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From Subsidy to Sustainability: Reassessing Pakistan's Input Support Policies and Their Impact on Crop Productivity

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Abstract

Pakistan's agri-business industry is one of the most the most essential components of the domestic economy. It accounts for the approx. 22.9 % of the GDP. It also provides employment to about 37 to 40% of the domestic labor force. The sector has been grappling with a variety of short-term growth opportunities and long-term volatility, e.g. 6.3% growth in FY 2023/2024. The author of this paper critically reassesses the input, support polices of the country, especially fertilizer, water (Abiana) and tube-well energy subsidies. Such policies, while significantly contributing to the fiscal deficit, aggravate the circular debt, which is projected to reach Rs. 2.47 trillion by May 2025, and provide little to no productivity increases. Empirical data shows very low growth elasticity of fertilizer subsidies (4.3% for wheat and 6.1% for rice for each 1% increase in subsidy), significant underperformance of subsidy mechanisms with little benefits to households (average Rs. 74/month for a family of five), and significant water wastage (38% of canal water is unutilized), excessive groundwater extraction, and low recovery of irrigation SE. Initiatives like the Punjab Kissan Card program have boosted overall input usage (increased urea sales by 57.9%) and while seed sector reforms and solarization efforts are promising, other issues of counterfeit seeds and unmoderated impacts of solar grids remain. Advocating for lessons from India (that is, Direct Benefit Transfer savings), along with Vietnam and Brazil, the analysis speaks to the need to move from indiscriminate, distortionary subsidies to precise, digital, market-facilitated subsidies and supports, complemented by enhanced targeted R&D in climate-smart agriculture, precision farming technologies, along with the requisite institutional reforms to construct resilience, sustainability, and productive farming in a climate and fiscally constrained world.

Keywords: subsidies, Fertilizer subsidy, Water management, Energy subsidies, circular debt, crop productivity, Kissan Card, climate-smart agriculture, Pakistan agriculture, input support policies, yield elasticity, sustainable farming

