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Sovereign Seeds: Analyzing the Sustainability of Peasant Seeds in the Context of Climate Change and Rural Exodus in Tunisia

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Sovereign Seeds:
Analyzing the Sustainability of Peasant Seeds
in the Context of Climate Change and Rural Exodus in Tunisia

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Tunisia and Italy: Politics and Religious Integration in the Mediterranean, SIT Study Abroad

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Abstract

How sustainable are peasant seeds? I answer this question on the basis of three elements: environment, economy, and social justice. Using interviews with farmers from various regions of Tunisia, an interview with an expert on climate change and migration, and an interview with a civil society organization working to promote sustainable agriculture, I found that peasant seeds are a sustainable solution for a suffering agricultural sector. Depleted water sources and drought are bringing to light the problems with water-intensive hybrid seeds, and farmers are losing money. As young men increasingly leave the agricultural sector, women are left behind, finding themselves subjected to unjust labor conditions. Peasant seeds, which are suited to the Tunisian climate and have been developed throughout generations of Tunisian farmers, allow farmers to adapt to climate change while spending less on input costs. It also functions as an adaptation strategy available to women and the poor, unlike migration. As the impacts of climate change become increasingly clear, achieving food sovereignty through the use of sovereign seeds becomes increasingly urgent.

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I. INTRODUCTION	5
II. LITERATURE REVIEW	7
III. METHODOLOGY	21
IV. FINDINGS AND DISCUSSION	25
V. LIMITATIONS	39
VI. CONCLUSION	40
BIBLIOGRAPHY	42

I. INTRODUCTION

Climate change is a pressing global matter, not only because of its impact on the environment, but also because it exacerbates existing human challenges: socioeconomic disparities, gender inequality, food scarcity, migration, health, global conflict and security. Addressing climate change must come through a lens sensitive to this range of issues. The following paper will specifically address the impacts of climate change on rural agricultural regions in Tunisia, and explore the intersections of climate change and migration. Though I remain focused on Tunisian agriculture and individuals living in rural regions, I will situate my research within the broader conversations of climate migration and ancestral and traditional knowledge systems.

Throughout my time in Tunisia, I have studied the political and humanitarian impacts of migration- particularly irregular migration from Africa to Europe. Though this migration pattern is often the most visible in the media and in political rhetoric, the majority of international migrants migrate internally at least one time before leaving their home country (Zuccotti, Geddes, Bacchi, Nori, Stojanov, 2018). I am thus interested in exploring further the impacts, patterns, and motivations for internal migration in Tunisia, and in connecting these patterns with patterns of climate change in rural areas. As I began conducting research, I found that climate-induced migration is often conceptualized as an adaptive response to climate change. However, migration remains most accessible to young males, and is dependent on socioeconomic factors and resources (Zuccotti, Geddes, Bacchi, Nori, Stojanov, 2018). Thus, it is an adaptation strategy not equally available to all people. We must consider: when people migrate, who is left behind?

I have studied climate change at Occidental College, my university in California. Throughout my studies, I have been most interested in adaptive responses to climate change that are rooted in traditional knowledge systems, which are rooted in harmonious, non-extractive, non-capitalist ways of being, knowing, and producing. The use of traditional seeds in Tunisian agriculture represents a traditional knowledge system which has the potential to both restore environmental degradation, as well as offer an alternative climate adaptation strategy to migration.

With these groundings, I will dedicate the following pages to an exploration of adaptive strategies to climate change. This study will address the following question: is the use of traditional/peasant seeds in Tunisian agriculture a sustainable adaptation to climate change? I shall test the hypothesis that yes, traditional seeds may serve as a sustainable adaptation strategy. I will explore the sustainability of these seeds in three dimensions: environmentally, economically, and socially.

To investigate these questions, I began with a review of the current literature. I interviewed 5 farmers in the Cap Bon region of Tunisia, and spoke with them about the current challenges facing agriculture, and how they are adapting to those challenges. I spoke with 3 other farmers over the phone. I also interviewed an expert in the field of climate change, migration, and traditional seeds. I visited the Banque des Gènes to learn more about their operations and their preservation and distribution of these seeds. Finally, I spoke with a representative from the Tunisian Association for Permaculture, to gain insight from a civil society organization. After completing this field work, I returned to academic sources to develop my argument and findings.

My investigation addresses the questions of climate change, migration, traditional seeds, sustainability, and vulnerability. It is thus necessary to begin with a review of the recent literature concerning these topics, and to explore their intersections with one another.

II. LITERATURE REVIEW

Though scholars tend to agree on geographical predictions of climate change (decreasing rainfall, rising sea levels, desertification, salinization, increasing temperatures), the ways in which these changes will impact human populations is up for debate. I will begin with an overview of how climate change impacts the Mediterranean region as a whole, and then move into a discussion of the relationship between climate change and migration. I will then discuss the history of traditional seeds in Tunisia.

Climate Change in the Mediterranean Region

At the center of this project lies the issue of climate change. Climate change has been increasingly discussed in the past half-century, as the impacts of climate change become clear through increasing temperatures, increasing periods of drought, floods, rising sea levels, salinization, and severe weather events (FAO, 2024). The connection between human actions and climate change has been established to the point that some academics have developed the concept of the “anthropocene:” our current, developing epoch, defined by “accelerated, human-dominated global change” (Moore, 2015). Though my investigation does not dwell on the causes of climate change, it is important to acknowledge the human responsibility for certain environmental disasters and stressors, as well as to acknowledge the disparity between who bears the brunt of the impacts.

Though climate change is a global issue, different regions of the world are experiencing the impacts of climate change differently, and to different extents. The countries most susceptible

to climate change, and which are already experiencing the worst impacts of climate change, are the countries least responsible for greenhouse gas emissions. That is to say that “low and middle-income countries contribute the least to greenhouse gas emissions, yet suffer the most from the impacts of climate change” (FAO, 2024). This is due to both geographic and economic circumstances.

The UN Environment Programme released a Mediterranean Assessment Report in 2020, outlining the impacts of climate change upon the Mediterranean region. According to this report, the “Mediterranean Basin is at risk of suffering from levels and rates of climate and environmental changes now and in the foreseeable future that exceed global mean values” (Lange et al., 2020). Average temperatures in this region have increased by 1.5 degrees celsius since pre-industrial times (higher than the global average increase), average rainfall has decreased, leading to more frequent and intense droughts (accounting for the fact that this region has historically been susceptible to drought), sea level rise, and the loss of fertile soils due to desertification and salinization of the soil (Lange et al., 2020). These climatic conditions are expected to not only lead to a loss of biodiversity, but also they are expected to create problems both in densely populated coastal regions, which face both increasing pollution and rising sea levels, as well as in rural areas, which rely on water-dependent agriculture.

