able to subsist off the marginally productive land. The new lands required heavy investments requiring large loans to begin farming. However, the low yields meant that settlers struggled to repay their debts, causing people to become "bound to the soil" with limited opportunities for advancement (Andriassen, 2009). The efforts to green the desert expanded the amount of arable land in Egypt but tied new farmers to high loans for land with low yields.

Additionally, the region began facing increasing environmental challenges to agricultural production due to increasing levels of salinity in the soil and the desertification of arable land. Projects to expand cultivated land often benefited wealthy landowners while causing unintended consequences that degraded the land of poorer farmers. For example, the Quta pumping project was completed in the 1960s

with the intention of reclaiming desert land in the Fayoum region by increasing water access. However, the pumps diverted waters away from farmers downstream in Thania, turning the area into "a hard, parched surface, sprinkled with a layer of salt crystals" (Barnes, 2012). Similarly, the construction of the Aswan High Dam, *Al-Sadd*, diverted up to 1800 tons of *Azote* fertilizer carried along by the Nile River and, at the same time, raised groundwater levels significantly by increasing irrigation. The consequences of blocking nutrient sediment brought by the river while raising groundwater levels was a dramatic increase in the saturation and salinity of the soils (Khalifa and Moussa, 2017). By the mid-1970s, scholars estimate that 35 percent of the land used for agricultural production in Egypt was facing high levels of soil salinity

and suffered from low crop yields as a result (Richards, 1982). The projects to expand the amount of irrigated and arable land often led to high levels of salinity in surrounding areas due to diversion and saturation.

In the 1970s, Egypt also began experiencing the effects of climate change shown by rising temperatures that impact sea levels and the viability of agriculture in the region. The International Panel on Climate Change demonstrates a global rise in temperatures that, with very high confidence, is caused by anthropogenic emissions of greenhouse gases. In a study conducted by Domroesa and El-Tantawib, Egypt is shown to have rising temperature trends in the annual winter and autumn temperatures and minimal winter and spring temperatures in the period 1971-2000 (2004). Sea levels in the Mediterranean reached up to 1-3cm per year in the 1990s due to climate change, increasing salinity levels and subsistence (Malm, 2013). The effects of rising sea levels are particularly damaging for Egyptian agriculture since the regions bordering the Mediterranean are agricultural areas along the Nile Delta, as illustrated in *Figure 4*. Furthermore, climate change increases the rate of desertification since precipitation is decreased, leading to a heightened reliance on irrigation for agricultural production (Darwish et al., 2013). The effects of climate change on soil salinity and desertification compounded the existing environmental concerns facing Egyptian agriculture.

The extensive reclamation projects and efforts to grow agricultural production caused a

massive drain on the economy and put the nation into debt. Prior to the 1950s, the Egyptian government held no foreign debt and even became a creditor to Britain during World War II; however, the redistribution and investment projects of the 1960s caused the deficit to triple from 1952-1958 to 1959-1966 (Amin, 1995). In 1967, the foreign debt rose dramatically due to military expenditures related to the war, and the government was forced to take out additional loans to cover subsidies because "ensuring stability meant maintaining the state's redistributive role" (Roussillon, 1998). The state of the economy continued to decline, and by the 1980s, the state was spending 28 percent of its expenditures (while running a deficit of 22 percent of its Gross National

