Agrifood Resilience Amid Geopolitical Shocks

Geopolitical shocks refer to any unusual political, environmental or economic event that is devastating, occurring at a country, regional or global level, that has the potential to destabilize the world economy and ultimately lead to food insecurity. The world has witnessed many such events, including the ongoing US-Israel-Iran war, Covid-19, the Russia-Ukraine war, climate change in Pakistan and the Great Depression of 1929 in the USA.

Food insecurity means unreliable and unaffordable access to sufficient, safe, and nutritious food for a healthy life. Food insecurity is not limited to non-availability or shortage of food but also discusses the affordability of safe and nutritious food to meet dietary needs and food preferences for an active and healthy life (Derived from FAO — Food and Agriculture Organization website).

A major cause may disable other contributing factors from becoming operative. For example, environmental problems may hamper the favourable, result-oriented agricultural policy of a political government. Similarly, acute climate change often causes heavy rains that destroy the agriculture sector, leading to food shortages. In the same line, poor water

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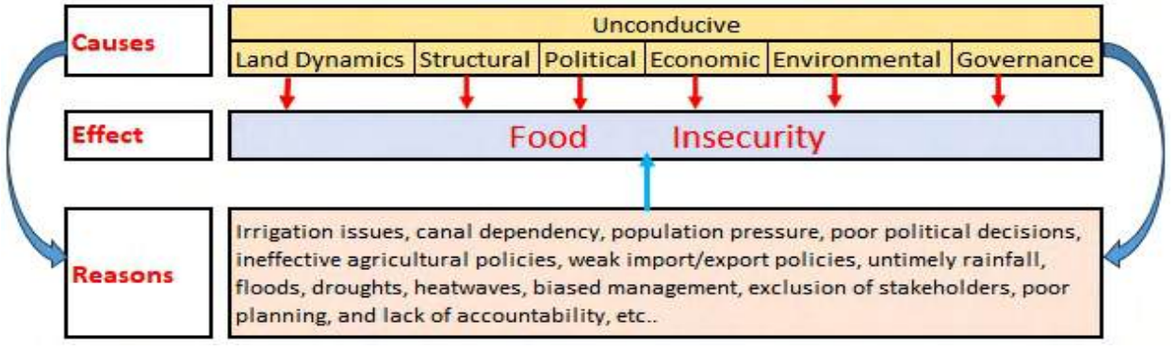
Epicenter	Trigger	Scope	Basic Issue	Major Disruption	Final Outcome
US, Israel & Iran	War	Global [Political]	Energy crisis	Disrupted energy supply chains	Poverty & food insecurity
China	Pandemic (Covid-19)	Global [Environmental]	Goods & energy shortage	Disrupted global supply chains	Poverty & food insecurity
Russia-Ukraine	War	Europe & North America [Political]	Energy & food crisis	Inflation from shortages & profiteering	Poverty & food insecurity
Pakistan	Climate change (floods, drought, earthquake)	Pakistan only [Environmental]	Loss of crops, vegetables & fruits	Agricultural goods shortage	Poverty & food insecurity
USA (Great Depression 1929)	Financial market crash	Global [Economic]	Overproduction & financial imbalance	Collapse of production & demand	Poverty & food insecurity



management, unfair water distribution for irrigation, and non-conducive agricultural policies and mistrust will inevitably result in lower agricultural produce.

There are five major causes that can expose a country to the risk of food insecurity. The level of risk depends upon the intensity of the reason(s). The intensity of a single leading reason or a combination of reasons determines the level of risk to food insecurity. For example:

- ***Extreme-Level Risk:*** Internal conflict, ethnic riots, financial dependency and extreme weather conditions are a few of the reasons determining extreme level risk.
- ***Very High-Level Risk:*** Water shortage, severe weather conditions, internal conflict and weak infrastructure may be the reasons for such risk.
- ***High-Level Risk:*** Political instability, economic instability, inflation, poverty and poor governance.
- ***Structural-Level Risk:*** Population pressure, weak technological base, underdevelopment, weak infrastructure, poor governance, economic instability, political polarization and financial dependency are the determinants of structural-level risk.