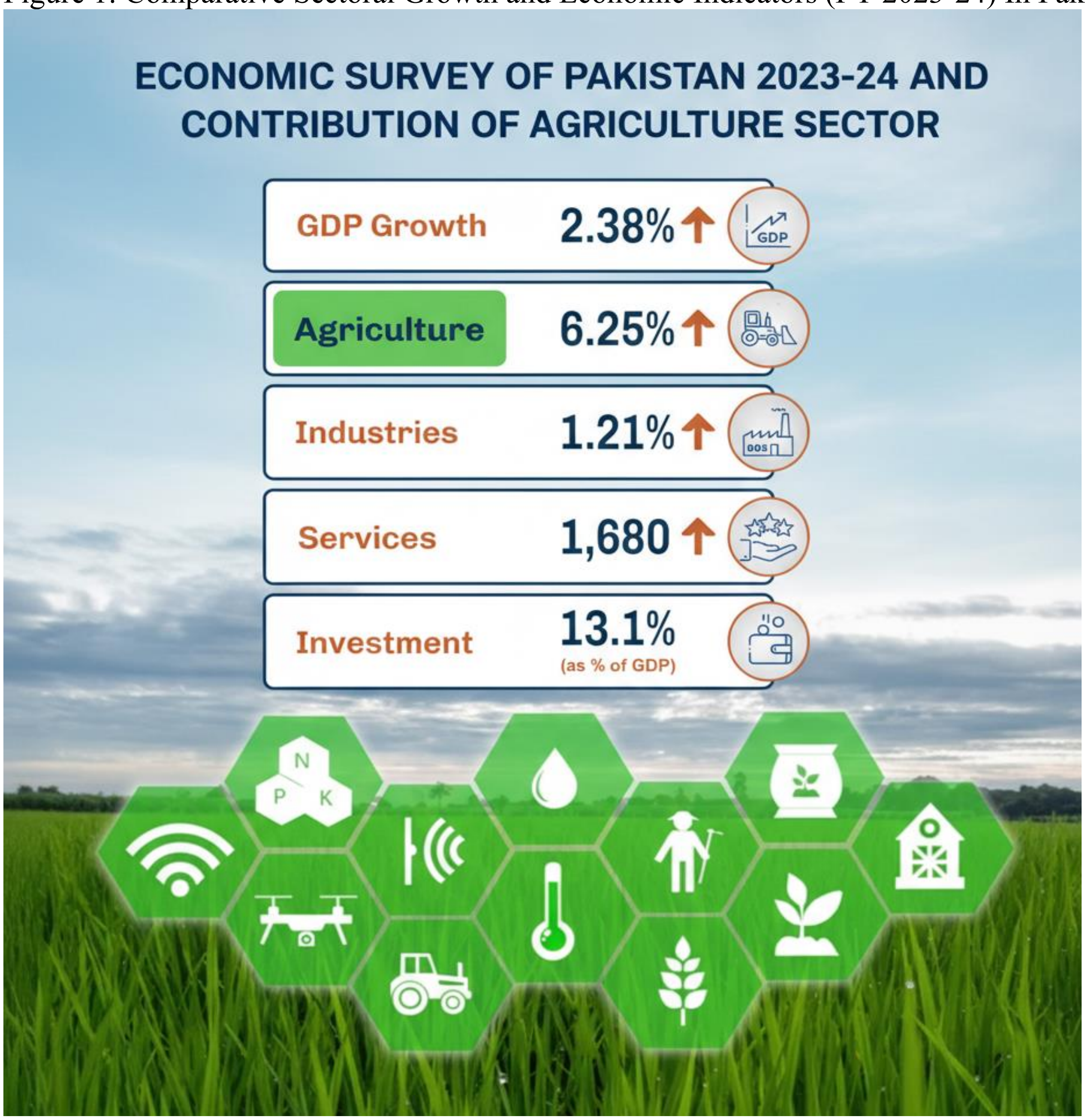
1. Introduction

The agricultural architecture of Pakistan illustrates a unique combination of historical path-dependency and present-day economic pragmatism. With the construction of the rural economy, the sector accounts for around 22.9% of Gross Domestic Product (GDP) and is the biggest provider of jobs, constituting 37.4-40% of the country's total employment (Latif et al., 2024). In the recent past, however, this fundamental sector has endured a volatility of macroeconomic asymmetric performance (Sultana, 2024). While the agricultural sector for the fiscal year 2023-2024 has accelerated growth of 6.3% because of the unprecedented output of wheat, cotton and rice, the previous year's performance was a dismal contraction of -0.2% (Kumar et al., 2024). A support framework which has focused on short-term price stability and input subsidies rather than long-term structural resilience has caused this phenomenon of `boom and bust' cycles' (Arestis, 2021).

2. The Macro-Economic Breakthrough for Agricultural Restructuring

Pakistan currently stands at a crossroads in terms of its economic potential. The present state of balance, which is dependent on temporary budgetary containment and external financing, is unable to tackle the fundamental sources of economic instability (Talpur et al., 2025). The 5E Framework and the Annual Plan for 2024-2025 are primarily focused at attempting to 'steer' the economy towards a potential sustainable growth path with a target GDP growth of 3.6 percent (Ministry of Planning, Development & Special Initiatives, 2024). This requires, from the agricultural sector, a break from the past models of stagnation and protectionism to the cultivation of a new, climate resilient system which would be risk responsive to the more dynamic challenges of climate change (World Bank, 2024).

Figure 1: Comparative Sectoral Growth and Economic Indicators (FY 2023-24) In Pakistan



The current subsidy regime poses a significant concern from a fiscal perspective for the country's stability. For example, due to unplanned subsidies and revenue losses from agricultural consumers, the circular debt in the power sector has reached 2.47 trillion rupees by May 2025 (Yasin, 2025). In addition, agricultural research funding under the Public Sector Development Programme (PSDP) has experienced a drastic reduction, from 23,928 million rupees to 4,254 million rupees in the 2025-26 budget cycle, an 82.2 percent decrease that will severely stifle efforts to develop new, climate-resilient varieties of crops (Concave Agri, 2025).

