Science Societies

# Improving global food system resilience against geopolitical conflicts under changing climate and soil pollution

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May 13, 2026



*Photo by Jacques Descloitres | NASA.*

Geopolitical conflicts—especially the Strait of Hormuz crisis—have exposed the vulnerability of global food systems by disrupting key supplies like fertilizers, energy, and food, leading to a sharp rise in global hunger and threatening food security worldwide. In this perspectives piece, former SSSA

President and World Food Prize Laureate Rattan Lal argues that strengthening food system resilience requires global cooperation, restoration of degraded soils and ecosystems, and using scientific, sustainable agricultural practices to promote peace and long-term food security.

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The anthropogenic crisis in the Strait of Hormuz has demonstrated again that the interrelated phenomenon of food–energy–water–soil–hunger are human-made tragedies. Disruptions in the shipment of oil, liquified gas, and fertilizers and import of food for the Gulf nations through the critical checkpoint have documented the tragic vulnerability of global food systems to regional political crisis. The global number of people at a critical level of food insecurity was estimated at 318 million in January 2026 and has now increased by 45 million in May 2026 (more than doubled since 2019) because of the crisis in West Asia (WFP, 2026; FAO et al., 2024; Buheji, 2026a, 2026b; 2026c).

Critically affected are (a) food-importing countries in Gulf states (Oman, Qatar, Iraq, Saudi Arabia, Yemen, Syria, and Gaza), Africa (i.e., Nigeria, Sudan, Democratic Republic of Congo, and Ethiopia) and South Asia (i.e., Afghanistan, Pakistan, Bangladesh, India, Nepal, Sri Lanka, and Myanmar), and South America (Brazil) among others. The Hormuz crisis has created a perfect storm that threatens to destabilize the global food systems.

The crisis also affects food production in countries that import energy (oil and liquid natural gas) and other agricultural products. A large proportion of the global fertilizer used is imported from the Gulf states. Among the major consequences of the Hormuz crisis on global food security is the disruption of fertilizer shipment (46% of global urea trade). Global estimates of fertilizer import (Mt/yr) prior to the Hormuz crisis was 19.1 by Brazil, 7.9 by China, 11.6 by India, 6.1 by Africa, 27.5 by South America, and 18.6 by Europe (FAO, 2025). Farmers in the U.S. who did not purchase fertilizers prior to the crisis are also affected by the estimated 25–35% rise in prices.

Thus, there may be shortage of urea for the current spring planting. In addition to disruptions in supply of food, fertilizers, and oil, other supplies being disrupted include methanol, aluminum sulfur, helium, graphite, glycol, iron ore, and steel pellets as well as adverse effects on green energy production (Geldard, 2026). The “perfect storm” is a lose–lose–lose situation for the whole world because of disruptive restrictions of fertilizer, food products, and energy sources. Indeed, a record number of people could face acute hunger even if the war stops now because the blockade has already proven to be a “food security time bomb” (Partridge, 2026) through disruptions of essential supplies for countries in Asia (e.g., China and India) and in Africa where people may suffer the most.

Thus, the objective of this article is to deliberate how to address such a crisis of global dimensions and to establish international policies that save the world from human-centric approach to geopolitical issues.

## Global food security and the West Asia crisis

War and turmoil in West Asia have undermined the international law and order. In affected regions, innovation may not thrive, opportunities may remain untapped, desperateness may spread beyond the region, and world peace and tranquility

become a distant dream (Figure 1).