Risk Level	Extreme / Famine Level Risk			Very High Risk			High Risk			Structural Risk		
Country Related Information	Rank	Country	Continent	Rank	Country	Continent	Rank	Country	Continent	Rank	Country	Continent
	1	Sudan	Africa	6	Ethiopia	Africa	12	Nigeria	Africa	16	Pakistan	Asia
	2	South Sudan	Africa	7	Congo	Africa	13	Myanmar	Asia	17	Bangladesh	Asia
	3	Yemen	Asia	8	Chad	Africa	14	Hati	Asia	18	N. Korea	Asia
	4	Somalia	Africa	9	Niger	Africa	15	Venezuela	S. America	19	Madagascar	Africa
	5	Afghanistan	Asia	10	Mali	Africa				20	Syria	Asia
				11	Burkina Faso	Africa						
Reasons Mix	Internal & ethnic conflicts, rigours climate & Poverty and Financial dependency.			Water shortage, rigorous climate, Internal conflict, bad governance & weak infrastructure.			Internal conflict, Economic instability, Inflation, Bad Governance.			Climate Change, Economic instability, Political Polarization, Population flux & weak Justice system (Structural stagnation)		

Reasons of Food Insecurity in Pakistan

Following are the reasons that can expose the country to the risk of food insecurity.

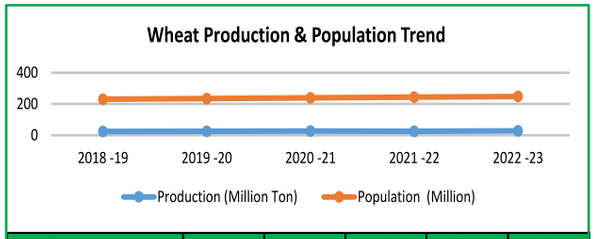
1) ***Political Factors:*** Lack of uniform agricultural policy, generic allocation of resources, poor price policy, no policy to address the Cobweb theorem, and no tangible policy for the Potohar region.
2) ***Structural Weaknesses:*** Focus on conventional crops, fragmentation of holdings, population pressure, unequal income distribution, poverty, weak research and development institutions, inappropriate warehousing and supply chain management, and informal commodity marketing and distribution networks.
3) ***Land and Geography:*** Vast rain-fed area of the Potohar region, vast hilly area, long belt of coastal area, and Thar desert of Sindh are not suitable for conventional crop cultivation.
4) ***Economic Factors:*** Financial dependency, poverty, inflation, energy prices and food imports.
5) ***Climate Change Impact:*** Heavy rains, floods, thunderstorms and hailstorms, cloudbursts and drought.
6) ***Geopolitical Disruptions:*** US-Israel-Iran war, Russia-Ukraine war, and internal and ethnic conflicts.
7) ***Political Instability and Polarization:*** Long-standing establishment intervention in national politics. A weak justice system that derails political governance. Successive protests and sit-ins tarnishing the image of the country and destabilizing the economy. A weak political system unable to meet the expectations of stakeholders. Extreme polarization among political parties and the electorate.
8) ***Technological Gaps in Agriculture:*** Lack of adoption of AI technology, Integrated Farming System (crops, vegetables, livestock and fisheries), Digital Agriculture Platforms and internet technology.

Food Insecurity in Pakistan

The agriculture sector that ensures food security comprises four subsectors, namely crops, livestock, forestry and fisheries. The other three agricultural sub-sectors do not expose the country to food insecurity in the short run, unlike crops. Crops have great potential for exposure to food

Period			2023		
Variable	Production	Consumption/Capita	Population	Consumption	Surplus(Shortage)
Unit	Million Ton	Kg / person	Million	Million Ton	Million Ton
wheat	28.18	124	240	29.76	(1.58)
rice	10	9.9	240	2.376	7.62
corn	9.85	7	240	1.68	8.17
pluses	0.382	8	240	1.92	(1.54)
Milk	67	260	240	62.4	4.60

insecurity in the short run due to five major causes. The crops sector is innately vulnerable, being stapled to the necessity of life of a common man. Data from 2023 shows that wheat and pulses always remain at the brink of shortage. Pakistan tends to import a small quantity of wheat when the combined effect of five causative factors does not favour wheat production. Pakistan permanently imports vegetables, pulses and edible oilseeds due to production falling far short of annual demand.



Period	2018 -19	2019 -20	2020 -21	2021 -22	2022 -23
Production (Million Ton)	24.35	25.25	27.46	26.21	28.18
Population (Million)	231	235	240	244	248

Both wheat production and population are increasing at almost the same pace. The only way forward is to extend the cultivated land area, as productivity is a limiting factor that cannot be stretched beyond a certain limit.

Strategy to Ensure Food Security in Pakistan

Wheat production is a major focus, along with other important crops, to ensure food security in Pakistan for 250 million people. The different strategies are suggested for different regions but here are some strategies that are suitable for all regions:

I) National Strategies

The following suggestions are applicable in all regions of Pakistan.

