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Climate change and Water Scarcity in the community of Chao, La Libertad, Perú.
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The impact of climate volatility in Chao's agriculture.

I. Introduction

Peru is one of the most biodiverse countries in the world; it has a population of approximately 34.9 million people. According to Worldometer around 80.6% of the population lives in urban areas while 19-24% lives in rural communities. (*Peru Population (2026) - Worldometer*, n.d.)

Worldwide, Peru still faces significant food insecurity especially in these rural agricultural regions. Food insecurity affects lots of growers due to significant situations like poverty, climate volatility, and unequal distribution and access to resources and infrastructure that provides them nutritious food.

Peru maintains a democratic republic with a presidential system. The government works hand in hand with regional and local administrations in order to manage public services and needs of the country. Around 17 to 19% of the population's land is used for agriculture and farmland. Their major crops and exports are based on avocado, corn, asparagus, passionfruit, berries and cacao, among others.

Chao is located on the northwest coast of the country in front of the Pacific. The weather is known to be warm, dry and desertic. In the following images we can find both a geographic map of Peru's regional split and Chao's one.



Figure 1. District of Chao map - Scribd-Jemeco Mejía
Figure 2. Map of Perú Peru. Encyclopedia Britannica, Inc 1998

II. Background : Families in Chao

A typical family in Chao consists approximately of four to five members living in an independent household. The graphic below shows Chao's Registered Population and the proportion of age groups and kinship categories. Parents often work in agriculture and agroindustry (field labor, packing, drivers, etc.) plus logistics and service/commerce, while children attend local schools.

Province, district, Kinship with Head of household	Total	Age groups					
		< 1 year	1-14 years old	15-29 years old	30-44 years old	45-64 years old	>65 years
CHAO DISTRICT	**30,418**	**717**	**9,853**	**8,237**	**6,479**	**3,846**	**1,266**
Head of Household	8,341		13	1,880	3,341	2,376	731
Partner	4,609		5	1,396	1,931	1,039	238
Son/Daughter	12,897	538	8,208	3,456	605	88	2
Brother/Sister in Law	429		2	264	130	13	
Grandson	1,499	139	1,161	189	10		
Father/Mother in Law	418		48		18	163	237
Brother/Sister	516	1	416	304	121	35	7
Other Relatives	1,709	39		748	323	132	51

Figure 3. Chao 's Registered Population in residential Households, by age groups and kinship category (Instituto Nacional de Estadistica e Informatica, La Libertad. October 18th, 2018.)

In terms of labor, wages and range depend on the job itself: Local drivers and operators reportedly appear to have salaries that round the $1,600 - $1,800 / month *soles peruanos* equivalent to $475-$535 USD a month. According to labor reports in Peru, agricultural workers often earn lower wages than workers in urban areas.

The typical family in Chao likely eats a diet centered on rice, potatoes, corn, bread, eggs. chicken, fish and other vegetables with food availability shaped by the economy and the irrigation of the valley and the counties. Most families find themselves disrupted with issues like water shortage and floods, extreme weather events in general that affect the availability of food.

All the food in Chao is commonly purchased in local markets and small shops accompanied by vegetables given by agricultural production in some households. Cooking is typically done at home using standard methods such as boiling, frying, stewing and grilling. (Fraser, 2025)

In terms of education, Peruvian families have access to public education which is supported by programs with social responsibility, driven by agroexport communities like Hortifort and organizations such as Enseña Perú. In communities like Chao, schools and health care centers manage to exist. Nevertheless, many families face limitations related to transportation and insufficient public funding.

III. Challenge and Impact

Climate volatility can worsen these inequalities because environmental disasters tend to damage infrastructure and buildings that belong to these school organizations and create pressure on both

health care services and education. (*Article: Más De 1.360 Estudiantes De Chao Fortalecieron Sus Habilidades Académicas Gracias a Hortifrut Y Enseña Perú, January 24th, 2024. Agraria.Pe.)*



In regards to infrastructure and services, people in Chao have access to basic services such as electricity, roads, local markets and communication services. However, access to clean water remains one of the region's most important challenges, because agriculture consumes a lot of water in an arid environment itself. This situation worsens during periods of drought and periods linked to climate change and El Niño and La Niña Phenomenon, so rural households may experience water shortages and inconsistent sanitation services. (*Clean Water and Sanitation for Peru's Coastal Cities*, 2026)

Moreover, additional factors affect inhabitants in the rural side of Peru, including meteorological events, economic instability (inflation), seasonal agricultural work and food prices, whether the household is stable or not, these aspects depend on day labor and how much food and services a family can afford. (Prezi, *Access to education and health in Peru and the United States,* n.d.)

