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Hydroponics In Switzerland: A New Era of Farming

Location and Demographics

Switzerland is in the middle of the European continent. It is landlocked, having no ocean access. It is home to approximately 9 million people. The country has a very centralized society, with over 86% of the population living in urban areas and only 14% living in rural areas (U.S. Census Bureau). It also has a unique political system; the nation operates under a system of direct democracy where citizens get to vote on specific national and local issues, while working with a Federal Council that gets elected by the people to act almost like governors in the US (Federal Dept. of Foreign Affairs FDFA, "Political System").

Family

The Swiss do not have large households. The average Swiss household has 2.18 people, which is consistent with other highly developed European nations (Federal Statistical Office, "Households"). The workforce is typically employed in skilled fields such as healthcare, information technology, and construction and infrastructure (Osam Formations). These jobs are relatively well-paying, and the average yearly wage is $87,468.24 USD. The Swiss job market and labor force are among the best paid anywhere in the world (Trading Economics).

Daily Life

The daily life of the ordinary Swiss people is very reliant on their infrastructure. The country has a highly developed and available power grid, and 96.7% of the country has access to safe and clean drinking water (CEIC). There is a lot of internet use, and roughly 96% of the entire population has access to it (Wikipedia contributors, "Telecommunications"). The physical aspects of the infrastructure are also very highly developed, and the road quality is rated at a 6.3 out of 7, which allows easy access and transport even in the mountains and Alps (The Global Economy). Another highly revered part of Swiss life is how well developed and well thought out the education system is. There are eleven required school years, and afterwards, the students are funneled into either a “specialized vocational training,” which would be like a tech school in America, and prepares them for a trade. The other path is to take "Gymnasium", which prepares for further education after high school. Both of them can lead to university and college; however, the first is meant more to put people into the workforce as quickly as possible. Education is free for virtually all students and residents in Switzerland (SWI swissinfo.ch, "Education"). As opposed to education, healthcare is very private, and there are individualized private health care companies that require insurance payments. It is required for everyone to have insurance, and so a large part of their paycheck will go towards it (Allianz Care).

The daily diet of the Swiss is a conglomerated and combined cuisine from the neighboring countries. It is very highly influenced by the Germans and French, but there is also some Italian influence. The diet is made up of simple, dense foods that originally were supposed to fuel the farmers of old and needed to grow in the harsh conditions. Common cuisines include potatoes, cheeses, and bratwurst (sausages). Some famous national dishes are: cheese fondue (melted cheese), raclette (melted cheese scraped on top of potatoes and vegetables), älplermagronen (a sort of hot casserole made of potatoes, noodles, and cheese), and rösti (a potato cake) (MySwitzerland). The modern dietary guideline recommends a

balanced approach of 1-2 liters of water, five servings of fruits and vegetables, three portions of wholegrains, and two to three portions of dairy, every day (Nourishing Traditions). The majority of food is bought from local supermarkets; however, many rural and urban families get food for their diets from small personal or community gardens. The gardens aren't large enough to produce enough crop yield to skip a trip to the store.

Geography

Looking at the country from above shows just how intense the elevation changes can be. Mountains cover more than half of Switzerland's total land, although only one quarter of the population actually lives there. The Jura mountain range in the northwest is mostly unpopulated, and traditional agricultural lands cover a lot of this range. Another area- the Central Plateau- makes up only one-quarter of the country's total area but contains the largest concentration of urbanization and houses the majority of the population in Switzerland (Federal Dept. of Foreign Affairs FDFA, "Geography").

Because of the mountainous terrain, and having the flatter terrain inhabited by people, agriculture faces some harsh limitations. Only 36% of the land in the country is actually arable and suitable for growing crops (Federal Statistical Office, "Agricultural Areas"). Another key point is that farm size is pretty small at an average of just 21.5 hectares, which is about 52 acres (Zimmerman). This is very different from places like the United States; in places like Minnesota, the average farm is hundreds of acres and has massive machinery used to harvest these giant fields. In addition, there is more arable land due to how much less of the total land is mountainous (Winter). Swiss farms are relatively limited and have to grow more hearty traditional crops such as wheat, barley, rye, oats, potatoes, sugar beet, and corn (Fooby).

Climate & Solutions

Switzerland is experiencing real impacts of climate change. Changing weather is forcing some farmers to adapt to the new climate. For example, warmer temperatures have led Swiss farmers to experiment with growing crops like sushi rice instead of relying solely on traditional crops like potatoes (SWI swissinfo.ch, "Sushi Rice"). The country does not need agricultural exports to support itself economically because it makes the majority of its money from selling high-quality goods like jewelry and precious metals. Over time, some of these things may lose their value, so being agriculturally sustainable is incredibly important (Workman).

