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EDITORIAL

Climate change and food security in Peru: A problem already at the family table

Cambio climático y seguridad alimentaria en el Perú: un problema que ya está en la mesa de las familias

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Peru is a country of remarkable geographical, biological, and cultural diversity, characterized by extreme contrasts, including its rugged topography, which ranges from sea level to more than 6,000 meters above sea level within relatively short distances, giving rise to a remarkable variety of climates, ecosystems, and distinctive ways of life. This same diversity, which has made Peru one of the world's megadiverse countries, also makes it one of the most vulnerable to climate change. Tropical glaciers, river basins and valleys along the Pacific slope, the short distances separating agroecological zones, and the dependence of agricultural production systems on rainfall create conditions in which the effects of global warming are likely to be more severe and unevenly distributed [(1)].

Climate change acts as a chronic process that steadily increases temperatures, alters rainfall patterns, and weakens the capacity of ecosystems to recover. Against this backdrop of heightened vulnerability, acute events such as the El Niño phenomenon become more intense and destructive. What was once an occasional extreme event now affects a highly vulnerable territory, characterized by shrinking glaciers, increasingly degraded soils, and production systems with limited adaptive capacity. Thus, the El Niño phenomenon not only causes immediate damage but also amplifies and accelerates the effects of climate change, which continues to progress over time [(2)].

The impacts of climate change are already evident across several sectors. The loss of glacial surface area since the 1960s has reduced water availability in Andean river basins, affecting agricultural irrigation and electricity generation [(2)]. Extreme events such as the El Niño phenomenon, prolonged droughts, unseasonal frosts, and floods damage road and irrigation infrastructure, disrupt land transportation, and generate substantial economic losses. In food production, particularly among smallholder farming households in the Andean highlands and Amazonian regions, declining crop yields, crop losses, and an increased incidence of pests have been reported. In 2023, national agricultural production declined by 4.1%, one of the worst figures recorded in recent decades [(3)]. These effects extend from agricultural fields to household tables, as rising food prices reduce access to an adequate diet.

From this perspective, climate change affects all four dimensions of food and nutrition security (FNS). In terms of availability, it reduces yields of crops such as potatoes and maize, particularly in the Andean highlands, where atypical frosts, droughts, and increasing pest infestations are altering traditional agricultural calendars. Regarding access, infrastructure damage and reduced food production lead to price increases that disproportionately affect low-income households and limit their ability to consume a varied diet. In terms of utilization, deteriorating water quality, the increasing incidence of diarrheal diseases, and water stress reduce the body's ability to effectively utilize available nutrients [(4)]. Finally, the dimension of stability concerns the

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sustained adequacy of the other three dimensions of FNS, which is undermined as what was previously an acute crisis becomes a recurrent condition of food insecurity for millions of people.

The scarcity and high prices of healthy foods, such as fruits and vegetables, force families to replace them with less expensive alternatives, including ultra-processed foods that are high in calories but low in micronutrients. These energy-dense, nutrient-poor diets create conditions in which excess body weight and anemia can coexist within the same household and even in the same individual. This represents a concrete manifestation of the double burden of malnutrition: obesity and micronutrient deficiencies driven by the same dietary pattern and exacerbated by climate change [5].

In the face of this increasingly pressing situation, the remaining research agenda calls for a multisectoral approach. Important evidence gaps remain regarding how climate change is transforming Peruvian food systems as a whole. Studies are needed that rigorously integrate climatic, agricultural production, economic, and nutritional data, particularly in the Andean highlands and Amazonian regions, to enable a comprehensive understanding of the changes caused by climate-related phenomena throughout the food system, from production to consumption. Further evidence is also needed to better understand the potential of native agrobiodiversity, agroecological systems, and short food supply chains, not only as strategies for climate resilience but also as pathways toward improving dietary quality.

Finally, the main challenge facing Peru is to assume more active and shared responsibilities. Academia must generate applied, locally relevant knowledge, overcome disciplinary fragmentation, and train professionals capable of integrating perspectives on climate, food systems, and nutrition. Civil society and farmers' organizations play a key role in protecting agrobiodiversity, monitoring local impacts, and advocating for environmental policies. Through their everyday choices, citizens can contribute by reducing the water and carbon footprints of their diets, prioritizing fresh and locally produced foods, and reducing waste and plastic use. No single sector can solve this problem alone. The most realistic approach is to build a collective response that recognizes Peru's diversity not only as a cultural asset but also as a source of vulnerability that must be managed to confront a climate that has already changed.

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