In Chao, the current El Niño and La Niña phenomena is best described as a matter of high risk coastal climate monitoring. SENAMHI has issued an "El Niño Coast Alert" as of May 1st, 2026 and recent reports indicate an El Niña Alert could be shown soon.

For Chao this topic is severe because even a little coastal warming or cooling can change the rainfall and the crop water demand among other issues that affect agricultural work life.

This trend is not only affecting or improving the land of Chao; it is more of a volatility risk trend that has short shifts between El Niño and La Niña conditions. An example of this trend is shown in the graphs below which exemplify the volatility in the period between February and January.

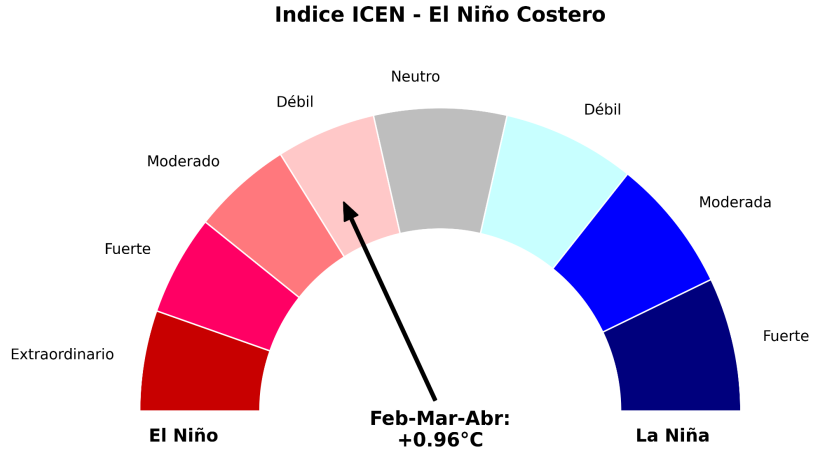

Figure Num 3. ICEN Index - El Niño Costero - *SENAMHI - Fenomeno El Nino*, n.d.

For the rest of the year, it can be seen that La Niña and El Niño could bring drier conditions to the north coast while increasing rainfall in the sierra (see Figure 4 below), so the outlook for Chao is continued stress on water availability rather than a survival to this risk. (*SENAMHI - Fenomeno El Nino*, n.d.)

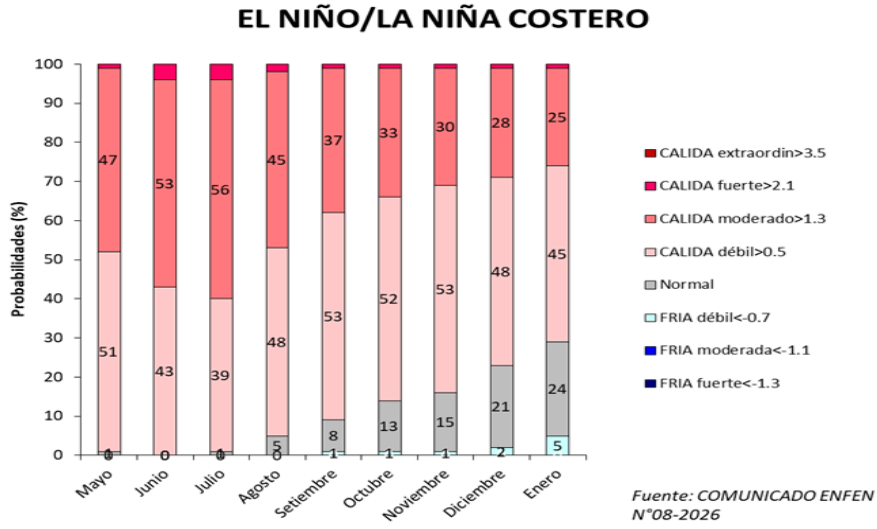

Figure 4. El Niño / La Niña Costero May-December) (*SENAMHI - Fenomeno El Nino*, n.d.)