- **Topographic Mapping:** The process to collect the physical, natural and artificial data (rivers, hilly area, plains, deserts, upper crest of land, slopes, water features and forests) to assess the water availability, agriculture potential and climatic effects.
- **Drone Crop Protection:** Using drone technology to protect the crops from locusts, pests, and crawling and flying insects.
- **Genetic Engineering:** Using this technology to develop crops that are more resistant to extreme climate change, drought, famine, floods and short-term water shortage.
- **AI-Driven Agriculture:** Artificial Intelligence technology is used to analyse the big data to predict the yield per acre, water requirement, disease control and planning for crops timing and quantifying the final produce.
- **Smart Real-Time Monitoring:** Sending the farmer's smartphone real-time data regarding soil moisture, humidity, temperature and weather and climate change.
- **Socioeconomic Uplift:** Food security also requires that inhabitants can afford to purchase food. Socioeconomic status comprises four variables: income, education, health and dwelling. All four variables depend upon the income of the individual. Different earning opportunities should be provided to people to increase the income of individuals to enable them to purchase food.

2) Provincial Strategies

SINDH

Sindh has its own dynamics for low agriculture productivity. Here are a few measures for improvement rather than listing the reasons thereof.

- **Sprinkler and Drip Irrigation:** Use sprinkler and drip irrigation in the Thar desert and also replace conventional flood irrigation with sprinkler irrigation to conserve canal water flow.
- **Salinity and Waterlogging Control:** The solution is either to control this twin problem or to cultivate salt-resistant crops. This twin problem persists in vast area of Sindh region that demands a permanent solution to eliminate waterlogging and salinity.

- **Farm Waste Control:** A comprehensive mechanism should be designed to control waste during on-farm and off-farm activities.
- **Land Reforms:** These reforms should be implemented in the true sense to transfer and protect the rights of tenants.

PUNJAB

There is no major problem in Punjab that hampers the overall productivity. Even then it is comparatively much behind the productivity of advanced countries. Best canal system exists in Punjab which meets the basic requirement for agriculture productivity. Even then, a few suggestions are offered at the operational level for waste control.

- ***Productivity and Diversification:*** Improvement in productivity, water management, introduction of new technology, fertilizer, medicated seeds and diversification of crops.
- ***Harvest and Labour Management:*** The major problem, as gathered from local people, lies at the harvest stage, not at the sowing and growing stage. The conventional tenant system has been disappearing slowly and gradually. These tenants were available round the clock to handle all stages from cultivation to harvest. Secondly, the cutting and threshing period is limited to no more than 12 days. Now, in the absence of tenants, labour is not available to all farmers when cutting and threshing machines are needed during this limited period. A formal and professional company or companies should be established to provide all services under one umbrella to all farmers within the 12-day period to control waste.

KPK

The agriculture-related problems of KPK are different from those of Punjab and Sindh. Water shortage, flood, small holdings, poor governance and slow adaptability are a few of the distinct features of the agriculture sector in KPK. The following suggestions are offered to improve productivity to ensure food security.

- ***Flood Management:*** Recent floods destroyed 30% to 80% of crops in flood-affected districts. Flood prediction and flood control systems should be established to save crops from destruction.
- ***High-Value Crop Transition:*** Due to small holdings, KPK agriculture should be diverted to high-value crops from conventional crops to enable farmers to increase their incomes.
- ***Northern Livestock Development:*** Most of the northern areas of KPK comprise mountains and hills. Livestock has more potential than crops to increase the income of individuals, enabling them to afford health, education, housing and food.

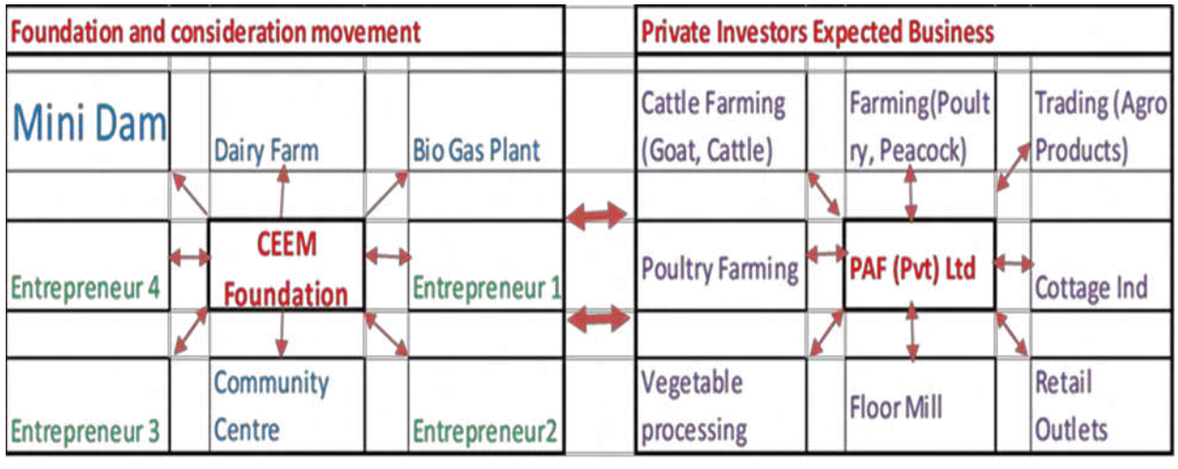
BALOCHISTAN

The Baluchistan agriculture sector mostly depends on rain-fed surface run-off water. The old Karez system is vanishing slowly. The following suggestions are offered for improvement of agriculture.

