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Spain, Desertification

## **Desert Storm on the Iberian Horizon: Spain's fight for Fertile Ground**

Earth, wind, fire, water. These are the four elements that ancient civilizations believed comprised everything we know. Now, in the age of advanced technology and commercial grocery stores, we are losing sight of how integral these four elements still are. Even though we now know that there are other factors at play in the creation of the world, water and earth continue to remain necessary for sustaining human life, and we are consuming both at an alarming rate. In fact, at the rate the planet is heating right now, scientists believe that around 90% of the land on earth will be degraded by 2050 ([UNESCO](#)). Soil degradation, as defined by the food and agriculture organization of the United Nations, is “a change in soil health status resulting in a diminished capacity of the ecosystem to provide goods and services for its beneficiaries” ([FAO, 2020](#)). In certain parts of the world this issue is compounded by the lack of water, especially regions within 2000 miles of the Sahara desert, as its arid climate spreads due to global climate change. One country that is at the forefront of this water crisis, chiefly as it pertains to the growing lack of humidity in the soil (known as desertification), is Spain.

Spain is a western European country surrounded by an estimate of 8000 kilometers of coastline ([Instituto Geografico Nacional](#)) that includes shores on the Mediterranean sea and Atlantic Ocean. It is located on the Iberian Peninsula, sharing borders with France and Andorra to the east and Portugal on the west. The nation hosts a beautiful and diverse geographical landscape, with a large plateau called the Meseta Central at the interior, and the Pyrenees Mountains painting the eastern border.

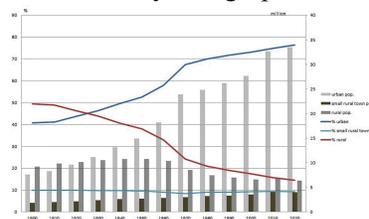
The population is roughly 47.3 million people ([Census, 2025](#)), with 81.3% of the population living in urban areas ([Taylor&Francis](#)) and only 18.7% living rurally. The average size of one farm is roughly 26.4 hectares ([CaixaBank Research, 2023](#)). For reference, this is about 1/18th of the size of an average farm in the United States. The average household size is 2.5 people, with the average amount of kids per family being 2. Extended families often visit or live with the nuclear family as well. The mother usually stays home with the kids while the father goes to work. In 2024, Spain's labor force was predominantly employed in the service sector, accounting for 71.52% of workers, while 15.62% worked in industry, 6.57% in construction, and 6.3% in agriculture. The average salary across all sectors was €26,950 ([OECD, 2024](#)).

The average diet in Spain consists of mainly plant-based foods, with a source of protein (like chicken, ham, etc.) at lunch and dinner. Healthy, local unsaturated fats such as olive oil are staples of the Spanish home, often used for cooking as a substitute for butter. Also, there exists a daily tradition called “tapas”, in which Spaniards enjoy a midday snack (often some type of bread, vegetable, and cheese combo) at around 3-4pm. The infamous, vibrant Spanish nightlife offers additional opportunity for food consumption, with meals lasting for many hours late into the night. Beyond just sustenance, in Spain food is used as a means to connect with family, friends, neighbors, and community members. Food is the life-blood of Spanish culture, and therefore it is imperative that the land that creates it stay healthy and abundant.

With the accelerated lack of access to water in Southern Europe and Eastern Africa, the people of Spain have been hit with a gradually increasing food insecurity problem. In fact, nation-wide surveys state that about 19.2% of Spanish adolescents experienced household food insecurity in 2022 ([ScienceDirect](#)). As a result, the national populace has been experiencing a severe water shortage that

has caused drought and dry soil, impacting the production of the country's largest national agricultural exports, barley, wheat, grapes, and olives (CIA), and skyrocketing the average price of drinking water (EEA, 2012). Local farmers have been struggling to maintain necessary crop yields, leading to an increase in international imports to meet domestic demand. The amalgamation of rising costs and declining agricultural productivity has emphasized financial stress on low-income households, exacerbating the growing nutritional instability.