The main drivers behind this are sea temperature anomalies in the Pacific, especially in the coastal Niño zone and the Central Pacific. In Chao, impacts are amplified by dependence on irrigation so even small climatic changes matter when water storage agricultural systems are compromised. (*Impactos De El Niño De Intensidad Fuerte a Extraordinaria*, n.d.)

Rural populations are usually affected by farming complications such as irrigation problems and crop maintenance while this phenomenon is in progress. Urban households on the other side are not that exposed through crops, but they can still face higher food prices, difficulties in preserving animal life, drainage problems and health risks when extreme weather occurs.

Children, elders, pregnant women and people with chronic illnesses are often more vulnerable because drastic climate changes can reduce the quality of food, the water security and the access to healthcare. Seasonal and informal workers are also exposed because their incomes fall when logistics and agriculture work are jeopardized. (*¡Es Niño!: Impacto Económico En La Región Andina | Publicaciones*, n.d.)

In Peru, climate adaptation has often included irrigation modernization, canal improvements and water storage innovations. These solutions help reduce the losses climate change gives but their performance fully depends on the maintenance of the equipment, training or if small farmers can afford the equipment long term. (*Mitigación Del Impacto Del Cambio Climático En El Recurso Hídrico De La Sierra Peruana Con Acciones Técnicas De Siembra Y Cosecha De Agua*, n.d.)

Nevertheless, Peru counts with a lot of strengths following this issue:

- A strong agricultural sector in the Coast Valley.
- A lot of experience in agriculture, irrigation infrastructure and exports. (*Agricultural Investment and Productivity Un Developing Countries*, n.d.).
- Initiatives in proposing organizations that supply projects around irrigation. (*ChavimoChic Irrigation Project - Peru*, n.d.)

Countries near Peru tend to have the same climate issues, especially Ecuador, Bolivia and parts of Northern Chile and Colombia. Common responses among these countries include rainwater reservoirs, drip irrigation, weather-based farm advisories and flood control. All of them are relevant comparisons because they show that simple storage plus better irrigation prediction is a better solution for the adaptation. (*Ecosystem-based Adaptation Strategies to Climate Change in Colombia and Ecuador*, n.d.)

I think similar solutions are feasible in Chao because the proposals are affordable for them and can work in the long term if maintenance is the correct one. Farmers need to make sure that the measures applied are executed properly.

IV. Proposal

Although my proposal is contemplated initially in multiple strategic steps, my suggestion will be focused on the basis of the solution. The solution recommends a community-managed water storage system based on ferrocement tanks, combined with locally operated purified water through JASS organization. JASS is a community- based organization elected by the community that is responsible for providing water and sanitation services. In other words, it is responsible for the administration, operation and conservation of the drinking water system. The JASS is legally recognized. (Water for People, 2016). The system would first prioritize reliable household and small-farm water access. METOS and drip irrigation systems would be considered only as future improvements after the water storage system proves to be effective in the future.

V. Action Plan Cycle, Challenges and Policy Requirements

1. Action Plan Cycle

a. Funding

The project would be financed through a multi-entity partnership. Relationships should be established with all of them in order to make the project financing process a successful one. The four entities that would be involved are the following:

a) Peruvian Government
b) Agro Exporting Companies
c) JASS, and the
d) Community of Chao

The municipal government would fund construction labor and coordinate implementation, ensuring that public resources proposals reach lower-income households. On the other hand, Hortifrut would serve as the primary private sector partner for the project, the company would contribute with construction materials, water treatment equipment and technical training through corporate social responsibility agreements that JASS promotes. JASS would collect household fees to cover materials like chlorine, water quality testing, operator compensation and routine maintenance. Chao's members would contribute in labor and participate implicitly in system oversight. This model distributes costs across multiple organizations and reduces the financial burden on individual households aligning with existing initiatives in the region.