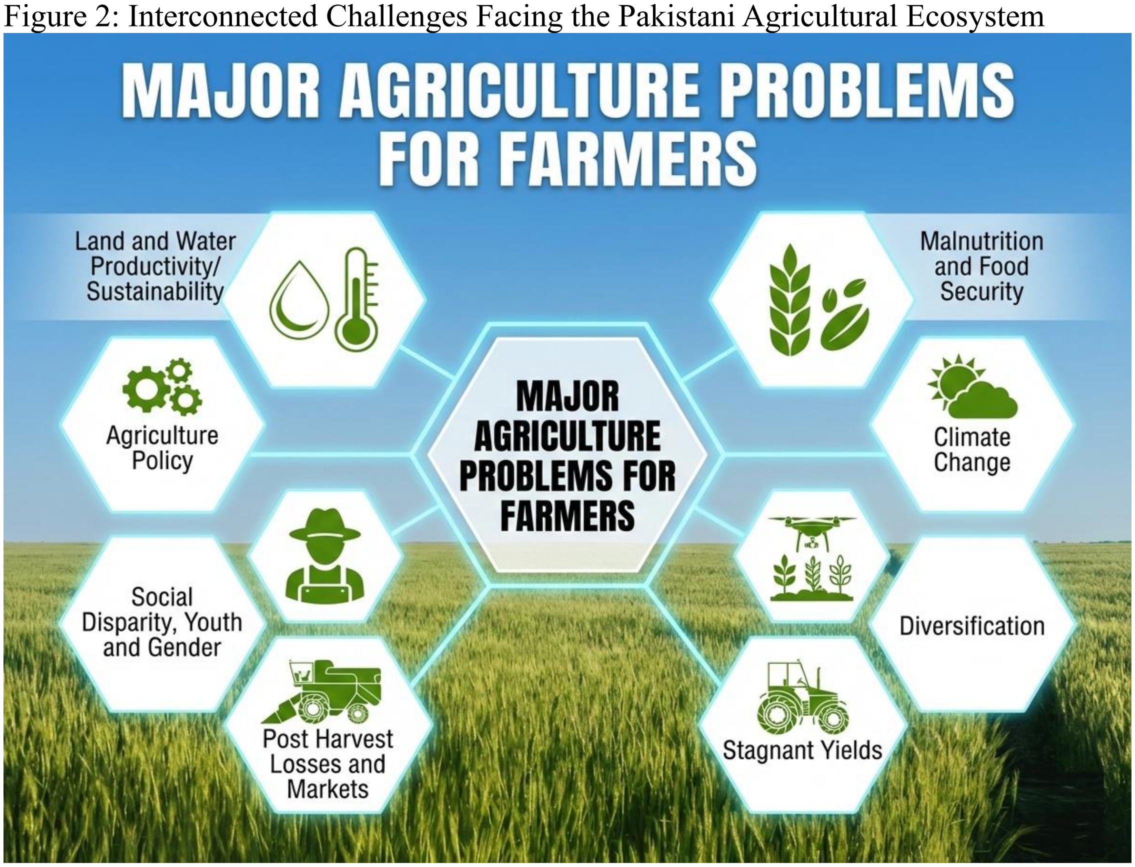
Table 1. National Agricultural Performance and Economic Indicators

Indicator	**FY 2022-23**	**FY 2023-24**	**FY 2024-25 (Projected)**	**Source**
Real GDP Growth (%)	-0.2	2.4	3.6	
Agricultural Sector Growth (%)	-0.2	6.3 - 6.4	1.5	
National Savings (% of GDP)	13.2	13.0	-	
Investment-to-GDP Ratio (%)	14.1	13.1	-	
Circular Debt (Rs. Trillion)	2.31	2.39	2.47	

3. Fertilizer Subsidies: A Reappraisal of Yield Elasticity and Economic Efficiency

The primary goal of Pakistan's input policy, which aims to promote the provision of affordable fertilizers to small-holder farmers, has been to enable 90 percent of the farmers to access the basic nutrients needed (Ali et al., 2016). Nonetheless, a review of the relevant literature shows that from 1990 to 2022, although the negative effects of disinvestment in fertilizer subsidies are positively linked to the yields of major crops, the actual yields remain unaffected (Sadaf et al., 2018).