In Tunisia, climate change manifests through “the rise of temperatures, decrease of precipitation, elevation of the sea level, and the increase in frequency and intensity of extreme climate phenomena” (Smida Guesmi, 2024). As a result of these climatic changes, Tunisia can expect to face increasing “water stress, desertification, loss of biodiversity, [and] decline in agricultural productivity” (Smida Guesmi, 2024; Ministère de l’Environnement, 2022). Highly dependent upon water resources, the agricultural sector will be especially impacted by

decreasing precipitation and rising temperatures (Labiadh, 2021). The Ministère de l'Environnement predicts “a decline in precipitation of 22mm per year and an increase in continuous dry days of 17.1 days per year,” based on current trends (Smida Guesmi, 2024; Ministère de l'Environnement, 2022). As of 2023, the water level of dams was at a mere 31 percent capacity (Smida Guesmi, 2024). As a result of this water stress, the agricultural sector is expected to decline in productivity, with the annual contribution to GDP expected to fall between 5 and 10 percent by 2030 (Smida Guesmi, 2024).

Climate Change and Migration

In the early 1990s, scholars began to examine the relationship between climate change and migration, even suggesting that “the greatest single impact of climate change might be on human migration” (IOM, 2008). Norman Myers of Oxford University, a leading scholar on what he defined as “environmental refugees,” estimated that by 2050, there would be approximately 200 million people displaced due to sea level rise, monsoons, drought, and flooding (Myers 2005). This estimate has taken hold in the climate migration literature, though other estimates range between 25 million and 1 billion displaced people by 2050 (IOM 2008). The range in estimates results from the difficulties in defining climate migrants, making predictions, and in dissecting motivations for migration.

The International Organization for Migration (IOM) released a report in 2008 outlining the relationship between migration and climate change. They open with a discussion of definitions. There are limitations to both the terms climate/environmental “refugee” and climate/environmental “migrant.” The former accurately denotes a sense of urgency. However, international law limits the definition of “refugee” to those fleeing persecution, and to those who cross an international border. “Climate refugees” who are not fleeing persecution, and who do

not cross international borders, would be excluded under this definition. On the other hand, “migrant” implies more agency, perhaps inaccurately. Thus, the IOM chooses to use the terms “forced climate migrants” and/or “environmental migrants,” which they define as “persons or groups of persons, who, for compelling reasons of sudden or progressive changes in the environment that adversely affect their lives or living conditions, are obliged to leave their habitual homes, or chose to do so, either temporarily or permanently, and who move either within their country or abroad” (IOM 2008). In my study, I will use the term “environmental migrant” as defined by the IOM thus, and I will be focusing on environmental migrants who remain within the borders of their country of origin (Tunisia).

Scholars agree that the relationship between climate change and migration is neither simple nor necessarily direct. Some scholars suggest that conflict serves as the intermediary between climate change and migration. Barbara Bendadi, in her article “Migration Induced by Climate Change and Environmental Degradation in the Central Mediterranean Route,” argues that as resources become more scarce, conflict over those resources emerges, pushing some individuals to flee conflict (Bendadi 2018). However, environmental migration is also very closely linked to economic concerns. As agriculture becomes less profitable due to lack of rainfall or desertification, for example, some individuals are spurred to look for income elsewhere. Scholars do agree that environmental changes are rarely the sole motivator for migration, due to the close relationship between climate change and economic concerns, as well as due to the difficulty in extracting “push” and “pull” factors.

The IOM also points out that it is difficult to make predictions about the future of climate migration past the year 2050, as this is highly dependent upon current responses to climate change. Policies regarding greenhouse gas emissions, for example, will highly influence the

course of global climate change, and thus influence the extent of climate migration. However, even in the IOM's "best case scenario," climate migration continues in the next century, though remains at a manageable level (IOM 2008). However, in their "worse case scenario" prediction, in which fossil fuels continue to make up the majority of energy production, and global population growth increases, "predictions of 200 million people displaced by climate change might easily be exceeded" by the 2050's (IOM, 2008).

Internal Migration

Though it is important to emphasize the potential global scope of environmental migration, it is also important to note that the majority of environmental migrants will remain within the borders of their country of origin (IOM 2008, Chibani 2024). Even the majority of international migrants migrate internally before moving abroad (Zuccotti, Geddes, Bacchi, Nori, Stojanov, 2018). There are two sorts of internal migration: rural-rural migration and rural-urban migration. Rural-rural migration largely consists of seasonal migration for agricultural work in other rural regions (Lucas 2015). Rural-urban migration involves people seeking more employment opportunities, education opportunities, higher skilled labor, or more access to resources in larger urban centers (Lucas 2015).

In Tunisia, urban pull factors reflect the disparity in development of rural and urban regions. While the human development index of Tunisia is overall fairly high, it remains unequal between rural internal regions and urban coastal regions (0.231 in rural Kasserine, and 0.762 in Tunis, for example) (Gueddana 2021). Rural regions tend to have higher rates of poverty, lower rates of education, less developed infrastructure, and lower access to resources, such as financial credit (Gueddana 2021). This creates pull factors for individuals seeking more opportunities in

urban areas. However, it also creates challenges for migration, as a lack of financial resources acts as a barrier, due to the costs associated with migration (Lucas 2015).

As argued in the essay “Rural Migration in Tunisia: Drivers and Patterns of Rural Youth Migration and its Impact on Food Security and Rural Livelihoods in Tunisia,” economic concerns are a primary driver for internal migration in Tunisia. Employment in the agricultural sector is steadily declining, as the sector becomes less profitable. As a response, families are seeking to diversify their income, which often involves migration to urban areas. This study also notes, importantly, that the majority of rural-urban migrants are young men. Women are more likely to migrate to other rural areas, most often to work in agriculture (Zuccotti, Geddes, Bacchi, Nori, Stojanov 2018). I will return to this gender divide in the following section concerning vulnerability.

Rural-urban migration results in costs and benefits for both rural areas and urban centers. For urban areas, the benefits include an increase in the country-wide average income level as urbanization increases (Lucas 2015). The individual who migrates also experiences a range of benefits, including more job opportunities and access to education. However, there are external costs associated with urbanization, particularly rapid urbanization. This includes “over-crowding, pressure on infrastructure such as roads and schools, pollution and inadequate waste disposal” (Lucas 2015). The Food and Agriculture Organization also warns of a potential decline in wages as job competition increases in urban areas (FAO 2024). For rural areas, the benefits are primarily experienced by those who receive remittances from family members who have migrated (Lucas 2015, Zuccotti, Geddes, Bacchi, Nori, Stojanov 2018). The costs for these rural areas include a decline in investment, leading to cyclical pockets of poverty. Additionally, there are costs for those who remain in rural areas and do not migrate. For example, as more young

men leave the agricultural sector to seek employment in urban areas, women are becoming more involved in agriculture. This phenomenon, sometimes referred to as the “feminisation of agriculture” (Zuccotti, Geddes, Bacchi, Nori, Stojanov 2018, Amayed 2023), contributes to women’s increased vulnerability to labor exploitation- an issue which I will return to.

Climate Vulnerability: Theoretical Framework

As mentioned above, different regions of the world experience climate change differently and to different extents. Beyond this, different individuals within regions experience different levels of vulnerability to the negative impacts of climate change. The Food and Agriculture Organization of the United Nations (FAO) offers a clear definition of climate vulnerability in their 2024 publication *The Unjust Climate- Measuring the Impacts of Climate Change on Rural Poor, Women, and Youth*. Vulnerability refers to an individual or group’s propensity to be negatively affected- in this case, by climate change.