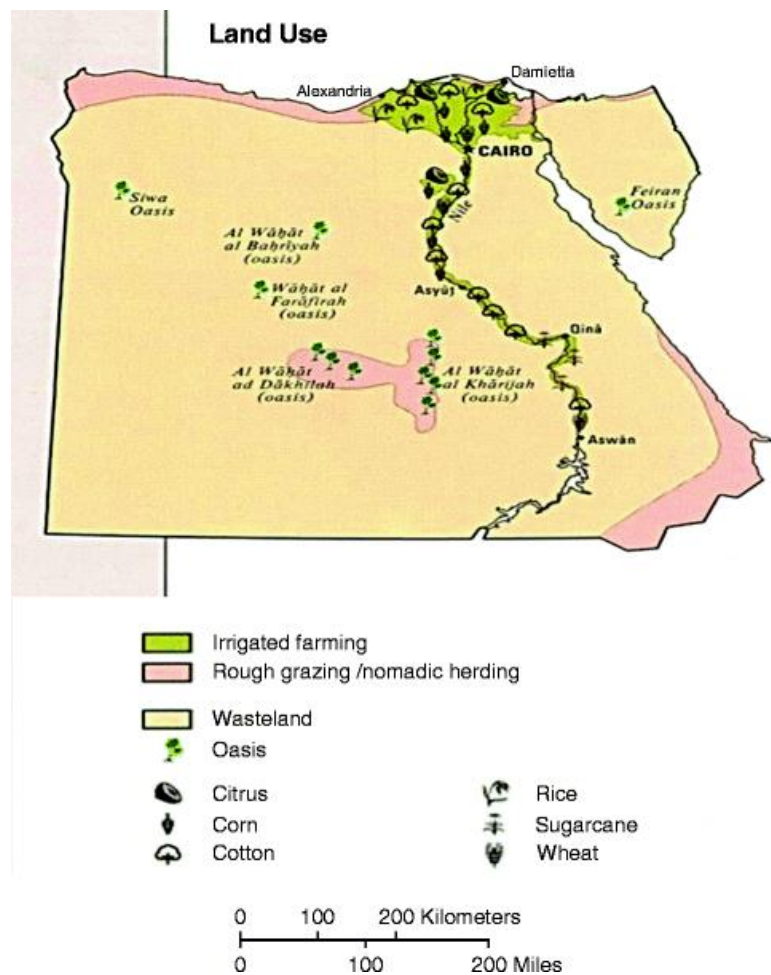


Figure 5: Land Use Map of Egypt (Darwish et al., 2013)

Product) on subsidies to maintain the price of necessities like food and bread (Roussillon, 2008). The investments in agricultural development and the necessity to support the impoverished population drove the country into high debt.

By the end of the 1980s, the state could no longer afford to continue the food and agricultural subsidies that the rural population depended on. The massive debt accumulated between the 1960s and 80s amounted to \$40 billion by 1987, forcing the Egyptian government to accept an IMF grant hinging on the condition that the government removed subsidies and liberalized the economy (Roussillon, 2008). Mubarak, under the World Bank's guidance, began abolishing the features of the Nasser administration that were implemented after the revolution, including dismantling agricultural cooperatives, removing land ownership limits, and ending subsidies for fertilizers (Malm, 2013). The growth rate of the economy stagnated while inequality prevailed as a few were able to exploit the advantages of deregulation. Meanwhile, the majority of the population became impoverished.

"By the mid-1990s Egypt remained poor and indebted, but some Egyptians were very rich... it became increasingly difficult for the Egyptian authorities to convince those most affected by unemployment (over 25 percent of the active population), and those who watched already-meager purchasing power halve because of price increases and the reduction of subsidies, that their impoverishment was not the counterpart of the extreme affluence of a few" (Roussillon, 2008, p. 376).

The limited agricultural growth, removal of support, and increasing levels of inequality led to a decline in public support for the

government and its ability to exert authority over the general population. The prices for land and agricultural inputs increased dramatically while agricultural production remained limited, causing many rural peasants to be evicted from their land and become impoverished (Malm, 2013). The farmers in the agricultural regions became incredibly discontented with the government because of the removal of state protections and increasing rates of poverty, leading to "clashes over land boundaries, struggles over access to irrigation and attempts by landowners, many of whom were absentee, to claim land that was not always covered by the new tenancy legislation" (Bush, 2010). The violence witnessed in the rural areas indicates an increasing gap in the government's authority, as the people openly defied the new legislation and turned to violent means instead of state-sanctioned forms of justice. The initial clashes between the landowners and the landless are a key indicator of the turmoil created by the agricultural decline that led to the revolution in 2011.

