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Chile, Sustainable Agriculture

Amaranth to the Rescue for Chile's Drought

Drought has plagued Chile for more than a decade. Droughts can be the main reason for wildfires, strained water supplies, and parched crops. In recent years, Chile has been hit with some intense droughts. With climate change worsening yearly, when will the next big drought be in Chile? Droughts have also been affecting farmers. It's hard to keep your plants alive with little water. Can amaranth help Chile make it through its next big drought?

Chile has a diverse geography, with a desert and mountains in the same country. The north has the Atacama Desert, one of the aridest deserts in the world (World Food Bank). In central Chile, they have the Central Valley, where most of Chile's population lives (Britannica). The southern part of central Chile is described as a forest and lake region. Chile is known for its Andean mountains. With such a diverse geography, it's expected to have different climates. Central Chile has a Mediterranean climate, where summers are hot and winters are humid. The southern regions have a high frequency of rainfall, throughout the year. The north of Chile has an arid desert climate with dry conditions (WorldData).

Chile has a population of around 20 million people. 88% of the population lives in urban areas (Global Economy), and 12% is rural (World Bank). Chile's leadership is presidential, and its government is a unitary state and a democratic republic. The average farm size in Chile is 50 hectares (Young Farmers). In 2021, it was reported that 14.25% of the land is currently cultivated (global economy). Some major crops are grapes, apples, potatoes, wheat, and corn (Crop Trust). Their exports are copper ore, fish, and iron. (OEC).

A typical family has 3 to 4 people in a household. The type of house will depend on the area you live in. In small towns and rural locations, people are likelier to own homes or cabins, whereas city dwellers are more inclined to rent apartments (Expat Arrivals). The Chilean diet includes a lot of meat, fruit, vegetables, rice, and potatoes (GoWay). To cook food, they use hot stones, earth ovens, and meat curing (International Living). They get their food from supermarkets. The most popular jobs are agriculture and mining. Their yearly wage for mining is 12,618,064 CLP, or 13122.79 USD; for agriculture, it is 5,615.939 CLP, or 5.84 USD (Economic Research) (Salary Expert).

Chile provides free or subsidized health care to individuals who cannot afford private health insurance (Global Health). The educational pathways in Chile are eight years of free basic education, four years of elective secondary school, and an additional number of years of flexible higher education (Britannica). Chile does have access to water; in 2020, the availability was 98.77% (Macrotrends). Additionally, they have access to markets, restrooms, electricity, and phones, which are widespread in Chile. In 2021, some families were struggling with online schooling. In rural areas, 60% of people needed access to the internet (Assembly) (Country and Family).

Chile's drought and climate change seem to be getting worse. In February 2024, there were days of extreme heat, going up to 95–100 degrees Fahrenheit (CPD). Following these extreme heat days, deadly fires occurred. At the peak of the fire outbreak, there were 165 active fires, and 14,000 houses were destroyed or damaged (CTIF). It's unclear how the fire started, but climate change seems to be part of it with how hot it was. The low humidity and high wind speeds make it hard to control the wildfires and can also help a fire spread. Chile has recently experienced periods of severe drought. Because of the extreme

drought in 2018, Laguna de Aculeo, a well-liked fishing spot in Chile, completely dried up (Climate News Inside).

For a decade, central Chile has been experiencing a lack of rain, which has gotten pretty extreme, with just 10% to 20% of the rainfall (Earth Observatory). Due to low reservoirs and stressed water supply systems, 2019 was a challenging year for farmers. Tens of thousands of farm animals died, and many more were in danger. Tanker trucks provided water to people in rural areas (Earth Observatory) (Bartlett, John). In urban areas with droughts, vegetation, and higher temperatures were lost. Climate change made the area more susceptible to flooding; in 2017, just five millimeters of rain caused landslides and flooding.

In February 2023, a deadly wildfire occurred in Chile because of the drought. People were killed, injured, and left homeless as the wildfire spread across central and southern Chile. The raging fire destroyed a forest spanning over 889,000 acres (Disasterscharter). Farmers lost crops, which led to food shortages for their livestock. The same wildfire in 2023 affected 6,993 small and subsistence farmers (Relief Web).

There are many reasons for droughts in Chile; one of the main reasons is climate change. Scientists believe that human-induced climate change is to blame for some of the climate change on Earth. It is also because of the drought that, on average, they get 72 mm to 90 mm per month between May and August (World Bank Climate).