According to the FAO, vulnerability consists of a combination of three factors: exposure, sensitivity, and adaptive capacity. Exposure refers to type, frequency, and intensity of climate variations or stressors that impact someone (FAO, 2024). For example, coastal regions are more exposed to rising sea levels than inland regions. Sensitivity refers to the degree to which a person is susceptible to harm due to exposure to climate stressors. This may be biophysical or socioeconomic. For example, older people are more sensitive to worsening air quality; lower quality soil is more sensitive to drought; and “producers with limited access to land and capital are often forced to mine soil nutrients and continuously cultivate a small range of crops over multiple years to meet immediate food security needs... degrad[ing] agricultural soils and mak[ing] producers more sensitive to future climate stressors” (FAO, 2024). Adaptive capacity refers to an individual's ability to adjust to immediate or expected damage. This includes both

mitigating damage as well as taking advantage of potential opportunities. Adaptation may be anticipatory (*ex ante*) or reactive (*ex post*). Anticipatory adaptation refers to the adaptation strategies developed in response to long-term climatic changes, such as increasing temperatures and drought, while reactive adaptation refers to short-term adaptation in response to extreme climate events. The FAO report also considers “maladaptive” responses to climate change: “vulnerable people often liquidate productive assets, limit food consumption, reduce productive investments, deplete groundwater reserves or withdraw children from school to counter the immediate impacts of climate-related events on consumption and income, but this can undermine their capacity to address future stresses” (FAO 2024, 12). The three factors of exposure, sensitivity, and adaptive capacity come together to determine an individual’s vulnerability. In my research, I will be using this particular framework of vulnerability when considering climate change’s impact on the agricultural sector in Tunisia.

This publication from the FAO also provides my research with the framework for understanding rural vulnerability to climate change. The FAO provides data outlining the ways in which rural communities in low and middle-income countries are particularly vulnerable to climate change, due to their reliance on climate-dependent agriculture, higher poverty rates, and limited access to services and institutions (FAO 2024). Within this subcategory of rural communities, the FAO provides data referring to the different levels of vulnerability based on wealth, gender, and age. Though gender is the most prominent factor in my research, I will expand briefly upon the factors of wealth and age, as they provide relevant context for the issue of vulnerability.

Poor rural households are more vulnerable to climate change than non-poor rural households, according to the FAO. First, we may consider *exposure*. “Poor people are often

concentrated in areas that are more exposed to climate stressors,” which is likely related to the fact that “places with suboptimal climate conditions and limited market access have lower average agricultural productivity levels, leading to lower farm incomes and higher concentrations of people living in poverty” (FAO 2024, p 15). Rural poor people are more *sensitive* to climate change in the sense that they are more likely to rely on small-scale, climate-dependent agriculture for their livelihoods. Poorer households are also more likely to be less educated, resulting in fewer off-farm employment opportunities. In terms of adaptation capacity, rural poor households are more likely to adopt maladaptive adaptation strategies, such as removing children from school and reducing income diversification (FAO 2024). Extreme weather events tend to impact poor households more severely, as they have fewer resources available. Floods and extreme temperatures both result in rural poor households losing more income than non-poor rural households, according to FAO data. Interestingly, drought does not result in the same disparity, as rural poor households tend to seek off-farm revenue at higher rates during droughts.

Young rural households (households in which the head of household is younger than 35 years old) tend to be less vulnerable to climate change than older rural households. Though younger households tend to possess fewer assets and land, they tend to be more educated. As a result, off-farm revenue is more accessible to younger households. In response to extreme weather events, younger households tend to lose more agricultural revenue than older households, yet compensate by seeking off-farm revenue at higher rates than older households.

Climate Change, Vulnerability, and Gender

I will now turn to a discussion of gender and its relationship to climate change and vulnerability. I will begin by relating the FAO’s findings on gender and climate vulnerability, and then move to a discussion of how this operates in a context specific to Tunisia. The FAO found

that female-headed rural households are more vulnerable to climate change than male-headed rural households. This is due to gendered patterns and disparities in resource and land access, time use, income opportunities, and access to services. Statistically, women are “significantly less likely to enjoy secure rights to land, and, when they do, the land... is usually smaller and of lower quality than that of men” (FAO 2024, p 24). Women also tend to have less access to “critical agricultural and nonagricultural support services, such as farm extension, credit and insurance services,” leaving them more sensitive to loss of agricultural revenue (FAO 2024, p 24).

Importantly, women are statistically less likely to seek off-farm revenue. This is due to several factors, which FAO outlines. First, women tend to have more domestic expectations than men. The FAO cites data from the UN Department of Economic and Social Affairs, which states that, globally, women spend an average of 4.2 hours per day on unpaid domestic work, whereas men spend an average of 1.9 hours per day on the same activities (FAO 2024). This results in both lower average educational achievement, as well as limits employment opportunities. Off-farm employment options “are often limited to part-time, informal, low paid and precarious work” (FAO 2024, 23). Additionally, and particularly relevant to my research, is the impact this domestic labor has on migration.

Women are less likely to migrate to seek off-farm opportunities and alternative livelihoods than men. Social and domestic expectations often require women to stay at home while their husbands or sons migrate to seek alternative livelihoods. This observation is consistent in the Tunisian context. In a paper also published by the FAO in 2018, called “Rural Migration in Tunisia: Drivers and Patterns of Rural Youth Migration and its Impact on Food Security and Rural Livelihoods in Tunisia,” the authors found the majority of both international

and internal Tunisian migrants to be male. Additionally, the majority of Tunisian migrants coming from agricultural backgrounds were sent to migrate as a form of income diversification for the family unit (Zuccotti, Geddes, Bacchi, Nori, Stojanov 2018). Placing this study in conversation with the 2024 study, we may understand that in the face of climate shocks, women are less able to utilize the adaptation strategy of migration, thus leaving them more vulnerable to climate change, and more likely to develop maladaptive practices.

Tunisian Women and Agriculture

The gender-based inequalities outlined in the FAO report exist in the Tunisian context as well, though Tunisian rural women face particular and unique challenges. Women in Tunisia play a significant role in agriculture, representing 70% of the agricultural workforce (Gueddana 2021, Mazhoud 2023). However, they own only 5% of arable land. This is related to the fact that men typically inherit family land. Additionally, only 19% of rural women have their own sources of income, as opposed to 60% of rural men (Gueddana 2021). Rural women are also the demographic which experience the lowest levels of education, and the highest levels of illiteracy. For example, statistics from the Oued Sbaihia region in the North of the country show that “39% of the women are illiterate, 39% have stopped their studies at the primary and 22% reached the secondary level” (Amayed 2024, p 19). On a broader scale, the national illiteracy rate of the country is 18%, whereas the illiteracy rate of rural women is 32%. Additionally, 60% of children attend preschool in urban regions, while only 17% of children attend preschool in rural regions (Gueddana 2021). This reflects both the unique challenges faced by women, but also reflects the stark socioeconomic disparity between rural regions of Tunisia and the coastal urban regions.

