

TA6884 - Green and Resilient Rural Recovery through Agri-Food
System Transformation in the Asia and Pacific Region

Pakistan Agri-Food System Assessment Report

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Stephen Davies
Amna Ejaz

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Individuals interviewed:

1. Mudassir Shafique, International Finance Corporation (IFC)
2. Charles Schneider, International Finance Corporation (IFC)
3. Wasim Iqbal, Pakistan Agricultural Marketing Regulatory Authority (PAMRA)
4. Asad Raza, Pakistan Mercantile Exchange (PMEX)
5. Saqib Shehzad Saleem, Representative Punjab Agriculture Department
6. Muhammad Zeshan, Pakistan Institute of Development Economics (PIDE)

Consultative Workshop participants:

1. Nazim Ali, United States Agency for International Development (USAID)
2. Emily Vooris, UN World Food Programme (WFP)
3. Muhammad Imtiaz, International Center for Agricultural Research in the Dry Areas (ICARDA)
4. Munawar Kazmi, Australian Centre for International Agricultural Research (ACIAR)
5. Tehseen Qureshi, World Bank
6. Sahibzada Mansoor Ali, Asian Development Bank (ADB)
7. Muhammad Danish, Asian Development Bank (ADB)
8. Kashif Salik, Sustainable Development Policy Institute (SDPI)
9. M. Faisal Ali, Pakistan Institute of Development Economics (PIDE)

10. Farah Naz, Pakistan Institute of Development Economics (PIDE)
11. Mubarik Ali, Ministry of Planning, Development, and Special Initiatives
12. Ghulam Sadiq Afridi, Pakistan Agricultural Research Council (PARC)
13. Faiz Rasool, Global Alliance for Improved Nutrition (GAIN)
14. Iqra Akram, International Water Management Institute (IWMI)
15. M. Tahir Ali, International Water Management Institute (IWMI)

Key Findings Dissemination and Validation Workshop participants:

1. Arif Rehman, Ministry of Planning, Development, and Special Initiatives
2. Shingo Kimura, Asian Development Bank (ADB)
3. Ghulam Sadiq Afridi, Pakistan Agricultural Research Council (PARC)
4. Mubarik Ali, Ministry of Planning, Development, and Special Initiatives
5. Nazim Ali, United States Agency for International Development (USAID)
6. Nazeer Ahmed, Ministry of Planning, Development, and Special Initiatives
7. Naeem Ullah, Ministry of National Food Security and Research (MNFSR)
8. Haroon Sarwar, Ministry of National Food Security and Research (MNFSR)
9. Muhammad Imtiaz, International Center for Agricultural Research in the Dry Areas (ICARDA)
10. Tehseen Qureshi, World Bank
11. Sitara Gill, Food and Agriculture Organization of the United Nations (FAO)
12. Sahibzada Mansoor Ali, Asian Development Bank (ADB)
13. Yahya Gulraiz, Sustainable Development Policy Institute (SDPI)
14. Faiz Rasool, Global Alliance for Improved Nutrition (GAIN)
15. Farah Naz, Pakistan Institute of Development Economics (PIDE)
16. Muhammad Danish, Asian Development Bank (ADB)
17. Iqra Akram, International Water Management Institute (IWMI)
18. Babur Wasim, Asian Development Bank (ADB)
19. Munib Baig, Asian Development Bank (ADB)
20. Safyan Kakakhel, Asian Development Bank (ADB)
21. Ahmed Nawaz, Asian Development Bank (ADB)
22. Umer Saeed, Asian Development Bank (ADB)
23. Ryutaro Takaku-Bessho, Asian Development Bank (ADB)
24. Ishfaq Ahmed, Development Bank (ADB)

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List of Acronyms and Abbreviations

ADB	Asian Development Bank
ADP	Annual Development Plans
AFS	agri-food system
APMs	agriculture produce markets
CGE-W	Computable General Equilibrium – Water Model
EWR	electronic warehouse receipts
GDP	gross domestic product
IFPRI	International Food Policy Research Institute
IFC	International Finance Corporation
IMF	International Monetary Fund
IWT	Indus Waters Treaty
MAF	million acre feet
MMT	million metric tonnes
MSP	minimum support price
PAMRA	Pakistan Agricultural Marketing Regulatory Authority
PASSCO	Pakistan Agricultural Storage and Services Corporation
PDNA	Post-Disaster Needs Assessment
PIDE	Pakistan Institute of Development Economics
PMEX	Pakistan Mercantile Exchange
TFP	total factor productivity