There has been a correlation between droughts and Indigenous women's economic well-being. After a study by the IDB, they discovered that Indigenous women are most affected by droughts. They found it has been lowering their income, raising the possibility that they will work as unpaid family workers, and decreasing their likelihood of working in agriculture (IDB). In 2021, more than half of Chile's population will reside in regions impacted by water scarcity (IGWA).

Nonetheless, Chilean water companies are working to help with the water shortage. They intend to make investments totaling more than \$400 million. Sixty percent of the funds will go toward developing the infrastructure needed to supply the population with clean drinking water in 2024. They have also been investing in measures to combat climate change since all water reservoirs were nearly gone due to the drought.

The amaranth could be the future of agriculture and help other countries besides Chile. The amaranth could help people in countries struggling with malnutrition and droughts. Amaranth is a great plant; you can eat all of it; it has many benefits for humans, such as being high in protein; and it can be sustainable. There are a lot of treats you can bake with amaranth: popcorn, cookies, muffins, and more. The amaranth would go great in Chile's cultural diet since it is considered a vegetable, and it could be implemented into recipes or a diet very easily. Various dishes, including rice, muffins, pancakes, chili, stews, and soups, use cooked amaranth.

You can also feed cooked amaranth to your monogastric livestock, such as dogs, chickens, horses, rabbits, pigs, cats, goats, and sheep. Amaranth has been shown to improve the performance and health of monogastric animals (NIH). If amaranth is heat-treated before feeding, it can be utilized as a feed component for chickens. According to the UK Department of Animal and Food Science, studies have indicated that chicken diets can completely substitute meat-and-bone meals with heat-processed amaranth grain.

With Chile's very diverse geography, this could help farmers who don't have the ideal soil and still make money because of the amaranth. Moreover, the amaranth plant can tolerate a wide range of geographical elevations. It can grow in temperate climates without much cold, but it prefers hot, tropical weather.

Amaranth is very tolerant of unfavorable soils with high salt or alkalinity levels (ScienceDirect). Due to its exceptional resistance to drought, amaranth is a valuable crop during periods of uncertain climate change and water scarcity.

Little grains of the amaranth crop can cover a large area with a small amount of the plant. It is also very easy to grow. Small farmers would find it affordable (fact).

Amaranth is low in saturated fats and high in protein, fiber, vitamins, and all nine essential amino acids, and the whole plant is edible from the seeds to the leaves (Food Unfolded). The pharmaceutical industry also uses the plant to make drugs that treat a variety of illnesses, including stomach ulcers, atherosclerosis, and tuberculosis. Additionally, it supports collagen maintenance, blood vessel formation, muscle tissue repair, and iron processing. (NIH).

This could make it sustainable for future generations. It can help with malnutrition and food security in struggling countries, making this plant sustainable. Amaranth can aid in severe droughts or other situations since it is suited to harsh environments. Additionally, it assists areas with unfavorable soils high in salt or alkalinity. It is inexpensive, meaning most farmers would have it available to people.

Amaranth could be part of the solution to help farmers during the drought. For my solution, we plan to establish a non-profit organization., and we will spread awareness of amaranth since it can help farmers during hard droughts. Next, we will get funding from the Chilean government through subsidies by contacting them, completing a subsidy request, and educating the government. Then we can encourage small farmers in Chile to plant amaranth by educating them about the plant. Next, begin distributing recipes and educating consumers about the benefits of consuming them in popular markets and stores. With this solution, there would still be human rights issues, but it could help farmers.

A program in Oaxaca, Mexico, aims to increase food and address health issues in rural communities by utilizing amaranth. They are collaborating with 250 small farmers, entrepreneurs, and community advocates. They are combating obesity and malnutrition by building new markets for amaranth. They collaborate with chefs to develop inventive uses and new, healthy recipes (Fact).

Our non-profit organization will lead this project, which will specialize in spreading awareness of the amaranth plant in Chile. The Chilean government would help us fund our organizations with a subsidy funding solution that will help farmers during the next hard drought. If this works, we could implement this plant in other countries experiencing hard droughts. We would get stores to start selling the plant and give them recipes like vegetable soup with cooked amaranth.

For a decade, Chile has been struggling with drought. The amaranth can help farmers during the next big drought and in many other poorer countries that struggle with malnutrition and droughts. This may not solve all of their problems, but it will fix a big issue for farmers.

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