Low levels of education, little access to land, and low potential for migration leads to rural women’s particular vulnerability to dependency and exploitation. In specific, 61% of rural

women are employed in “occasional” agricultural work (Gueddana 2021, p 9). Many women engage in under-regulated short term day labor, often as harvesters. In these precarious conditions, women are often paid very low wages and work long hours. The current minimum daily wage for women working in agriculture is TND 17.7 (USD 5.5). In one month, this amounts to TND 400 (USD 125) (Slaimia, 2021). However, day laborers often have to pay a “middleman fee” to a man who drives women to and from the fields. These trucks are often overcrowded and dangerous. As a female farmer speaking to a reporter said: ““there are 60-year-old sick women who can’t stand for long periods. To stop them from sitting and gain a few centimeters to squeeze in more women, the middleman pours cold water into the back of the truck”” (Slaimia, 2021). Then, “the middleman determines his and the women’s wages with the farmer. If their wage is theoretically TND 20 [USD 6.2], then at best they receive TND 15 [USD 4.7] after the middleman’s commission” (Slaimia, 2021). Other women speaking to this reporter mentioned incidents of sexual harassment and rape, sometimes at the hands of farmers. Other women expressed a general sense of abandonment by the government.

In 2019, the “Sabbala tragedy,” in which an overcrowded transport truck crashed, killing 12 female laborers and injuring 20, resulted in the state imposing a Safe Transport Law Specific to Agricultural Sector Workers (Slaimia, 2021). However, due to a lack of oversight and a lack of specificity, this law has not been enforced, remaining mostly on paper.

As I will expand upon in my research findings, women are increasingly involved in agriculture as youth and men increasingly migrate to cities to seek off-farm revenue. This exacerbates women’s vulnerability to both agricultural exploitation as well as climate change. This brings me to the gap in the current literature. How might alternative *ex ante* adaptation

strategies to climate change impact women working in agriculture differently than rural to urban migration?

***Ex Ante* Adaptation Strategies: Hybrid Seeds vs. Peasant Seeds**

The *ex ante* adaptation strategy which I focus on in my research is the utilization of peasant seeds. These peasant seeds (also called local seeds, traditional seeds, farmer seeds, or indigenous seeds) carry with them the genetic material of generations of Tunisian agriculture. In the first few decades of French colonization, the Tunisian agricultural sector was refocused, placing an emphasis on food exports. Peasant land was redistributed and repurposed. During this process, many traditional farming practices, knowledge systems, and seeds were lost (Amayed 2023).

After independence, the new Tunisian government replicated these same colonial practices, but with a new emphasis on “food security,” which became the dominant global agricultural model in the 1970s and 80s (Amayed, 2023). This model emphasized high production rates, especially for developing countries, and pushed for specialization and globalization. With support from the World Bank and the IMF, Tunisia adopted the 1986 Structural Adjustment Program, which industrialized agriculture and promoted liberal market policies. After adopting this program, Tunisia began importing hybrid seeds. Struggling farmers accepted these hybrid seeds in order to increase their yields. However, the hybrid seeds lacked adaptability to the Tunisian climate, resulting in high water requirements and susceptibility to disease. Additionally, the seeds must be repurchased annually, as they cannot self-seed. As Aymen Amayed points out in his article “Agricultural Transition in Tunisia: the Importance of Farmer Seeds for Food Sovereignty,” these hybrid seeds have led to economic consequences for

farmers, as they require higher input costs: irrigation, pesticides, fertilizers, and annual purchases. It also has resulted in a loss of cultural knowledge.

The peasant seeds, which hybrid seeds replaced, are more suited to the Tunisian climate, and they carry with them generations of peasant knowledge and heritage. In another article from Amayed, he explains that the cultural knowledge associated with peasant seeds “is very important to cope with climatic conditions which change, such as temperature and the irregularity of the seasons... [and] having this knowledge is important for the survival of the community” (Amayed 2024, p 80). The peasant seeds “carry enormous genetic knowledge which has been developed between the seeds themselves, the farmers, and the environment in which they live” (Amayed 2024, p 80). The use of peasant seeds allows farmers to lower irrigation costs, fertilizer costs, and pesticide costs, while also freeing them from dependence upon the global import economy.

As peasant seeds are more drought resistant, the use of these seeds may be considered an *ex ante* adaptation strategy to climate change in the face of increasing temperatures and increasing periods of drought. This opens the door for my research of peasant seeds as an *ex ante* adaptation strategy.

III. METHODOLOGY

In order to address the question of the sustainability of peasant seeds, I adopted a qualitative approach, which involved interviews with 8 farmers, 1 academic expert, and 1 civil society organization. The first set of interviews with farmers, which involved interviewing 5 farmers in the Cap Bon region, did not directly address peasant seeds, as this theme had not become central to my research question at that point. However, these interviews addressed climate change’s impact on agriculture and mitigation strategies, including migration. Therefore,

these interviews remain relevant to my research, and serve as a valuable entry point for discussion.

My primary advisor for this project, Dr. Samira Mechri, connected me with her colleague, Professor Habib Ben Boubaker, who specializes in geography with a focus on climate change. Professor Ben Boubaker had some connections with farmers in the El Harouri village, a rural agricultural region 6 km west of Kelibia in the Cap Bon region, and he invited me to come to Kelibia with him to interview these farmers. I prepared a questionnaire to ask some local people of El Harouri. I prepared the questions in French and English, though the individuals whom I interviewed spoke Arabic, so Professor Ben Boubaker served as my translator. I asked each individual the same questions: basic information about name, age, place of residence, occupation, and types of crops cultivated. I then asked about the present state of agriculture and climate: in the past 5 years, has agriculture become more difficult? If yes, why? What are the most significant climatic challenges you face? How has the climate changed in the past 5 years? I then asked about adaptation: How are you adapting to these challenges? Do you expect people will leave the region in the future? Though the interviews were brief, this allowed me to get input from numerous individuals within the limited time that I had in the area.

I interviewed 3 additional farmers via phone interview. I connected with the first farmer, Slim Marzougui, through the website of the Association Tunisienne de Permaculture (Tunisian Association for Permaculture). The TAP has a database of Tunisian farms and farmers who are engaging in sustainable agricultural projects. I reached out to the El Berima Farm through this database, and spoke to Marzougui over the phone. I asked him about his farming methods, whether farming was becoming more difficult for Tunisian farmers, what mitigation strategies

farmers were using in the face of climate change. I also asked him about the use of peasant seeds in Tunisian agriculture.

Achref Chibani connected me with the last two farmers. I connected with Achref Chibani, an expert in the field of climate change, migration, and peasant seeds. We discussed via phone interview the relationship between internal migration patterns and climate change in Tunisia. We also discussed the implementation of peasant seeds and their role as an adaptation strategy. After the interview, Achref sent me the phone numbers of two farmers who utilize peasant seeds: Radhouane Tiss and Hafedh Korbaa. I followed up with them via phone interview.

I asked similar questions of these two farmers. I asked for background information about where they farm, how many hectares they farm, and what crops they farm. I asked about their use of peasant seeds: How long have you been using peasant seeds? Which varieties of peasant seeds do you use? How do the peasant seeds compare to the hybrid seeds? Where do you get these seeds from? How are they different from hybrid seeds from abroad? Are there any challenges to using peasant seeds? Finally, is it becoming more common to use these seeds?