- ***Karez System Revival:*** Revival of the Karez system of irrigation will reduce irrigation costs, which can be utilized in fruit production.
- ***Mini Dam Construction:*** Baluchistan accounts for around 43% of the total area of Pakistan. The construction of mini dams, to store the surface run-off water, is the only solution to increase agriculture productivity to ensure food security in the long run.
- ***Livestock Industrialisation:*** Livestock should be declared a separate industry and incentives should be provided for rearing animals and promoting animal husbandry.

POTOHAR

Potohar, which comprises four districts (Rawalpindi, Attock, Jhelum and Chakwal), is the most neglected area for agriculture despite great potential of both



agriculture and livestock farming. The problems include small holdings, shortage of capital and water scarcity. Potential includes 1.9 million acres arable land, 2.0 million jobless youth, 3.5 million MAF surface run-off water and best suited space to build mini dams at every 2 km to store the surface run-off water for agriculture and livestock rearing.

When Potohar Plateau observes the timely rains, the overall production of wheat becomes marginally surplus, enabling Pakistan to avoid imports. The wheat production can be made sustainable if this model is applied in this special region. This region experiences very few natural disasters of mild intensity.

vegetables) in coordination with the community.

- ***Dairy Farming:*** Production of milk and other dairy products.
- ***Goat Farming:*** Raising of goats and production of meat and by-products.
- ***Rearing of Livestock:*** Raising cattle and heifers.
- ***Poultry Farming:*** Poultry farming and poultry products.
- ***Vegetable Farming:*** Production of vegetables and extended products.
- ***Ostrich Farming:*** Production of ostrich meat and its by-products.

Extended Products from different vegetables

Tomato	Potato	Carrot	Spinch	Peppers	Maiz (Corn)	Cucumber	Onion	Broccoli	Green Beans
Tomato Sauce	Potato Chips	Carrot Juice	Frozen Spinach	Hot Sauce	Cornmeal	Pickles	Onion Powder	Frozen Broccoli	Canned Green Beans
Tomato Paste	French Fries	Carrot Cake	Spinach Powder	Dried Chili Flakes	Corn Flour	Cucumber Juice	Dried Onions	Broccoli Soup	Frozen Green Beans
Ketchup	Potato Flakes	Dried Carrot Chips	Spinach Pasta	Paprika Powder	Corn Starch	Cucumber Salsa	Onion Rings	Broccoli Powder	Pickled Green Beans
Sun-dried Tomatoes	Hash Browns	Carrot Puree	Spinach Dip	Pepper Jelly	Popcorn	Cucumber Relish	French Onion Soup Mix		
Canned Tomatoes	Potato Starch	Pickled Carrots	Canned Spinach	Roasted Red Peppers (jarred or canned)	Canned Corn				
Salsa	Potato Flour				Corn Syrup				
Tomato Juice									

CEEMAP-Potohar Agriculture Model: To consolidate the total small holdings of the village community into a single unit to produce economies of scale in production. Individual cultivation increases costs beyond the value of produce. The basic pillars of the model are a foundation of village community, a single unit of land, a mini dam, a dairy farm, a biogas plant, and livestock and other farming activities. A complete cluster farming concept is implemented where all members of the village community will be involved in both on-farm and off-farm activities. This model will not only ensure food availability but also help increase the income of all individuals to uplift their socioeconomic status.

The CEEMAP management and community will jointly produce crops, vegetables, livestock and extended products. This relates to different businesses run by a foundation and other commercial companies or individuals under the aegis of the foundation. Major activities are given hereunder:

- ***Self-Sustained Foundation:*** Growing agricultural produce (wheat, maize, pulses, groundnut and
- ***Fish Farming:*** Fisheries.
- ***Extended Products:*** Making, baking, manufacturing, preparing or processing extended and by-products (depicted below) from surplus produce or otherwise.
- ***Cluster Marketing:*** Selling all products in the market as an off-farm activity to ensure 100% community payback and to save them from exploitation as individual sellers.

Private companies or individuals can use the space of the village community for any of the businesses as per the formula given above.

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