Executive Summary

Despite agriculture's central role in Pakistan's economic growth, the sector continues to struggle with decades old structural issues and its performance is weak. Spending on subsidies for water, fertilizer, electricity, and wheat procurement reached US\$1.25 billion in Punjab alone, far more than the funding provided for research and development. Inefficient and fragmented value chains, high post-harvest losses and transport costs, limited access to formal markets, dependence on subsidies, and underdeveloped storage and processing infrastructure are among the significant problems affecting agriculture. The deep-rooted traditional system, characterized by reliance on commission agents and the weak implementation of market reforms both restrict farmers' bargaining power, especially for smallholder farmers. Moreover, although on average the country's population is food secure in terms of caloric sufficiency, limited dietary diversity and inadequate access to nutritious foods cause widespread malnutrition.

Regardless of these issues, some positive changes have been introduced. The recent rollback of wheat procurement and the minimum support price policy presents both challenges and opportunities as long-sought reconsideration of crop choices and promotion of higher value or climate-resilient alternative crops now seems possible. Market reform under the Punjab Agriculture Marketing Regulatory Authority (PAMRA), created as an initiative of the World Bank's SMART program, presents another opportunity, particularly as the notified areas for central markets have been dropped, creating an opening for more competition. Although implementation remains slow, the Authority has begun paving the way for market modernization. However, this transition must be supported by improvements in market access, development of an improved and well-managed storage network, and well-functioning price mechanisms to protect food security and farmer incomes.

In addition to the marketing, value addition, and productivity challenges identified above, climate change will also create constraints and challenges for agri-food development and transformation in Pakistan. The sector faces likely increases in extreme events, particularly flooding, as well as longer-run chronic effects of heat on yields and labor productivity in agriculture, rising salinity and land drying, and increasing crop water requirements even as other demands for water increase.

Key findings of the report are highlighted here:

I. Shifting Wheat Policy. Wheat policy in Pakistan continues to shape farmer decisions and the broader functioning of the rabi production system. However, fluctuations in policy—such as removal of the minimum support price (MSP), followed by its reintroduction after just two seasons—can hamper crop diversification, delay investment in alternative crops, and weaken confidence in market reforms. The situation is further exacerbated by limited value chain development in alternate crops, weak price signals, inadequate storage facilities, limited agro-processing, and fragmented market linkages. The following recommendations are put forth to counter these issues:

Encourage crop diversification under a stable policy environment. Policy stability is essential, as farmers require predictability in order to make the best planting decisions. The

reintroduction of the MSP this year in response to the recent floods and related losses, although an understandable short-term measure, has created uncertainty regarding the longer-term direction of wheat policy. A more consistent approach would use the MSP only as a contingency option for a severe crisis, or better yet, develop a farmer registry that can target payments by size of farm or location. This would provide farmers the clarity needed to explore alternative crop options, which in turn and over time would reduce wheat production, if dictated by market forces, and would shift marginal wheat-producing areas toward higher value crops.

Expand value addition and processing. As recommended above, with the government signaling MSP as a contingency plan reserved for severe shocks, the rollback of wheat procurement and support policies is likely to lead to crop diversification, if the initiative is adequately supported. This is a valuable opportunity to invest in localized value chains and processing industries that can handle a wider range of crops. Value addition will also be essential to provide options for better nutrition.

II. Market Systems. Agricultural marketing in Pakistan continues to operate either through informal channels or formal systems with limited transparency or competition, and with poor price information for farmers. While reforms like PAMRA were introduced to modernize markets, most central markets continue to operate under outdated models. For many farmers, particularly small and medium ones, and those in remote areas, the journey from farm to market is hindered by long distances, poor road infrastructure, limited transportation options, and lack of aggregation facilities. Many farmers also lack access to adequate storage facilities, often relying on open-air or informal storage. The limited use of certified warehouses and absence of an effective warehouse receipt system is an additional constraint.

Recommendations:

Strengthen PAMRA to support market development. The establishment of PAMRA itself marked a significant policy shift in Punjab’s agricultural marketing. However, it is likely that the initiative was implemented hastily, and thus, its full potential remains untapped. Within the current departmental setup, PAMRA is best suited to evolve into a platform that standardizes auctions, digitizes market data, and regulates licensing and grading more effectively.