The main issue with the Swiss food system is how reliant they are on imports for food, and how impactful the carbon footprint is. At first, Switzerland appears to be very food secure. Their overall food insecurity is very low, and around only two to three percent of the population is experiencing moderate to severe food insecurity (World Bank). The nation faces a huge issue, though- the unsustainable food system. Currently, Switzerland produces only half of all the food it requires to feed its people, and it can not grow nearly enough vegetables to meet the demands of the people (SWI swissinfo.ch, "Fact Check"). Because the country is so mountainous, and the other nations nearby have much flatter terrain which gives them more arable land, it is more economical for Switzerland to simply purchase its food from nearby nations and import it (NationMaster).

This lack of in-country food production has harsh environmental consequences. A surprising 80% of Switzerland's whole carbon footprint comes simply from imports, and it comes from the constant imports of food and ag products (SWI swissinfo.ch, "Why Switzerland's Carbon Footprint"). Just because Switzerland is beautiful and appears environmentally friendly does not mean it actually is.

A vast difference exists in who can afford fresh, local food in Switzerland. Even though 90% of citizens say they want to buy Swiss-grown food products to support local farmers, there simply is not enough of it to go around. Because of these supply issues, it makes local food much harder to get and more expensive. Although rural populations live closer to the farms, urban communities- such as single parents and resident foreigners- often are already below the poverty line and struggle with the high price of these local foods. High living expenses and mandatory health insurance mean these families are forced to buy cheaper imported goods instead of the organic local options (Wikipedia contributors, "Poverty in Switzerland"; IamExpat).

To fix this reliance on imports and in order to make the most of the nation's arable land, Switzerland needs a new approach. Moving from ag subsidies toward new, and more efficient methods like large-scale hydroponics and aquaponics is the obvious step. The goal is to cut food imports by 30% within five years. Achieving this would significantly lower the 80% of the nation’s carbon footprint that comes from the current agricultural trade (SWI swissinfo.ch, "Why Switzerland's Carbon Footprint").

Hydroponics

Hydroponics are a method of growing plants without soil, instead using nutrient-saturated water to deliver minerals directly to the roots. In these systems, plants are often supported by a material such as perlite, clay pebbles, or rockwool, which allows the roots to stay hydrated while keeping oxygen levels high. By removing the need for tilling and large plots of land, hydroponics allows for vertical stacking and year-round production in climate-controlled environments like greenhouses. This process is significantly more efficient than soil-based farming because it utilizes closed-loop water systems to prevent evaporation as well as runoff, resulting in up to 90% less water consumption while producing much higher crop yields in a fraction of the space (Hoosier Hills Food Bank).

The use of these ag systems should focus on a recycling and compost-style model by using things that already exist inside Swiss infrastructure. For example, the heat generated from industrial plants can be funneled into the greenhouses, which would lower the energy required for hydroponic production. Since 86% of the population lives in urban areas, placing these facilities near large cities like Zurich or Basel would take almost all of the need for transport and reduce the carbon footprint from delivery (Federal Dept. of Foreign Affairs FDFA, "Geography"). Another important step would be to make local and household-sized aquaponics systems. This would allow people to get greens right in their own homes and skip a trip to the store, which would save gas. Another recommendation is to utilize vertical farming for certain produce like greens, tomatoes, and berries. This maximizes the yield even in small spaces. They could be put in place of the small community gardens in places (CEIC).

Indoor farming also protects the environment. Hydroponic systems use 90% less water than soil farming and stop chemicals from leaking into the Swiss lakes (Rufí-Salís et al.). By using aquaponics as well- where fish fertilize the plants from their waste- farmers can produce both protein and vegetables in the same small space (by eating the fish!). This setup keeps food production steady even as the climate shifts (SWI swissinfo.ch, "Sushi Rice"). Ultimately, increasing the native supply will lower prices, making fresh, healthy food accessible to Swiss citizens while building a clean-earth future.

Funding

The funding for making this transition and upgrade is already in the budget. Switzerland spends $3 billion annually on agriculture for 9 million people (Federal Dept. of Finance). For some context, Germany

spends $6 billion but supports a much larger population of 83 million (European Parliament). The issue is not a lack of funding, but how inefficiently it is being spent. These funds should be reallocated towards modern and highly efficient solutions that can work anywhere, such as hydroponics, and would be a far more effective use of Swiss money than the outdated traditional farming methods.

Support

Because of the way Switzerland uses a direct democracy, this change would require a lot of support from the local cantons and communities. Cantonal leaders must show the voters that food sovereignty and freedom are a matter of national security and economic gain- but also a way to protect the environment. Switzerland already is very good at logistics and finance, so infrastructure for these systems is not far-fetched. There will be hurdles, such as convincing traditional farmers to work inside of glass greenhouses rather than in the traditional open fields. However, other nations have already proven this works. The "Friðheimar" farm in Iceland uses geothermal power to grow large amounts of produce even in freezing temperatures and poor soil, proving that the aquaponics and hydroponics systems are viable and the geographical location is not a limit.

Conclusion

Switzerland is in a good position to make this project a reality. To get the hydroponics systems running, the country will need to come together as one and bring light to this issue. If Switzerland can prove the viability of hydroponics, other countries will follow. Let’s protect our earth- together.

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