Lastly, I interviewed Sahar Meddeb, who works for the Tunisian Association for Permaculture and who specializes in peasant seeds and food sovereignty. I asked her questions about the TAP, the organization's role in distributing peasant seeds, the legal challenges which peasant seeds face, and about food sovereignty.

To ensure transparency throughout the interview process, I gave participants a brief synopsis of my research interests before beginning to ask questions. However, I refrained from stating my hypothesis to avoid unduly influencing the conversation. All participants consented to using their full names, except for the El Harouri farmers, whom I shall refer to by initials.

In addition to these interviews, I also visited the Banque National des Gènes in Tunis with Professor Ben Boubaker's Master's Degree students. The Banque National des Gènes plays an important role in the preservation and dissemination of peasant seeds. On my visit to the BNG, I toured the laboratories where seed preservation takes place, and also got to see examples of various peasant seed varieties. A researcher gave a presentation, explaining the history of the BNG and their role in preserving peasant seeds. This researcher followed up with me via email by sending me various scientific sources regarding the distribution and characteristics of different peasant durum wheat varieties throughout Tunisia. These sources offered some scientific grounding for my research.

In addition to these interviews and field visits, I also read academic sources about climate change, internal migration, climate vulnerability, and peasant seeds. This research began by reading a recent publication from the Tunisian organization Observatoire de la Souveraineté Alimentaire et de l'Environnement (Observatory of Food Sovereignty and the Environment, OSAE). This book, *Jus Resistendi: Tunisian Peasant Narratives on Climate Justice*, is a collection of essays that introduced me to the concept of peasant seeds and traditional Tunisian farming practices. It also touches on issues such as rural migration, women's role in agriculture, and food sovereignty.

Through further online research I was able to find a substantial body of literature regarding climate change in Tunisia, climate change in the Mediterranean region as a whole, migration, rural to urban migration, as well as sources concerning mitigation strategies and traditional farming practices. However, fewer sources connected the issues of rural exodus and peasant seeds. My research thus fills this gap, by comparing the sustainability of migration with the sustainability of peasant seeds.

El Harouri served as an appropriate site for my research, as the region was rural, consisting of mostly agricultural land. Farmers in this region typically rely on the *Barrage Lahjar*, a large dam, for water. However, the dam is currently at much lower capacity than a typical year, so I wanted to learn more about how this impacted farmers, and whether this was an unprecedented occurrence. El Harouri's proximity to the larger city of Kelibia made it an appropriate site to explore off-farm work mitigation strategies, as well as made it accessible for me to visit within a day.

As I conducted my research, my research question and focus adjusted throughout the process. Eventually, I decided that it was important for me to center the concept of sustainability. The question thus arose: what does sustainability mean? Though sustainability is a widely used term, particularly in the West, precise definitions and understandings remain elusive. A subliminal debate runs through discussions surrounding sustainability, as John Vucetich and Michael Nelson describe in their essay "Sustainability: Virtuous or Vulgar?" Is sustainability about maximizing the efficiency of human needs? Or is it about protecting ecosystem health? In other words, "does human need define ecosystem health, or does ecosystem health define the limits of human need?" (Vucetich and Nelson 2010, 540). This debate also reflects a division between a traditionally Western anthropocentric ideology towards nature and the ideology typically more present in Indigenous communities, which offers a more interrelated, reciprocal and "ecocentric" relationship between humans and "nature" (Maison 2023, 45). Though I will not delve too deeply into this ethical and ideological debate, I will proceed with this dichotomy in mind and offer an understanding of sustainability that does not depend upon a Western-centric, modernist framework which prioritizes development and progress over ecological preservation, and instead considers a definition of sustainability which values "both human and more-than

human interests, simultaneously, and not with one subordinated to the other” (Maison 2023, 53). Additionally, I will follow the framework that “sustainability... require[s] valuing not only ecosystem health and economic development but also social justice” (Vucetich and Nelson 2010, 542). Thus, I measure the sustainability of peasant seeds based upon these three elements: ecosystem health/environment, economic development, and social justice. I shall thus organize my findings around the environment, economy, and social justice.

IV. FINDINGS AND DISCUSSION

Environment

Climate Change and Drought

Upon speaking with individuals in Harouri, I found consistency between each of my interviews. All 5 people whom I spoke with answered affirmatively that farming had become more difficult in the past 5 years. Though not everyone was currently a farmer, they all came from agricultural backgrounds and were familiar with the state of agriculture in their region. They all answered that the biggest challenge which farmers currently face, and the reason why farming is becoming more difficult, is the lack of water. They spoke of the lack of rainfall, the dry dam, the dry wells. When I asked if this has always been a challenge, they said that in the past 5 years, it has become more pronounced.

One of the men, M, offered to show me the *Barrage Lahjar*. It was a short walk from where we had been speaking. When we arrived, he pointed to a grassy field. Grazing cattle stood in the distance. He told me that normally, this is the dam, filled with water. Since the drought began five years ago, it has been dry. He also showed me a well which he normally used as a source of water. It was dry, and half filled with sand.

M also explained to me that since there is a lack of rainfall, farmers are digging wells deeper and deeper. However, this is costly, and not affordable for everyone. A younger man, S, told me that the lack of rainfall has resulted in farmers relying upon public water in canals. However, there are tariffs for usage, and occasionally the water is shut off.

Slim Marzougui from El Berima Farm, which is located just southeast of Tunis, near the Boukornine National Park, spoke of the same problem. He said that farming is becoming more difficult with droughts, and expects that it will continue to be difficult: “last summer was difficult, this summer will be even more difficult...” he said (Marzougui 2024). He said that there are many periods of drought, and as a result, farmers are digging deeper and deeper wells. However, Marzougui argued that digging deeper wells and “using the same practices” reflects a failure to adapt to changing climate conditions (Marzougui 2024). El Berima farm, (which is also an educational site), uses permaculture farming practices, which involve using crop diversification and using drought resistant seeds. Marzougui suggested that if more farmers adopt these practices, farming will not be so difficult, even in drought conditions.

Radhouane Tiss, a farmer from Tatooine, also cited drought as being a challenge. He also mentioned increasing temperatures. He said that rainfall was increasingly infrequent, and when it does rain, it rains excessively, causing flooding. He said that this has become increasingly challenging for him in the past 5 years.

These reports from the farmers of dry conditions aligned with my background research about climate change in Tunisia. The global rise in temperatures is leading to decreased precipitation and increased water stress (Guesmi 2024, Ministère de l’Environnement, 2022 Labiadh, 2021). The Climate Change Knowledge Portal of the World Bank notes a 3% decrease in rainfall in the past 30 years (World Bank 2021). As Labiadh notes in a report prepared for the

Forum Tunisien pour les Droits Économiques et Sociaux, this lack of rainfall is especially noticeable to farmers, who rely on rainfall for their livelihood. My findings from interviews were consistent with this data.

Hybrid Seeds, Peasant Seeds, and their Impacts on the Environment

Through my interviews with Marzougui, Chibani, Hafedh Korbaa, and Radhouane Tiss, I learned more about peasant seeds, hybrid seeds, and their relations to the environment. Hybrid seeds, according to these three individuals, are highly water demanding. Chibani explained that with the use of hybrid seeds, the fertility of the land is negatively impacted, due to their high water demand and heavy pesticide and fertilizer use which these seeds require.