Explore electronic warehousing and digital market platforms. Investing in electronic warehousing systems and digital platforms can strengthen market stability and empower farmers by allowing them more flexibility in timing their sales. Electronic warehousing can enable safer, standardized storage, especially in flood-prone areas. If targeted to appropriate end-users and scaled properly, especially along with quality certification, integration with broader market reforms through PAMRA, and linkages to digital marketplaces, this system can serve as a critical buffer in volatile years.

Engage medium and large farmers as catalysts of change. Given the diverse characteristics of actors within the agri-food sector, a standardized policy approach is unlikely to fully tap the unique potential, needs, and capacities of each group. Tailored strategies are therefore needed for different farmer groups, which make use of quite varied value chains, to account for how each is likely to interact with the market.

III. Climate Change Effects. Expanding climate-smart agriculture and increasing resilience to extreme weather events and shifting rainfall patterns, as experienced in 2022 and 2025, is critical for the agri-food system. The costs incurred within several weeks of extreme flooding can be huge and are far beyond what the government is able to manage. In 2022, losses to agriculture, mostly crops, were on the order of US\$9.2 billion, and little international support was provided to cover these needs. Compensation for losses will always be insufficient, and therefore a concerted effort to develop resilience should be front-loaded.

Simulations using IFPRI's computable general equilibrium model (CGE) showed that the payoffs from reducing losses in labor and water productivity due to heat stress, avoiding land salinization, and averting yield decreases by using heat- and drought-tolerant practices and varieties can provide benefits of similar value to providing flood compensation, which is far beyond the government's potential. Finding the right balance for investments in these areas will be challenging, but necessary to minimize future losses from climate change.

Recommendations:

Design and implement programs to balance investment in resilience to floods versus adaptation to long-run climate effects. Floods have visible and dramatic costs while the longer-run climate change effects may be less obvious but are consequential. Costs of adaptation and resilience are large for a government that is fiscally strapped, so it is critical to ensure that funds are spent productively. A more complete analysis than was possible here would be a good starting point.

Address water scarcity in the face of increased water demand. Water demand is rising due to greater household, industry, and livestock requirements, as well as for environmental purposes and for crops whose water requirements are growing due to climate change. Crops account for the greatest share of water use, so crop diversification and better management are needed.

Address issues related to heat stress. Labor productivity is likely to fall with climate change as a result of rising temperatures, particularly in agriculture and for female workers, who provide much of the labor in agriculture. With higher evaporation and perhaps less available water, soil salinity levels could rise. Also, continental drying of agricultural land will affect South Asia and possibly Pakistan as well. An important task for research and extension services will be to support productivity by designing mechanization interventions for those activities most sensitive to heat stress.

Mainstream climate-sensitive agricultural services. The major effects of climate change in the agri-food system will be to affect yields and water use, which (along with heat stress) will change the profitability and competitiveness of most crops in the country.

IV. Cross-Cutting Themes. The recommendations also cover a number of cross-cutting themes that must be considered across all dimensions of agricultural transformation. These include the need for timely data, evidence-based research, stronger institutions, and the meaningful integration of women and youth. As crop patterns shift and markets evolve under climate pressure, improved data systems and research partnerships can support adaptive and targeted policies. At the same time, inclusive value chains that engage women and youth

through skills development, micro-credit, digital tools, and emerging agri-logistics opportunities will be essential to build both resilience and productivity across the agri-food system.

This report aligns with broader development goals of the Asian Development Bank's Strategy 2030, particularly the strategic objectives of Promoting Rural Development and Food Security; Tackling Climate Change, Building Climate and Disaster Resilience, and Enhancing Environmental Sustainability; Strengthening Governance and Institutional Capacity; and Accelerating Progress in Gender Equality.

Project Background

This assessment report is part of the Asian Development Bank's (ADB) regional technical assistance project TA6884: Green and Resilient Rural Recovery through Agri-Food System Transformation in the Asia and Pacific Region. The project aligns with ADB's comprehensive US\$14 billion support program (2022 – 2025), which represents a significant commitment to addressing the worsening food crisis in Asia and the Pacific. The program targets four critical areas: (i) impact assessment of COVID-19 on food and nutritional security and rural development; (ii) identification and promotion of smart, resilient, gender-responsive, inclusive, and sustainable agri-food systems; (iii) testing and demonstration of climate-smart agriculture interventions; and (iv) development of inclusive and sustainable agribusiness value chains.