Figure 2: Interconnected Challenges Facing the Pakistani Agricultural Ecosystem



The models analyzed show that the provision of fertilizer subsidy, from a 1 percent increase, is almost insignificant to staple crops, with wheat growing to 0.043 percent, rice to 0.061 percent, sugarcane by 0.044 percent, and cotton by 0.022 percent (Abid Hussain et al., 2018). Maize, with an elasticity of 0.207 percent, is an exception due to the productive utilization of hybrids which are more responsive to the fertilizer (Sato et al., 2022). With the exception of the 200 billion Rs. subsidy which is more of a disinvestment of a negligible subsidy of 74 Rs. per month to a family of 5, the results are positive (Abedullah and Ali, 2024).

Table 2. Empirical Correlation and Regression Analysis of Fertilizer Subsidies (1990-2022)

Crop	Correlation Coefficient (Subsidy vs. Yield)	Yield Increase per 1 billion PKR Subsidy (mound per acre)	Yield Elasticity to Subsidy (%)	Source
Wheat	0.459	0.26	0.043	[1]
Rice	0.468	2.04	0.061	[1]
Sugarcane	0.351	32.93	0.044	[1]
Cotton	0.224	0.19	0.022	[1]
Maize	0.551	62.17	0.207	[1]

4. The Water Management Crisis: Subsidy Inefficiency and Scarcity

Although Pakistan’s contiguous irrigation system is the largest in the world, the country suffers from an accelerating water crisis due to infrastructure decay, seepage, and theft (Al Karam Farm Technologies, 2025). The current “Abiana” (water rates) system is still in place, and since the system is subsidized, the rates do not promote efficient water use, or the adoption of modern technologies, such as zucchini drip and sprinkler irrigation (Mansoor, 2025).

Annual water subsidies in Pakistan amount to between Rs. 677.56 and Rs. 899.05 billion, or 0.81 to 1.07 percent of GDP. Irrigation is essential for 90 percent of food production, and canal water losses, unfortunately, reached 38 percent in 2025 (Mahfooz, 2024). The result of this water mismanagement is a systematic and severe groundwater over-exploitation in the regions of Sindh and Balochistan, which is due to the ever-dwindling water allocations (Rashid et al., 2025). The “paddy trap” crisis also describes the subsidization of, and reliance on, water-netensive rice cultivation which, along with methane emissions, discourages crop rotation (WWF-Pakistan, 2025).

5. Energy Subsidies and the Circular Debt Trap

The accumulation of circular debt has been aggravated by providing subsidized electricity for agricultural tube wells. By 2024, the recovery rate for agricultural tube-well users was 68.79%, indicating an ongoing loss for the government (Felix, 2024).

To counter these losses, the government has undertaken solarization. That said, the unmanaged solar boom (16.6 GW solar panels imported in 2024) future destabilization of national grids by triggering demand downturn from high-value industrial and commercial customers. Unmanaged, this demand downturn would lead to a ~31% rise in grid electricity prices by 2030 (Energy for Growth Hub, 2024).

Table 3. Fiscal and Operational Metrics of the Power Sector (Agriculture Focus)

Metric	Value	Implications	Source
Circular Debt Total (May 2025)	Rs. 2.47 Trillion	Systematic fiscal insolvency	
Ag Tube-well Recovery Rate	68.79%	High revenue leakage	

Industrial Cross-Subsidy	Rs. 131 - 160 Billion	Reduced industrial competitiveness	
Solar Panel Imports (2024)	16.6 GW	Massive grid defection risk	
T and D Losses (FY 2023-24)	18.31%	Well above NEPRA limits	

6. Seed Sector Reforms: Navigating Regulation and Quality

It has been argued that development and adoption of high quality and genetically pure seeds is fundamental for closing yield gaps (Abedullah and Ali, 2024). The Seed (Amendment) Act 2024 and the National Seed Development and Regulatory Authority (NSDRA) are landmark initiatives to modernize the seed sector (Ministry of National Food Security and Research, 2024).