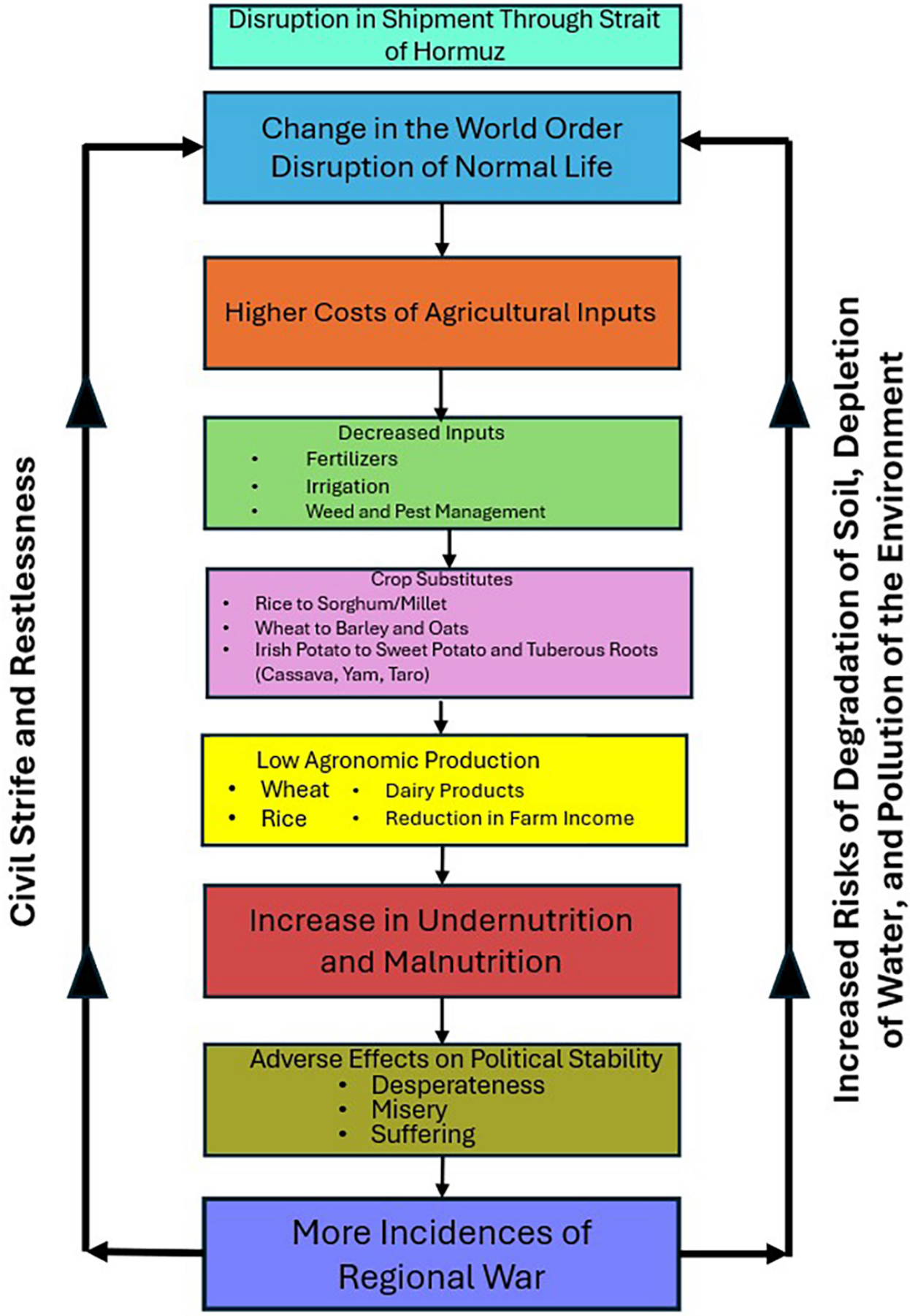
Disruption in Shipment Through Strait of Hormuz
Change in the World Order
Disruption of Normal Life
Higher Costs of Agricultural Inputs
Decreased Inputs
• Fertilizers
• Irrigation
• Weed and Pest Management
Crop Substitutes
• Rice to Sorghum/Millet
• Wheat to Barley and Oats
• Irish Potato to Sweet Potato and Tuberous Roots (Cassava, Yam, Taro)
Low Agronomic Production
• Wheat
• Rice
• Dairy Products
• Reduction in Farm Income
Increase in Undernutrition and Malnutrition
Adverse Effects on Political Stability
• Desperateness
• Misery
• Suffering
More Incidences of Regional War
Civil Strife and Restlessness
Increased Risks of Degradation of Soil, Depletion of Water, and Pollution of the Environment

*Figure 1. The downward spiral set in motion by the crisis in the Strait of Hormuz must be reversed urgently and scientifically.*

Indeed, the crisis in West Asia is a strong threat to global food and nutrition security. The food insecurity caused by the war in Ukraine, leading to reduced production and export of wheat and other food products, is being strongly aggravated by the war in West Asia. The most severely affected may be sub-Saharan Africa (SSA) where the rate of population growth remains more than that of food production (Table 1).

Table 1. Temporal changes in population growth, total cereal production, and per capita cereal grain produced locally in sub-Saharan Africa.

| Year | Population (M) | Total cereal grain production (Mt) | Per capita grain production (kg) |
|---|---|---|---|
| 1961 | 191.7 | 33.7 | 176 |
| 1970 | 240.0 | 40.7 | 176 |
| 1980 | 315.7 | 47.6 | 151 |
| 1990 | 422.2 | 60.8 | 144 |
| 2000 | 549.9 | 75.9 | 138 |
| 2010 | 717.6 | 115.3 | 161 |
| 2020 | 938.4 | 154.5 | 165 |
| 2021 | 961.2 | 156.9 | 163 |
| 2022 | 984.0 | 157.5 | 160 |
| 2023 | 1007.8 | 160.8 | 160 |
| 2024 | 1032.2 | 156.9 | 152 |

*Note.* Adapted from FAO Stat.

The data in Table 1 and Figure 2a and 2b show that between the year 1961 and 2024, the rate of total cereal grain production in SSA has lagged strongly behind that of the rate of population growth. The slope of the regression line shown in Figure 2b may become more negative even if the supply of fertilizers, seeds, machines, and irrigation equipment is immediately restored. This crisis has long-lasting effects on global food systems.