In line with similar agri-food assessments conducted by the International Food Policy Research Institute (IFPRI) in other countries, this study aims to provide evidence-based analysis of Pakistan's agri-food system to guide ADB's strategic investments and policy support. Specific goals include:

- i. Evaluating post-COVID-19 impacts on food security and rural livelihoods.
- ii. Identifying short-, medium-, and long-term investment needs.
- iii. Analyzing transformation pathways for sustainable and resilient food systems.
- iv. Developing country-specific recommendations for ADB's lending pipeline.

Furthermore, under the specific mandate for Pakistan, the team was tasked with conducting two in-depth analyses: the first examines the recent developments in wheat policy, while the second reviews the impacts of climate change and extreme weather events. Given their far-reaching implications for national stability, food security, and agri-food system transformation, both areas are currently recognized as high priorities in Pakistan's agriculture and food security agenda. Little time was put into specific analysis of COVID-19 as its effects merged with other destabilizing macro and political events.

Data collection and analysis consisted of:

- i. A desk review of national and provincial strategies and policy documents.
- ii. A field mission and multiple in-depth interviews with representatives from government agencies, development partners, and local institutions.
- iii. A National Consultative Workshop, held in July 2025 in Islamabad, Pakistan, which incorporated real-time feedback using the interactive Mentimeter platform.
- iv. Descriptive analysis using agricultural and economic data from both national sources and international databases.
- v. Quantitative modeling using IFPRI's Rural Investment and Policy Analysis (RIAPA) framework and IFPRI's Computable General Equilibrium – Water (CGE-W) Model.
- vi. Consultations with the ADB team.
- vii. A Results Dissemination and Validation Workshop, held in December 2025 in Islamabad, Pakistan.

1. Current Situation of Pakistan's Agri-Food Sector

1.1 Background

Pakistan, like most developing economies, often views the agri-food sector as the backbone of the economy and its transformation as a key accelerator for increased per capita income, poverty reduction, and a more sustainable and climate-resilient economy. In fact, over recent decades, Pakistan has grown to be a lower-middle-income country and has seen agriculture's contribution to its gross domestic product (GDP) drop from 28.6% in 2006 to 23.7% in 2019, while the off-farm portion grew by about 4%.¹ However, annual agricultural growth rates were over 4% until 2000 and have been less than 3.0% since then. Between 1991 and 2019, Pakistan grew more slowly than regional neighbors (at about 2% annual per capita real growth since 2000 versus about 4.8% in India and Bangladesh), according to the World Bank.² Poverty had declined steadily in Pakistan until 2018, when the percent of poor in the total population was 21.9%. Since then, the decline has stagnated and the number of poor has grown.³

In the agriculture sector, output per worker has grown at just 0.7% per year in Pakistan, significantly below the South Asia average growth of 2.8%. This slow output growth is directly related to slow yield growth, as wheat yields are just half that of China's and are 15% below India's yields. Pakistan's use of water in agriculture puts it among the 10% worst-performing countries in terms of agricultural water productivity.⁴

Over the decades, Pakistan has gone to the International Monetary Fund (IMF) to borrow funds numerous times and generally has not followed through on the reforms required as loan conditions⁵. From 2022 to 2024, the country suffered a broad economic crisis, driven in part by expenditures on COVID-19 responses, the higher cost of imports due to the Russia-Ukraine war, and the 2022 floods, which caused US\$16.9 billion in damages. Prior to that period, there had been a facility with the IMF, but disagreements with the government over energy subsidies, taxation and external borrowing, the low export base, and other issues led to the facility's withdrawal. Inflation reached 37% in May 2023, industrial output dropped by 10%, GDP flattened, and the value of the Pakistan rupee declined from PKR 136 per dollar in 2019 to PKR 283 in 2024. Since then, a new Extended Funding Facility has been set up with the IMF, inflation has subsided, exports have grown, and debt has been rescheduled. The government

1 Thurlow, J., B. Holtemeyer, S. Jiang, K. Pauw, and J. Randriamamonjy, "Measuring Agrifood Systems: New Indicators and Global Estimates," IFPRI Discussion Paper 2339, IFPRI, 2025. <https://hdl.handle.net/10568/174848>.