Hafedh Korbaa is a farmer in Bani Hassan, a small village near Monastir. He farms 96 different varieties of peasant seeds, and 16 varieties of hybrid seeds. He spoke of the difference between these seeds, saying that the hybrid seeds demand water, fertilizer, and pesticides, while the peasant seeds do not. Marzougui mentioned the same distinction. The hybrid seeds are not adapted to the climate, use lots of pesticides, more water, and, he claims, are not as delicious. Tiss gave a similar report. Hybrid seeds require pesticides and chemical products to ward off disease, while peasant seeds do not.

Hybrid seeds are more susceptible to disease due to their lack of genetic variation (Houloul Team 2023). The seeds are designed to create uniform yields. However, this homogeneity means that disease spreads quickly and easily between crops. In their article “National seed catalog: what alternatives for the recognition of peasant seeds?” researchers from the Houloul knowledge base of public policies in Tunisia mention a specific example of this: in 2020, a previously unknown disease spread throughout pepper nurseries in the Bembla Monastir region, causing “significant losses for around 400 farmers, due to the use of a single variety of

pepper not resistant to this virus” (Houloul Team 2023). One farmer in El Harouri, K, mentioned this problem as well, saying that vegetable diseases have been a challenge for him in the past five years.

The Banque National des Gènes (BNG) plays an essential role in the identification, preservation, and distribution of peasant seeds. I learned more about their role during my visit to their office and laboratory in Tunis. A BNG researcher gave a presentation in which she introduced the history of the BNG and their primary objectives. The BNG has been operating since 2007, making it one of the first gene banks in the world. Their goal is to preserve the genetic biodiversity of Tunisian plants (and animals), in order to ensure food security.

As this researcher said, “there are plenty of seeds which are incapable of resisting lack of water, shortages, also the increase in temperatures, drought...” (BNG 2024). As climate change becomes more pronounced, these seeds which are not drought resistant are at risk of failure, meaning that people who depend on these seeds are at risk of food shortages. Thus, the BNG preserves the genetic information of the peasant varieties “that our grandfathers and our grandmothers cultivated” (BNG 2024). These varieties- mostly barley, wheat, and other cereals- “are capable of producing even with dry conditions” (BNG 2024). After identifying and preserving these seeds, the BNG then distributes them to around 100 different farmers throughout Tunisia. These peasant seed varieties are not only more suitable for the Tunisian climate, but also represent an important aspect of Tunisian heritage.

Economy

The Current Crisis

Tunisia is facing an economic crisis. Even after the 2011 Revolution, which was inspired by economic grievances, the economic situation in Tunisia remains a pressing issue. Tunisia’s

inability to reach a loan deal with the IMF, rising inflation, stagnant GDP growth, and declining foreign investment is leading Tunisia into a “macroeconomic crisis” (Diwan, Alaya, Meddeb 2023). Additionally, the unemployment rate reached 16.4% by the end of 2023 (National Institute of Statistics Tunisia, 2024).

This economic crisis is felt throughout the country, but places a particular strain on the rural regions which already fall behind the urban centers in terms of economic growth and development. The unemployment rate is higher in rural areas of the interior of the country compared to urban coastal areas, and the poverty rate is also higher: 26% in rural areas compared to 6.3% in large urban centers, as of 2022 (African Economic Outlook, 2023).

In addition to this broader economic crisis, farmers are facing the economic challenges associated with climate change and decreasing yields. The annual harvest yield of 2023 was historically low, due to the drought of the past four years. The grain harvest “plummeted to 80 percent below the previous year’s” in 2023 (Diwan, Alaya, Meddeb 2024), resulting in the necessity for increasing imports of cereals to meet food security needs.

With the predictions of decreasing rainfall in the coming years in mind, the outlook for farmers is bleak. Predictions assert that by 2030, the agricultural sector’s contribution to GDP will decline between 5 and 10 percent (Smida Guesmi, 2024). By 2050, “the productivity of wheat and olive trees will decrease by 40 percent and 32 percent respectively” (Smida Guesmi 2024, 10). The agricultural sector’s decline in productivity will contribute to the rise in rural exodus, as farmers are forced to seek off-farm revenue to account for a loss of profits (FAO 2024). This rural exodus will only exacerbate the existing disparities between rural and urban centers, as well as create increased pressure on infrastructure and employment in urban areas.

In El Harouri, I observed the phenomenon of individuals seeking off-farm revenue. Two individuals whom I spoke with lived in El Harouri, and came from families of farmers. However, they traveled to Kelibia daily for work. One woman, L, said that agricultural challenges have led to individuals increasingly looking for employment in the city center of Kelibia. K, an older man who farms cattle, vegetables, and fodder, said that this rural exodus has led to a lack of laborers, which presents additional challenges for farmers. He said that young people especially are leaving the agricultural sector and moving to nearby cities. This aligns with the report from the FAO, which states that young people are most likely to seek off-farm employment in order to diversify their family's income (FAO 2024).

Comparing Economic Benefits and Challenges of Peasant and Hybrid Seeds

I spoke with Marzougui, Chibani, and Korbaa about the economic aspects of hybrid seeds compared to peasant seeds. Chibani spoke of the immediate economic benefits of using hybrid seeds. In the first year, these seeds are economically beneficial, as they result in a higher crop yield. Marzougui explained that this is how the seeds were initially marketed to farmers in the 1980s. Why would a small scale farmer reject the opportunity to use seeds that will produce more wheat for him? And, as Marzougui explained, they were initially given to farmers for free. This was part of the 1986 Agricultural Structural Adjustment Program, introduced by the IMF, which introduced hybrid seeds. After 1986, farmers underwent a wide-scale loss of traditional seeds, traditional practices, and land.

Though these hybrid seeds were marketed as having benefits for food security due to their higher yields, there are economic challenges to the use of these seeds. Necessary input costs for these seeds include the cost of fertilizer, pesticides, and water. And the price of these products is increasing: "In 2021, peasant protests broke out. Among the causes was the price of fully

imported... ammonium-based fertilizers” (Smida Guesmi 2024, 15). In El Harouri, M also mentioned this problem, saying that farmers are required to pay more and more for necessary products. In addition to higher input costs, hybrid seeds must be repurchased annually, as they cannot self-seed. Chibani and Marzougui both mentioned this as being an economic downside to hybrid seeds.

On a macroeconomic level, hybrid seeds create a precarious dynamic of international dependence. Dating back to the French colonial era, Tunisia has been highly dependent upon cereal imports, and highly focused on allocating agricultural land to exportable crops. As Smida Guesmi explains, “20.7 percent of Tunisian agricultural land is allocated to fruit trees... among fruit tree production, 51.9 percent of olive oil and 10.6 percent of dates are exported” (Smida Guesmi 2024, 15). On the other hand, “Tunisia is highly dependent on cereal imports: 93 percent for soft wheat, 67 percent for barley and 40 percent for hard wheat” (Smida Guesmi 2024, 15). After the 1987 Structural Adjustment Plan, seeds, too, began to be imported, in order to increase output. The import of hybrid seeds rapidly changed the landscape of Tunisian agriculture: in the 1970s, peasant seeds represented around 65% of production, while today they represent only 5% (Naser 2022). This dependence on imported seeds leaves farmers susceptible to shortages. The war in Ukraine led to “67% of Tunisian farmers fear[ing] a shortage of seeds in sight of the 2022-2023 season” (Naser 2022).