Among the notable changes is the closure of 430 seed companies found to be non-compliant, and the first such division of seed companies based on research (Dawn, 2025). The positive effects of enhanced technology are particularly visible in the rice sector, where the introduction of hybrid varieties has resulted in a 25 to 30 percent yield increase as compared to average seeds; this success has led to the first ever export of hybrid rice seeds to the Philippines in 2024 (Revathi et al. 2025).

7. Digitization and Targeted Support: The Kissan Card Initiative

The Kissan Card program initiated by Punjab government offers hand-held interest free loans and chat loans to farmer who possess land sized 25 acres or less. As of January 2025, 530,000 cards have been issued and the Bank of Punjab states there is potential to add 750,000 cards. (Kaur et al., 2022 The program has had a positive effect on input usage as evidenced by a 57.9 percent rise of urea sales across Punjab (Directorate General Public Relations Punjab, 2025). There is a tendency for complexity and divergence of results where the program may encourage the adoption of modern inputs, but may also lead to the abandonment of less modern inputs such as Integrated Pest Management (IPM) and organic fertilization (Deguine et al., 2021).

Table 4. Kissan Card Program Parameters (Punjab)

Feature	**Phase I (2024)**	**Phase II (2025)**	**Source**
Landholding Eligibility	Up to 12.5 Acres	Up to 25 Acres	
Max Loan per Season	Rs. 150,000	Rs. 150,000	
Interest Rate	0% (Interest-free)	0% (Interest-free)	
Approved Cards	~535,000	Targeted 750,000	
Utilization Focus	Fertilizer, Seed	Fertilizer, Seed, Diesel	

8. Climate Change and the Transition to Smart Agriculture

Pakistan was exposed from all sides in 2022 with unexpected floods. It caused a loss of 4.4 million acres of crops, costing $12.9 billion in damages (International Food Policy Research Institute, 2024). In this situation, Climate-Smart Agriculture (CSA) is a strategic necessity in obtaining a “triple win”- more productive, more resilient, and lower greenhouse gas emissions (Nadeem et al., 2024).

Even with benefits in precision agriculture from 20 to 30 percent yield improvements and a decrease in input waste of 40 to 60 percent, adoption rates in Pakistan are a stark contrast to values seen around the world (P@SHA, 2024). Barriers encompass the high cost of equipment and the 40 percent of the rural population lacking internet access. However, initiatives like drought-tolerant Thar-2023 millet and heat-resistant Chakwal-50 wheat adoption prove that homegrown innovation can lead the country (Ayesha Ghouri, 2025).

9. Lessons from the Global South: India, Vietnam, and Brazil

Pakistan has the potential to take inspiration from peer economies. India has been saving money due to the DBT system. From 2023 to 2024 Indias DBT will save the government approximately 3.48 trillion rupees through reduced leakages under the PM-KISAN scheme (Subramaniam et al. 2024). Such changes have allowed India to lower its total subsidy spending from 16% to 9% of the budget while boosting the number of beneficiaries by 16 (Keshava et al., 2025). Vietnam has successfully restructured its economy to become an export powerhouse (OECD, 2025). With the merger of the Ministry of Agriculture and the Ministry of Natural Resources and the Environment in early 2025, Vietnam created the first integrated institutional arrangement to manage the climate-agriculture nexus (Vietnam News, 2025). Similarly, Brazil changed from being a net food importer to a leading food exporter through positive long-term investments in agricultural research and development (de Souza et al., 2025).