2 Durand, O., and B. Saeed, "Reforms for a Brighter Future: Policy Note 4—Unleashing the Agri-Food Sector," World Bank, 2023. <https://thedocs.worldbank.org/en/doc/59dbf031f78c1a096ef5692feac018e9-0310062023/original/Pakistan-Reforms-For-A-Brighter-Future-Policy-Note-4-Unleashing-the-Agri-Food-Sector.pdf>

3 Wieser, C., and M. Meyer, "Pakistan's Poverty Trajectory: Progress, Peril, and the Path Forward," World Bank Blog, September 23, 2025. <https://blogs.worldbank.org/en/endpovertyinsouthasia/pakistan-s-poverty-trajectory--progress--peril--and-the-path-for>

4 Ibid., Durand, O. and B. Saeed.

5 Husain, M.A., *Rescuing Pakistan's Economy*, Issue Brief, The Atlantic Council, April 1, 2025.

<https://www.atlanticcouncil.org/in-depth-research-reports/issue-brief/rescuing-pakistans-economy/#:~:text=An%20inability%20to%20save%20constrained,investment%20was%20also%20much%20lower>

intends to sell state-owned enterprises and to create an austerity budget and is aiming for a 40% gain in tax revenue.⁶

These changes are a move in the right direction, but more needs to be done to put the country on an inclusive, high-growth path⁷. Some critical constraints on the economy appear to be diminishing, including recurrent fiscal and current account deficits. However, growth is still constrained by “protectionist trade policies, unproductive agriculture, a difficult business environment, a heavy state presence in the economy, and a financially unsustainable energy sector.”⁸

1.2 Structural Transformation in the Agri-Food System

Pakistan’s agri-food system (AFS), including primary (on-farm) agriculture as well as the off-farm components, accounts for 42.2% of the country’s GDP and employs 49.4% of its workers. Primary agriculture alone accounts for 24.7% of GDP and 35.8% of employment. Thus, remuneration is better in the off-farm industries of the AFS than within primary agriculture.⁹ From 2006 to 2023, primary agriculture’s share in GDP dropped by 4%, while the off-farm portion grew by 4%, suggesting a small but significant shift toward better employment within the system.

Table 1 shows the basic structure of the agricultural economy of interest in this analysis. The first column provides growth rates for the country’s main crops from 2006 to 2023. Most grew at around 3% per year in terms of contribution to GDP. Maize substantially exceeded that rate, while cotton’s contribution declined dramatically over these years. Wheat has grown more slowly, as expected for a staple crop. The next three columns show the relative contribution to GDP of the total AFS and its component parts: primary agriculture and the off-farm portion. The rows add two groups, livestock and other crops, where the latter is the remaining crops not listed individually. The column headed AFS shows the *proportional* contributions to GDP of these different activities, comprising both primary agriculture and the off-farm component. Wheat and vegetables are the crops with the largest contributions to GDP at about 10% each. Other Crops were the only activity nearing this level. Livestock accounted for about 50% of the total AFS contribution to GDP.

Among crops, vegetables surprisingly accounted for the leading crop contributor to primary agriculture GDP, accounting for 11.9%, while most of the remaining crops had much lower contributions. Livestock was by far the largest contributor, at 58.9%. For the off-farm component of AFS GDP, the largest crop contributors were wheat, generating 17.6% of all off-

6 Van Der Eng, P. “Pakistan’s Economy: Fallout of 2022 Economic Distress Magnified the Need for Structural Reforms,” *Asian Economic Policy Review* 20 (1): 128-146, 2025. <https://doi.org/10.1111/aep.12486>

7 Ibid.

8 World Bank, *Reforms for a Brighter Future: Time to Decide—Policy Notes: Fundamental Policy Shifts for Pakistan’s Sustainable Economic Development*, 2024. <http://hdl.handle.net/10986/41358>

9 In the absence of “food dollar” statistics in most countries, which show the off-farm portion of each consumer dollar spent on a commodity, the report by Thurlow et al. (2025) developed a methodology to determine some of these proportions. Thurlow, J., B. Holtemeyer, S. Jiang, K. Pauw, and J. Randriamamonjy, *Measuring Agrifood Systems: New Indicators and Global Estimates*. IFPRI Discussion Paper 2339, IFPRI, 2025. <https://hdl.handle.net/10568/174848>

farm value added, and rice, with 10.3%, while livestock's off-farm contribution was lower than its contribution to primary agriculture.