As the conditions of the rural population and poor urban population deteriorated, inequality between classes increased, leading to challenges to the government's legitimacy. The economic decline of the lower class and the removal of social supports heightened the critiques of government corruption that violated the "social contract" between the government and the governed (El-Haddad, 2020). The balance of power between the classes shifted significantly as the deregulation of the economy favored elite capitalists and forced the lower class into poverty through landlessness and food insecurity. The youth became especially critical of the wealth inequality blaming the administration for failing to "distribute the wealth evenly"

(Yehia and El-Din, 2013). Young people demanded change since they faced a future of limited economic opportunity due to the declining agriculture industry and industrial labor failing to incorporate the high amount of unemployed youth (LaGraffe, 2012). The government lost the support of the youth because they remained in poverty without opportunities for advancement. Meanwhile, they witnessed a small group of elites receive favors from the government.

In 2011, the global bread crisis and election triggered underlying tensions among the youth and lower class that overwhelmed the Egyptian government and led to a transition of power. Leading up to the revolution, Egypt held elections in November of 2010.

However, there was an extremely low voter turnout, signifying a loss of confidence in the government system and a lack of legitimacy for the outcome of the election. After the election, a plethora of street demonstrations and unorganized protests rose, with the largest protest taking place on January 25th, numbering as many as half a million Egyptians (Paciello, 2011). The election occurred during a bread shortage where prices increased up to 300 percent in some regions due to a disruption in wheat production, causing bread to become a "symbol of the protest" (Sternberg, 2012). The protests lasted from January to February and demanded the resignation of Mubarak until he stepped down from power, turning the control to Tantawi, the defense minister (Panciello, 2011). The Egyptian Revolution of 2011 that resulted in a peaceful transfer of power from the long-reigning president was part of a series of protest movements brought about by popular discontent. The government faced a paucity of legitimacy and popular support for the administration caused by dissatisfaction with economic opportunity and inequality.

The Revolution of 1952 brought improvements to the social and economic conditions of rural Egyptians that spurred the transition of power. Nonetheless, the infrastructure and investments in agriculture failed to meet the demands of the population due to lower yields and sowed future economic disaster. In the period prior to the Egyptian Revolution of 2011, the government sought to redistribute land and turn the desert green through reclamation efforts. The reclamation efforts required high investment in irrigation projects with diminishing returns and degraded the land of surrounding regions by blocking nutrients and increasing the salinity of the soil. Egypt also began experiencing the effects of climate change, where the higher average temperatures increased the necessity of water resources while threatening agriculture along the Mediterranean Sea as water levels rose. The Egyptian government became increasingly indebted to foreign powers because of the expensive investments in agriculture as well as military expenses leading to the removal of subsidies and economic protections. The liberal economic policies and the withdrawal of protections increased economic inequality and dissatisfaction with the government. The declining socioeconomic conditions led up to the months of social unrest witnessed in 2011 and the revolution that ousted Mubarak.

Discussion

The purpose of my research was to understand the role of arable land and agricultural production in the political stability of Egypt, comparing the 1920s-1950s with the 1960s-2010s. To a greater extent, the case studies suggest that the changes in arable land and agricultural

production impacted the stability of the political system and led to the revolutions of 1952 and 2011. During both periods, Egypt experienced declining conditions for arable land and agricultural production, although the ways and extent to which the degradation occurred varied between the periods. In the first case study, the agriculturists sought to increase production through cash crops, but the land became depleted of important nutrients like nitrate, causing lower crop yields. The problem was heightened by the implementation of a new hydraulic system that blocked the flow of nutrients from reaching the farmlands.

In the second case study, the program to reclaim desert land for cultivation created problems since the desert soil was low in quality, and the majority of the reclaimed areas only reached marginal productivity. The infrastructure projects, including the Aswan High Dam and the water pumping system along the river, also had environmental consequences since over-pumping led to salinization, and the dam, similar to the projects in the first study, blocked nutrients. Egypt also began to experience the effects of climate change during the second period, as the average temperature and sea level rose in the region, increasing saturation and salinity.