Figure 3: Pakistan's Agro-Food Trade Balance and Export-Import Dynamics

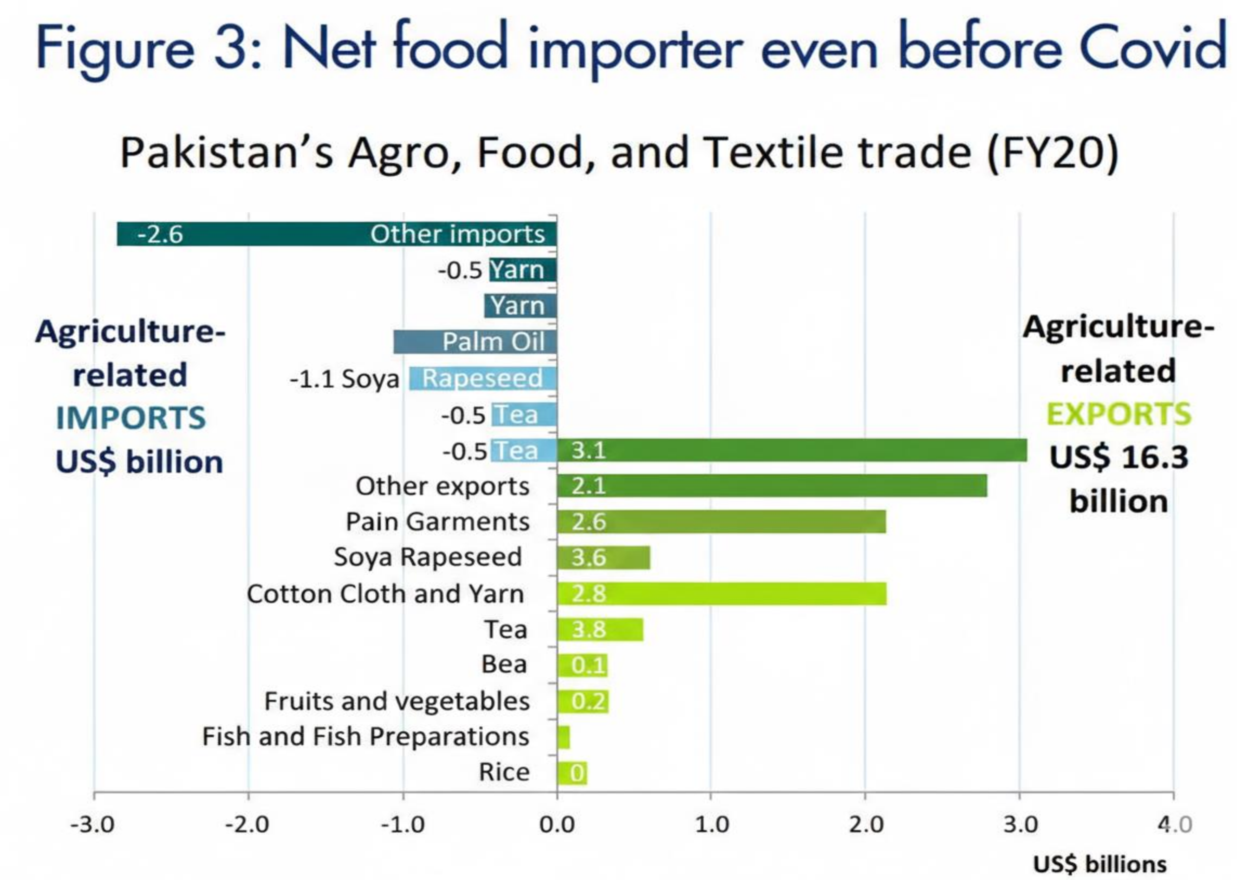


Table 5. Comparative Subsidy and Efficiency Metrics

Country	R and D as % of GDP	Key Success Mechanism	Impact	Source
Pakistan	0.16%	Kissan Card (Digital)	57.9% Urea increase in Punjab	
India	0.80%	DBT / PM-KISAN	Rs. 3.48 lakh crore saved	[21]
Vietnam	-	Ministry Merger (2025)	8.4% annual export growth	
Brazil	-	EMBRAPA / Agribusiness	Global breadbasket status	[19]

10. Conclusion

Pakistan's previous dependence on subsidies on fertilizer, water, and energy has created imposed fiscal stress and circular-detract, resource misallocation, and collapsed biodiversity, outcome leanness, and environmental stress. Kissan Card shows potential for direct targeting and support for incremental adoption of inputs, however, its impact is limited, and intensifying sustainable trade-off exists. Field data calls for more than evolution of direct, market, water and energy priced, integrated systems, plus agriculture R& D, seed system modernization, climate-smart and precision farming. Pakistan has more to gain than India, Vietnam, and Brazil in resource shifting toward innovation and productivity. Such politically costly transformations are needed to shift agriculture from a subsidized, volatile sector to a modern, sustainable engine of economic development, food security, and rural prosperity.

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