The use of peasant seeds addresses both macro-level and micro-level economic concerns. On an individual and household level, input costs are much lower. As peasant seeds are more suited to the dry Tunisian climate, they require less water. Korbaa recounted his first hand experience with this. He told me that of his 96 varieties of peasant seeds, and 16 varieties of hybrid seeds, the peasant seeds fare much better than the hybrid seeds when conditions are dry.

While his plots of peasant seed crops are green, the hybrid seed crops are yellow, dry, and dying. He told me that since adopting the use of peasant seeds 5 years ago, farming has become easier for him. His peasant seeds require less fertilizer, less pesticides, and less water. This makes them both lower maintenance as well as less expensive. Additionally, Korbbaa said that the peasant seeds sell for a higher market value than the hybrid seeds. Korbbaa also said that the peasant seeds are ultimately more productive than the hybrid seeds.

Chibani also spoke of economic benefits to peasant seeds. He said that the economic benefits of peasant seeds outweigh the immediate economic benefits of hybrid seeds. This is because farmers may use the peasant seeds for many years, whereas hybrid seeds must be repurchased annually. When considering both the environmental benefits of peasant seeds as well as the economic benefits, Chibani said that “there is no denying that the Tunisian seeds are more beneficial than the imported seeds” (Chibani 2024).

Social Justice

Gender

The third and final element of sustainability which I am considering in this research is social justice. Social justice refers to “justice in terms of the distribution of wealth, opportunities, and privileges within a society” (Oxford Dictionary). The first lens of social justice which I focus on in relation to peasant seeds is the lens of gender. As mentioned previously, women play a significant role in Tunisian agriculture, as they make up 70% of the workforce (Gueddana 2021, Mazhoud 2023). This significant number may be partially explained by the phenomenon of rural exodus, which often leaves women behind.

As noted in the 2024 FAO report, gender expectations result in women holding more domestic duties than men. Additionally, women tend to be less educated, especially rural women

(Gueddana 2021). These factors limit women's ability to seek off-farm revenue or to migrate to cities for employment. During our interview, Chibani mentioned that in more conservative and traditional regions of Tunisia, such as Tatooine in the south of the country, traditional gender expectations require women to stay at home with their families, and to tend to domestic duties. Chibani suggested that these gender norms are more prevalent in more conservative southern areas of the country than the less conservative northern regions.

Peasant Seeds as an Alternative to Migration

If migration is a less accessible adaptation strategy for women than it is for men, this allows us to understand that alternative adaptation strategies, such as the use of peasant seeds, may be particularly beneficial to women. The economic benefits of peasant seeds may result in positive impacts on women farmer's livelihoods. Aymen Amayed argues this in his article "Oued Sbaihia, or the Plot of Resistance." He claims that the women of Oued Sbaihia, a region in the north of the country, have used peasant seeds as a means of resilience for decades. He says that "by cultivating their peasant seeds, farmers were able, unlike other farmers in neighboring regions who cultivate hybrid seeds, to reduce their production costs," allowing them to be "economically resilient" (Amayed 2024, 95). This economic resilience is especially important for women who face "the systemic challenges of migration, lack of infrastructure [and] climate change" (Amayed 2024, 95.).

The implementation of peasant seeds may also result in decreasing women's vulnerability to exploitation. The mostly male rural exodus has left women more vulnerable to employment in inhumane conditions, without access to "decent remuneration, social protection, [or] insurance...exposed daily to the risks of arduous work for the benefit of investors and large landowners who have monopolized the land of the peasantry" (Amayed 2023). A broader

emphasis on using peasant seeds may mitigate this issue. The economic benefits to their cultivation may result in a lower male exodus in the first place, minimizing the “feminization” of agriculture and thus minimizing the exploitative practices in the agricultural sector.

Food Sovereignty

A discussion of peasant seeds would be incomplete without a discussion of food sovereignty. The introduction of hybrid seeds into Tunisia’s agricultural system came at a time when “the notion of “Food Security” was adopted as the global orientation towards food” (Amayed 2023). Food security and food sovereignty, though closely related, refer to distinct orientations towards agricultural production systems. Food security prioritizes food access. However, the development of the idea of food security arose in tandem with the globalization, specialization, and liberalization of the agricultural market. It emphasizes food access while taking into account neither the source of food nor the means of production of that food.

Food *sovereignty* also values food access. However, this notion also takes into consideration production systems, knowledge systems, tradition and heritage, and our relationship with the environment. To quote from the charter of the Observatoire de la Souveraineté Alimentaire et de l’Environnement:

Food sovereignty is the right of people to healthy, culturally appropriate food produced with sustainable methods, and the right of people to define their own agricultural and food systems. It places at the heart of political and food systems the aspirations, needs and livelihoods of those who produce, distribute and consume food, rather than the demands of markets and multinational corporations. Food sovereignty prioritizes production and local food consumption. It develops a model of sustainable peasant production that favors communities and their environment. It also gives countries the

right to protect their producers from low-cost imports and allows them to control their food production. It ensures that the rights to use and manage land, territories, water, seeds, livestock and biodiversity are in the hands of those who produce the food and not under the control of industry agri-food. The implementation of real agrarian reform is one of the main priorities of the peasant movement. (“The OSAE Charter,” OSAE 2024).

In other words, food sovereignty values not only food access but *sustainable* food access: that which is environmentally beneficial, economically beneficial, and socially beneficial.

The use of peasant seeds is intertwined with food sovereignty. It disintegrates Tunisia from the cycle of international seed dependency, allowing farmers to ensure access to seeds at all times, regardless of global supply chain interruptions. Peasant seeds allow farmers to pass on seeds to their children, their neighbors. Peasant seeds re-center farmers in the cycle of agriculture, rather than forcing farmers to function as consumers in the global agricultural market. Finally and importantly, these seeds contain generations of local knowledge: knowledge which has been developed in accordance with Tunisian soil, water, climate, and people.

Sahar Meddeb from the Tunisian Association for Permaculture explained the connection between food sovereignty and peasant seeds. The dependency on foreign countries and foreign producers leads to not only a loss of heritage, but it leads to a loss of knowledge. Meddeb explained that preserving these seeds also involves preserving knowledge, leading to a future in which farmers possess the knowledge, rights, and agency to produce food for themselves and their communities.

Challenges and Recommendations

Legal Challenges

Legal requirements create problems for farmers who wish to use peasant seeds. Law 99-42 of May 10, 1999 requires that all seeds go through a registration process and are “regulated by technical standards which are often favorable to large companies which produce commercial and hybrid seeds” (Houloul Team 2023). These technical standards measure the seed based on distinctiveness, homogeneity, and stability, as well as agronomic, technological, and environmental value (Tunisia Law no 99-42 of May 10 1999). Hybrid seeds are by design more homogenous than peasant seeds, as they are produced with the intention of creating uniform high yield crops (Houloul Team 2023). Thus, hybrid seeds meet these standards while peasant seeds do not. The peasant seeds are therefore prohibited from being registered in the national seed catalog, and seeds that are not in the national seed catalog may not be legally bought, sold, or used.