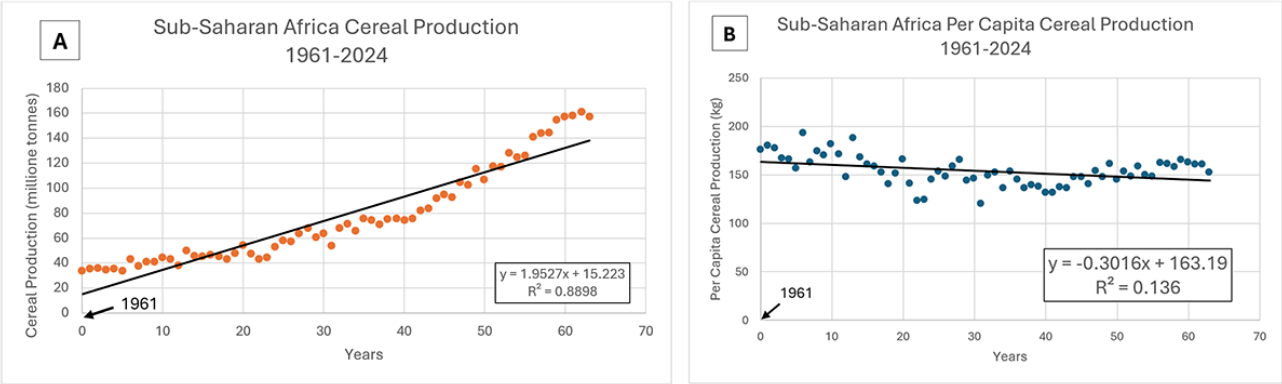


***Figure 2.*** *Temporal changes between 1961 and 2023 in food production in sub-Saharan Africa: (A) Regression equation between time and total cereal grain production (Mt); (B) Regression equation between time and per capita grain production (kg/yr). The negative slope of the per capita grain production can become steep if peace is not given a chance. Data on population and cereal grain production from 1961 to 2022 are from the FAO (2025) and United Nations (2024).*

However, the degradative and declining trends can be reversed and lead to restoration of supplies and assurance of global peace and tranquility (Figure 3).

Along with other regions of the developing world (Asia, Central America, the Caribbean, and Andean regions), the war in West Asia will strongly worsen in SSA. With global peace and tranquility, however, SSA can also be food self-sufficient and even become the bread basket of the world. Harmonious relations among nations can also be achieved by realizing the truism that world peace depends on translating proven science—particularly in crops, soil, and agronomy—into action in SSA and other regions prone to undernutrition and malnutrition.




*Figure 3. Ending hostility and setting in motion the process of global peace and stability necessitate restoration and rehabilitation of polluted soil and making agriculture a tool for human well-being and nature conservancy.*

## World peace is a scientific issue

It is thus important to identify, develop, and implement programs that transform agriculture as a part of the solution and an instrument of restoring degraded/polluted soils and ecosystems and destroyed infrastructure by enhancing trust and strengthening peace and harmony. Thus, strengthening the soil-peace-nexus is important to humanity's common future (Lal, 2015).

The crisis in the Strait of Hormuz also indicates geographically concentrated agricultural production creates systemic vulnerability in the global food supply chain (Buheji, 2026) because even over a short period (Feb 28 to May 10), it has made an additional 45 million people vulnerable to food insecurity (United Nations, 2026). The crisis in the Strait of Hormuz is a double-edge sword because it is a checkpoint for fertilizer and energy exports as well as for food imports for the countries in West Asia

region. This perfect storm is a humongous “sustainability trap” because a single potential failure in global food systems can have unimaginable catastrophic consequences.

War adversely affects soil properties and water quality with long-term consequences to human health and well-being (Morton, 2026). The legacy of any war and armed conflict on natural resources includes deforestation, degradation of soil health (physical, chemical, biological, and ecological), geomorphologic and pedologic transformations, water pollution, and the destruction of wildlife habitat.

Thus, in addition to banning war, an action plan must be in place to restore polluted soils and contaminated water resources for the safety and well-being of present and future generations and to provide a clean environment for wildlife habitat. Guiding principles for reconstruction of war-ravaged lands must be agreed upon and implemented by coherent and systematic policies. Land managers are key stakeholders in implementing restoration plans through the science–policy interface at local, state, national, and international levels.

The modern and highly destructive war on soil and nature are neither bearable from the environmental perspective nor acceptable from the ethical, moral, social, economic, and human perspectives. Thus, it is timely and urgent for the world community to work together and minimize risks of such atrocities against soil and nature. Yes, like any other living beings, soil and nature also have rights to be protected, restored, and managed sustainably to thrive and flourish for present and future generations. Let us give peace a chance to help humanity and nature.

After all, the world is one family (Vasudhaiva Kutumbakam, वसुधैवकुटुम्बकम्

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