While both case studies experienced negative environmental effects, the social and economic conditions at the beginning of the case studies varied. Prior to the 1950s, a larger portion of the population depended solely on agriculture for subsistence, possibly making the environmental changes more consequential to the local economies and societies. Although development remained limited, the 1960s-2010s experienced higher rates of industrialization, resulting in a greater portion of the population working outside of agriculture, which could have

decreased the impact of the environmental changes. The differences between the case studies are important because the economic and social conditions that resulted in the revolutions were likely a direct result of the agricultural conditions during the first period but have a greater degree of uncertainty in the second period. In other words, the second period contains a greater margin of error that the inequality and economic decline could be due to alternative factors instead of agriculture. Nevertheless, Egypt remained a strongly agrarian society throughout both periods, and therefore, changes in agriculture will have impacted a sizable portion of the population and economy.

The declining conditions for arable land and agricultural production led to critical developments in the social and economic state of Egypt. Between the 1920s and 1950s, many rural peasants became landless as their crop yields declined, and fertilizers were largely inaccessible, causing high poverty rates and migration to urban areas where wages declined while the rate of unemployment rose. The decline of the lower class increased inequality since wealthy landowners could afford the agricultural inputs and amass large amounts of land from the fleeing lower class. In the 1960s-2010s, inequality and poverty also increased; however, the mechanisms for change were different. The reclamation and investment in agriculture led the Egyptian government into high debt with foreign powers, resulting in the eventual collapse of social support for the lower class and the rise of capitalists. The removal of protections benefited a small portion of the population, but the majority of the agricultural workers and lower class began experiencing food scarcity and joblessness.

The 1960s-2010s are interesting to examine because the government attempted to

implement changes to prevent the instability caused by an agricultural decline in the previous case. The recultivation of desert land and investment in agricultural development, including the Aswan High Dam and water systems, was completed with the intention of increasing agricultural productivity and providing land to the growing population. However, the limitations of the arable land in terms of the quality of the soil (fertility) and water resources surpassed the ability of the government to circumvent, despite billions of dollars and years of efforts. In terms of implications for climate change scenarios, the failure of the Egyptian government to overcome the physical challenges of the environment during this period may be indicative of the trouble governments may face in the future when available resources become even more limited. The number of resources required to sustain agricultural growth without high-quality soil and plentiful water resources is almost implausible.

The social and economic conditions corresponding to the changes in arable land and agricultural productivity resulted in declining political stability. In the first case, the lower class became increasingly critical of the state and the capitalist system due to the high rates of poverty and inequality. The landless peasants began demanding government intervention to reform land distribution and turned to militancy when the political organizations failed to respond to their demands. Similarly, in the second case, the high portion of the population that became impoverished was angered by the removal of social protections and viewed the government as catering to elite interests. In both cases, the dismay with the government and declining legitimacy led to smaller acts of civil unrest and violence before turning to revolutions. In the 1940s and the 1980s/90s,

there were growing instances of strikes and protests along with larger food riots. The smaller waves of social unrest demonstrate a lack of coercive authority on behalf of the Egyptian government that preceded the revolutionary transitions of power. The existence of prior civil unrest also can be used to argue against scholars that depict the revolutions as isolated instances or tied to a singular factor: the protests that resulted in the transitions of power were part of a larger pattern of destabilization or the tipping point of a long build-up of tensions.

In each case, the Egyptian government failed to resolve the gaps in legitimacy and authority created by the social and economic conditions culminating in a transition of power. On July 23rd, 1952, King Faruq was forced to abdicate and go into exile in the bloodless revolution that demanded an end to the perceived 'feudalistic' state. In January 2011, the 30-year reign of Mubarak ended after weeks of protest with his forced resignation and replacement by a military official. The cases, while 59 years separated, resemble similar occurrences of long-standing social divisions and economic dissatisfaction reaching a tipping point that resulted in a relatively peaceful transition of power. With the repeated occurrences of food riots and in the second case of bread becoming a symbol of the revolution, the connection between the final transition of power and environmental changes remains evident. The declining conditions of arable land and agricultural production primed the country for social unrest and revolution.