About 75% of agricultural land in Spain is susceptible to desertification, and 25% is classified as degraded (News.cn). This statistic is one of many effects of times changing (?) that are absolutely devastating for the rural population, which is made up of about 8,699,600 people. Even though they are small in numbers, this rural minority cultivates roughly 54.1% of all land in Spain (CIA), and therefore is vital in the maintenance and upkeep of viable and healthy soil. However, the protection and restoration of rural agricultural land is facing one huge problem: depopulation of rural communities. As Spain expands as an industrial and tourism based country, the agricultural sector is being absolutely desecrated. In 1900 nearly 60% of Spain's total population lived in rural areas (Taylor&Francis). Since then, that number has dropped by a little over a third, as demonstrated by this graph:



This lack of human stewardship has had a detrimental effect on the already arid of the soil. As people continue to move out of rural townships, land and resources become abandoned, leading to an incremental increase in the desertification of the land.

As the percentage of degraded land in Spain grows, it becomes clear that this multifaceted issue cannot be solved by just one solution. There have been many ideas set forth by the United Nations and other entities on how to increase water supply and prevent climate based soil degradation, such as the desalination of salt water, reforestation, and the reintroduction of native ecosystems to degraded agricultural lands. While these solutions are viable in the short term, individually they fail to recognize the necessity for a holistic solution that addresses all sides of the matter. These sides include the necessity for increased production/importation of water, the maintenance and restoration of soil humidity, the need for an increase in rural population to maintain the land, and the need to use water efficiently.

### I. Production/Importation of Potable Water

As Spain faces increasing water scarcity, ensuring a dependable water supply that meets the country's demands has become an imperious issue. One of the most promising solutions for Spain's growing lack of access to water is the desalination of seawater. Spanish mechanics are at the forefront of this emerging technology, with over 900 desalination plants producing millions of cubic meters of potable water annually (Kemira, 2024). However, desalination is both costly and energy-consuming, and therefore is not a viable solution in the long run unless completely powered by renewable energy sources (seeing as climate change caused by fossil fuel burning only compounds the effects of desertification). Another option for meeting the water demands of Spain's general populace is the importation of water from countries with an abundance of it, like France, who is the largest exporter of potable water in the world (OEC, 2023). This method could prove effective if Spain were to reach a financially sustainable deal with these countries, and determine a plausible, efficient logistical plan to import those products. For example, France is a great choice for water importation because of the border that it shares with Spain, so most of

the importation would likely be done via truck or train. Conveniently, as of 2023 initiatives have been implemented to increase industrial railways in between France and Spain, resulting in the connection of the Port of Barcelona with the cities of Lyon and Toulouse ([AJOT, 2023](#)). This project has been paid for by investments from the European Investment Bank, who has invested 13.5 billion euros in high speed railways throughout Spain to date ([EIB, 2025](#)). However, this investment alone does not completely solve the water transportation issue, but instead it is clear that there must be an additional source of funding and infrastructure. One solution that could tackle both this dilemma and the current unemployment rate of 10.61% ([Moya, 2024](#)) in Spain is subsidies and incentives for businesses to invest in the railroad industry and/or create more railroad companies that transport water to rural communities. This proposal will not only assure that potable water is guaranteed to every Spaniard, but will also create countless jobs that would expand the economy, employing lasting effects on Spain's agriculture and industrial sectors.

## II. Maintenance and Restoration of Desertified Soil

The degradation of Spanish soils due to overcultivation, deforestation, and prolonged droughts has exacerbated desertification. Efforts to restore soil health must prioritize increasing soil organic matter and improving land management techniques. Intercropping utilizing compatible plant species such as wheat and turnips, or corn and legumes, has proven to be an effective method to combat soil erosion and restore soil fertility, although uncommon in most regions of Spain ([Vilmanya, 1987](#)). One successful example of this technique can be found in the southern tip of Spain, which coincidentally exhibits some of the most at risk soil for degradation in the country. After taking over his family's farm in 2012, a Spanish farmer named Alfonso Chico de Guzman quickly realized the detrimental effects that the chaotic weather patterns and arid climate had on his family's monoculture. Because of this, he decided to expand his farms' production from just a single species to many. Chico de Guzman utilized cohabitating crops such as pistachio trees and almond trees (that grow taller), and short grains and cereals (that grow close to the ground) to maximize his crop production efficiency while helping the soil maintain its humidity and composition. Additionally, many farms in Spain rely heavily on rainwater, including that of Chico de Guzman. Instead of letting the water run off and go to waste, the farmer replicated an ancient technique, carving swales in the slopes of his land, and creating sediment traps that catch nutrient-rich topsoil ([Bolongaro, 2019](#)). Not only do these antiquated methods maintain the humidity level of the soil, but they also protect the invaluable integrity of the topsoil, helping fight both the Spanish water shortage and soil degradation. These strategies, if implemented throughout Spanish agriculture by both large-scale and smaller farming operations will make a large difference in the fight for moist, fertile ground.