When I asked Korbbaa if there were any challenges to using peasant seeds, he mentioned only the legal challenges. He receives varieties of peasant seeds from the BNG, and then distributes the seeds to other farmers. However, he has faced challenges with distributing seeds due to his lack of “authorization” from the Ministry of Agriculture. Chibani also cited legal challenges as posing the primary obstacle for the use of peasant seeds. He told me that the use of peasant seeds is unfortunately uncommon, due to the lack of state support and prohibitions on these seeds.

Tiss, the farmer from Tatooine, mentioned this challenge as well. He asserted that using peasant seeds is very difficult because of the state regulations which prohibit the use of the seeds. In order to use and acquire peasant seeds, farmers informally exchange seeds with each other. Tiss hosts informal seed exchanges between farmers at his house, serving as a “*maison des*

semances” for farmers who are interested in exchanging seeds and knowledge. However, this must remain informal, as the seeds do not qualify to be entered into the national seed catalog.

The Tunisian Association for Permaculture hosted seed exchanges for several years, in which farmers could trade or buy peasant seeds. However, legal challenges resulted in the TAP halting these gatherings indefinitely, since Tunisian law maintains that selling seeds that are not in the official catalog is illegal. However, Meddeb said that farmers continue to hold these exchanges, though informally, as Tiss does. This has become possible due to the rising awareness about “their seeds and the importance of multiplying them and preserving them” (Meddeb 2024).

Though awareness about these seeds is increasing, as I heard from Meddeb but also from Tiss and Korbaa, the legal challenges result in these seeds only representing a small percentage of all agricultural production in Tunisia.

Recommendations

For policymakers, the first step in supporting peasant seeds is to revise Law 99-42 of 1999, and to revise the qualifications for seeds to be included in the national seed catalog. The Houloul researchers make this same recommendation. They also suggest that the Ministry of Agriculture create a separate registry for peasant seeds specifically, though still allow this registration to serve as a valid legal basis for the production, purchasing, and selling of these seeds. I reiterate this suggestion. However, I would like to note that the process of patenting seeds in Tunisia dates back only to the 1970s (Houloul 2023). For generations, Tunisian farmers could freely exchange seeds, pass seeds along to family members, children, neighbors, and friends. These exchanges existed beyond the framework of patents, ownership, and legal registration. Returning to this method of free exchange may not be possible. However, it is

possible to return agency to farmers, by inviting them to participate in the seed registration and certification process.

The Tunisian Association for Permaculture, in cooperation with the African Alliance for Food Sovereignty, has created a “farmer-managed seed system” legal proposition (Meddeb 2024). This proposal would introduce “a set of regulations that protect both the farmer and protect the local seeds” (Meddeb 2024), and allow farmers to have the legal right to use these seeds. The TAP submitted this proposal to the President of the Republic and Ministry of Agriculture. The Ministry of Agriculture responded negatively, citing the necessity for registered seeds to be homogenous. The Ministry of Agriculture did say that they are aware of the issue of peasant seeds, and they committed to working with the Gene Bank to work on a potential solution for registering the seeds, including devoting a scientific committee to further research. However, Meddeb reported that she “talked to the Gene Bank and they said that that never happened, that it's probably not going to happen... they talked about it, but nothing happened” (Meddeb 2024). Additionally, the disbanding of Parliament since 2021 has stalled this situation even further.

While the means of change through the government may be a slow and arduous process, individuals, journalists, researchers, and civil society can also play a role in supporting peasant seeds. Chibani asserted that researchers ought to invest more time in researching the benefits of local seeds, as few academic sources exist detailing their importance in Tunisia. He also said that journalists play a role in sharing the stories of small farmers. Storytelling, he said, is important. I agree with this assertion, as one of the initial ways in which I learned about peasant seeds was through the documentary from Habib Ayeb: *Couscous: Seeds of Dignity*. This short documentary beautifully captures the rich knowledge of small farmers in Tunisia, and the ways in which their

traditional seeds carry this knowledge. It also captures the frustrations of farmers who feel neglected by the government as they face environmental, economic, and social challenges. From this documentary, I found OSAE, which Ayeb founded. This documentary represents an example of how storytelling can inspire research and action. Civil society organizations like TAP and OSAE also play an important role in spreading information and in involving citizens involved in the protection of peasant seeds. For example, TAP hosts educational workshops and events for both farmers and non-farmers, such as markets and community harvesting events.

Individuals, too, can support peasant seeds by using their buying power as consumers. TAP hosts weekly markets for farmers who use peasant seeds and permaculture. They also have established a “participatory guarantee system”, in which a consumer can visit a farm, learn about the farmer’s methods, verify his use of local seeds, and build a relationship of trust between the two (Meddeb 2024). By then purchasing the farmer’s products, the consumer can support the farmer’s continued use of peasant seeds.

V. LIMITATIONS

There were several elements which would have made my research stronger that I was unable to achieve due to time constraints and other factors. First, my research would have been made stronger if I had interviewed female farmers who use peasant seeds. As my research argues for the relationship between gender justice and peasant seeds, the fact that I was not able to gather any data from this demographic directly is a limiting factor for this project. I conducted this research project over the course of four weeks. If I had more time, I would have sought out more farmers to speak to, specifically targeting female farmers. I also faced physical limitations with this project. Though I was able to physically visit El Harouri, it would have been ideal to physically visit El Berima farm as well as Korbaa’s farm in Monastir and Tiss’ farm in Tatooine.

However, I did not have access to a car, which makes accessing these areas difficult, especially within a limited timeframe.

VI. CONCLUSION

Farmers will bear the burden of worsening climate change. Already, increasing periods of drought are resulting in farmers needing to dig expensive wells and turn to expensive irrigation systems. This is exacerbated by the high water needs of hybrid seeds. As climate change is expected to bring even higher temperatures and even longer periods of drought, *ex ante* adaptation strategies are necessary to ensure the resilience of rural communities that rely on agriculture.

Migration, though considered by some to be an adaptive strategy to climate change, ultimately is a maladaptive strategy, as I found through my research. Rural exodus results in the abandonment of rural lands and communities and places extra strain on already strained urban centers. Unemployment is already high in Tunisia. More people seeking off-farm revenue only increases this percentage. Additionally, rural women have less access to migration, as gender norms and expectations restrict her to her household. As women are left behind, they are exploited in agriculture work, which has become a 70% female employment sector.

Support of peasant seeds will help revitalize rural regions. Not only do these seeds help mitigate climate change by using less water and not requiring pesticides or fertilizers, but they also hold an economic benefit. Farmers do not need to repurchase these seeds annually, nor purchase pesticides and fertilizers. The higher quality of these peasant seeds also results in a higher market value. Lastly, they are an adaptation strategy equally available to men, women, and small and large farms alike.

My research demonstrate that peasant seeds are sustainable on an environmental level, an economic level, and a socially just level. Though Tunisia has a long way to go before the use of these seeds is ubiquitous, the fact that more farmers are interested in using these seeds is an important step towards preserving local knowledge, cultural heritage, the environment, and food sovereignty as a whole. And just as wheat sprouts from a seed, food sovereignty begins with seed sovereignty.

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