However, the results of my research are limited because of resource constraints and extenuating variables that could have affected the economic and social conditions of the revolutions. The data for agricultural land in Egypt is restricted to after 1961, causing the first case study to rely primarily

on firsthand accounts of the changing environmental conditions and later research from environmental scholars that focused on historical agricultural production. The second case study encompasses more complete records of the documented salinity, sea level, and temperature that contributed to the understanding of change over time. Correspondingly, the rise of social media and a general increase in documented information provides a better conduit for understanding the causes of the protests in the second case since many personal accounts record the intentions and reasoning of the protestors.

Additionally, the results are complicated by factors other than the conditions for arable land and agriculture that impacted each case. The varying levels of industrialization that occurred are connected to the utilization of the workforce and the state of the economy. If industrialization absorbed the landless agricultural workforce, as intended by the government, then the effects of the decline in agricultural conditions may have become negligible. Even if industrialization allowed for decreased unemployment, the role of agricultural conditions would create pressure on the economy and, likely, the government, which could still impact political stability. Regardless, factors like wars, oil wealth, and technology likely contributed to the level of government stability and will have caused a limitation to the application of my results. In my research, I do not argue that the conditions of arable land and agricultural productivity were the sole cause of the revolutions in 1952 and 2011 but simply an underlying factor that contributed to the rising tensions resulting in the transitions of power.

Conclusion

By analyzing how past environmental changes have shaped political stability and the mechanisms for revolutions, the research can provide important insights for future climate change scenarios and upcoming challenges. Scholars on the Arab Spring have limited their focus too closely on the immediate events before the revolutions without diving into the historical context that contributed to the rising tensions and social unrest. The events directly prior to the revolutions are important to investigate, but I argue that they are tipping points in a bleak scene of declining political stability rather than a sharp precipice. The theories explored by scholars of the Arab Spring on the role of social media, corruption, and demographic changes are various factors that likely impacted the exact time and form of the uprisings. However, environmental changes are shown to destabilize the political system leading up to a point where more poignant events push the political system to the breaking point. Approaching revolutions through the lens of long-term changes that may have impacted political stability allows for the changes in government stability over time to come to light, indicating the build-up of socioeconomic factors critical to the growing demands for a transition of power.

Future research is needed to fully understand the role of environmental changes in political stability, including the extent to which the political systems rely on the natural world for stability. The results of my research demonstrating the role of arable land and agricultural production in contributing to the revolutions create space for future research to complete similar studies in other countries that were part of the Arab Spring. Likewise, the role of specific environmental changes in terms of water resources and global average temperature rises could provide deeper insights into kindred factors that could have

led to declining political stability and government transition. Additionally, the research sheds light on specific mechanisms that connected environmental changes with de-stability shown through economic decline and social inequality that would benefit from further exploration. As more countries are experiencing the negative effects of climate change, serious attention and consideration should be given to research on political stability in order to prevent and/ or moderate future crises.

For Egypt, climate change poses an existential threat to the future of its arable land and agricultural productivity that will continue to impact the country's political systems. Scholars predict that by 2030 there will be a substantial reduction in the

productivity of major crops in Egypt due to increasing temperatures and water scarcity related to climate change (Fahim et al., 2013). The amount of arable land for agriculture will also continue to decrease because of the sustained rise in sea level and salt-water intrusion of former agricultural lands (Mahmoud, 2017). According to Human Rights Watch, Egypt is already experiencing the beginning stages of political instability with a rise of protests in 2020 that were held in rural areas of northern Egypt, among the poorest sector of the population (Magdi, 2020). If the past pattern holds true, then the Egyptian government and agricultural industry are in dire need of intervention and investment to prevent the instability from rising into another revolution.

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