Synthesis of this multiple funding process is shown in the table below:

Entity	Principal role	What would they fund?
Government, Municipality, Ministry of Agrarian Development and Irrigation (ANA)	Public coordinator and equity guarantor	Construction labor and wages; permits and technical supervision
Agro-exporting companies (Hortifrut)	Strategic partners with an interest in water and the community exportation.	Construction materials (cement, steel, filters). JASS equipment, operator training
JASS	Purifying system operator	Collection of household fees, daily operation, maintenance, water quality records
Community of Chao	Beneficiary and co-participant	Community labor, system monitoring, fee payments based on ability to pay

b. Construction of Ferrocement Tanks

Early Activation - To monitor official warnings of the government, start the construction of ferrocement tanks and its cleaning. Also to supervise if the water that's coming from the Santa River through the Special Mother Channel Project of CHAVIMOCHIC is being potabilized with the JASS project. (SENAMHI - Fenomeno El Nino, n.d.)

c. Strategic Storage

It is the open window to store the water that is destined to basic and open consumption of irrigation and survival of agriculture crops of Chao's valley. The water storage from the Ferrocement tanks allows to cover the scarcity of water coming from the Santa River and the possible malfunction of water distribution. (SENAMHI - Fenomeno El Nino, n.d.)

d. JASS Potabilization

The impact of potabilization would be to assure more reliable water access during dry periods of El Niño, and also less water waste in agriculture and more crop survival with lower vulnerability for small farmers.

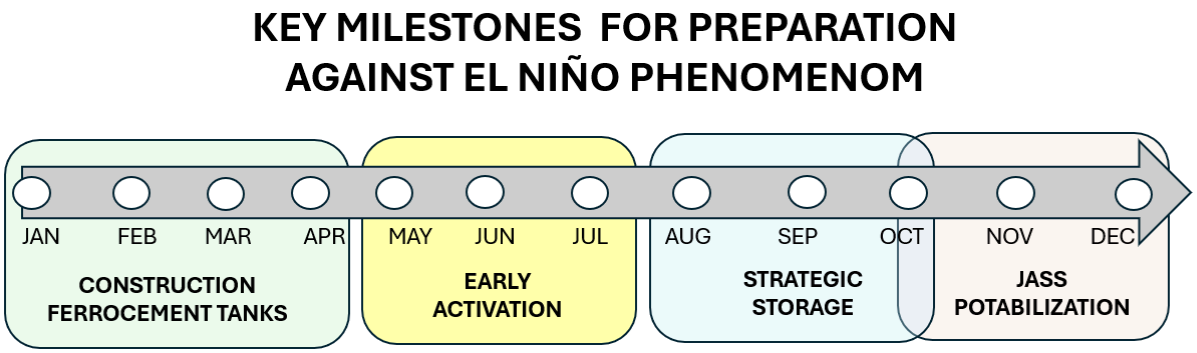

Figure 5. Key Milestones for Preparation against el Niño Phenomenom) (*Miguel Muñoz May 19th, 2026*)

2. Policy Requirements and Commitments

Policy wise, the project would need:

a) Local support for the water storage and management, from the Board of Pressurized Irrigation Users of the Moche, Virú, and Chao valleys in coordination with ANA (Autoridad Nacional del Agua (Central state body attached to the Ministry of Agrarian Development and Irrigation) (*Organizational Chart of Water Management Organizations in Piura, Peru. . ..*, n.d.)
b) Maintenance responsibilities from farmers.

The following table shows the geographical area that would be covered by the project, based on the number of JASS present in order to measure the performance of the project

Community	Estimated Households	Agriculture families
Nuevo Chao	486	150-200
El Progreso	200-300	100-150
San Roberto	150-250	80-120
JASS TOTAL approximately	836-1036	330-470

VI. Conclusion

The project is sustainable only if communities are trained and maintenance is planned and covered; otherwise, it would be very difficult for the system to sustain on its own. I find it very feasible because the idea is affordable, targeted and suited to the Chao's community and their climate/agricultural conditions. One of the reasons I have to think it would work is because the aim is to attack one of the most important problems first, not all at once.

As students who have access to high quality education, stability and opportunities, we have the responsibility to understand the struggles that vulnerable communities face and to speak out for solutions to protect them. We are privileged to learn about these matters of concern and, at the same time, these issues provide us the responsibility to act, to care and to use our voices to support the communities that are exposed to these resource shortages. Helping these communities is not only an act of solidarity but also an act of investing in the future of the planet and its security.

Resources

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