## III. Government Programs and Subsidies

Government intervention plays a pivotal role in combating desertification and ensuring sustainable land use. Spain has implemented several policies aimed at supporting farmers affected by soil degradation, including subsidies for water-efficient irrigation systems (such as drip/localized irrigation) and incentives for sustainable farming practices ([CaixaBank Research, 2023](#)). However, these programs often fail to reach the most vulnerable rural populations, who lack access to essential resources and infrastructure ([Maqueda, 2021](#)). Strengthening these initiatives by expanding education programs on sustainable land management, and promoting community-led conservation efforts can enhance their effectiveness. For example, if the Spanish government were to implement quotas and provide a small amount of funding for extracurricular options in the agricultural sector for public schools, taking inspiration from the 4H program in the American school system, they could significantly increase environmental awareness in youth while ensuring the future of Spanish farming. Moreover, it would be both fast and effective for the Spanish Ministry of Agriculture, Fisheries and Food (MAPA) to create a broad database for technologically accessible farmers to utilize that depicts a variety of ways that they can combat the desertification of their lands. This information would include intercropping techniques (compatible plants, instructions on how to start, etc.), where and how to apply for government support, data on water-efficient

irrigation strategies, instruction on how to construct sediment traps, and any other knowledge that would encourage more efficient use of land and water. Additionally, Spain's participation in European Union environmental initiatives, such as the Common Agricultural Policy (CAP), provides additional financial support to combat desertification ([European Court of Auditors, 2020](#)). This funding can be used to support the new educational programs (extracurricular option and website). Effective governance and innovative educational programs are essential to helping the individual farmer address the multifaceted challenges of soil degradation and water scarcity; after all, Spain's fight for fertile ground is not one that can be won by a single entity, but instead will be conquered as a result of each person doing their part to help.

#### IV. Efficient Use of Water

With increasing demand and currently limited supply, efficient water use is paramount in Spain's strategy to combat desertification. Agriculture accounts for over 60% of Spain's total water consumption, making irrigation efficiency a key area for improvement ([CIA, 2024](#)). Spain is off to a great start, however, with drip/localized irrigation accounting for over half of the total irrigation use ([Trenda, 2020](#)). These types of systems deliver water directly to plant roots which reduces evaporation losses, and therefore have proven successful in conserving water while maintaining crop yields ([European Observatory on Health Systems and Policies, 2024](#)). Aside from their benefits, localized irrigation can be expensive, and many rural farmers do not have the resources to implement and upkeep these apparatuses. Pricing reforms that subsidize drip irrigation equipment and market ceilings that limit the price that companies can sell the equipment for would greatly increase the use of this hydration technique and thereby benefit the efficiency of water use in Spain. Lastly, public awareness campaigns should be implemented to encourage conservation efforts at both the household and industrial levels ([European Environment Agency, 2012](#)). Expanding wastewater reuse programs and investing in smart water management infrastructure, such as water efficient appliances and rain water catchers on buildings, will further contribute to Spain's long-term water sustainability. A combination of technological innovation, policy reform, and public engagement is essential to ensuring the efficient and equitable use of water resources in the face of worsening climate challenges.

Although many questions remain unanswered in the face of worsening climate change and overall global pollution, one thing is certain: a multifaceted and wholesome approach to desertification is necessary to ensure the agricultural future of Spain. By implementing an increased importation of water, the use of intercropping and ancient soil-saving techniques, more efficient agricultural education for youth and farmers, and , Spain can actively curve its water use, protect and restore its soil quality, and inspire the next generation of farmers, ensuring that the both of its' life sustaining elements, water and earth, remain protected.

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