The large crops with the highest off-farm value added undergo only rudimentary processing, namely simple rice milling and wheat flour milling, with little attention to either grading or standards. Cotton processing is more elaborate, including carding and spinning activities. Apart from those three crops, the off-farm portions for crops, whether larger or smaller than the primary agriculture portion, individually account for only very small contributions to GDP. Similar stories can be told about the export and import proportions, where rice and cottonseed oil make up the bulk of exports, while the remaining crops are not exported much. Oilseeds—generally edible palm oil—and pulses dominate imports. Given the declining production of cotton, imports of that commodity have been growing.

Table 1: Basic Structure of Major Crops, Processing, and Trade, 2006-2023

	GDP Growth (2006-23)	Share of Column GDP (%)				
		AFS*	Primary Ag.	Off-Farm	Exports/ Output	Imports/ Demand
Rice	3.2	6.8	4.5	10.3	15.6	0.3
Maize	4.7	1.8	1.6	2.1	8.2	1.9
Pulses /Oilseeds	3.1	1.5	0.5	3.1	17.6	76.4
Cotton	-1.8	6.2	4.9	8.2	0.9	15.3
Wheat	2.2	10.3	5.5	17.6	0.1	2.8
Vegetables	3	10.1	11.9	7.3	2.7	2.3
Sugar	3.1	4.1	3.1	5.7	1.6	0.1
Other Crops	--	8.8	9.1	8.3	--	--
Livestock	--	50.4	58.9	37.4	--	--

Source: Diao and Thurlow, 2025, *Appendix 1* to this report.

Note: *AFS is the sum of the contributions of primary agriculture and the off-farm portion.

These results suggest the direction that crop expansion could take to achieve a rural transformation that reflects the government's vision for a dynamic economy. Specifically, exports of vegetables and maize could grow, as they already have some exposure to international markets. Also, import substitution could reduce the large imports of cotton pulses and oilseeds. The proportions of off-farm GDP generation could rise in most crops, but this will require more developed processing and retailing sectors than have emerged in Pakistan to this point.

1.3 The Investment Position in Pakistan

Investment in infrastructure, such as roads, technology and communications, and irrigation and water resources systems, and in health and education, can increase the likelihood that other investments will lead to more economic growth. However, in addition to Pakistan's poor

infrastructure, inflation, high interest rates, and a negative “ease of doing business” can negatively affect investment in the agri-food system. With the government running deficits and spending large amounts on policies that lead to circular debt problems in energy and, until recently, wheat procurement, there has been little scope for public sector investments in more beneficial programs.

Given the instability of Pakistan’s macroeconomy over the past decades and particularly in the recent past, it is no surprise that investment has been low. For instance, in FY2015, Pakistan ranked 151 among 175 countries in terms of its investment rate, much below its neighbors, India (32), Sri Lanka (36), and Bangladesh (40)¹⁰. In 2024, China had an investment rate of 40%, Bangladesh reached 31%, India’s was 30%, and Sri Lanka’s was 19%, while Pakistan’s investment rate was 11%, which includes some effect from the China-Pakistan Economic Corridor.

There are important examples and programs with potential that can move ahead as the government gets its house in order on the challenges presented above:

The China-Pakistan Economic Corridor is a framework of regional connectivity to benefit Pakistan and other regional countries. It is intended to improve geophysical links using better road, rail, and air transportation systems with “frequent and free exchanges of growth and people to people contact.” It commenced in 2015 with project funds of \$46 billion. While the program has had some ups and downs, it is continuing and, as of May 2025, was being extended to include Afghanistan.

With respect to agriculture, the government has been spending on the sector for many years, but rather than investments, funds were used for “direct and indirect subsidy support to agriculture and irrigation in Punjab and Sindh [which] has accounted for about US\$2.2 to \$2.7 billion of public spending per year, including tax relief for inputs, import and export subsidies and revenue gap financing.”¹¹

The two main topics considered in this analysis—changes to wheat programs and the damaging effects of climate change—are areas ripe for investment to transform the AFS and manage climate change effects. These are the same areas promoted in the Reforms for a Brighter Future Policy Note by the World Bank (footnote 8).

1.4 Current Policies and Programs

In the last 10 years, several policy documents and strategies have been introduced by Pakistan’s federal and provincial governments, with the aim of modernizing agriculture, promoting climate-smart practices, and improving food security and nutrition outcomes. These include the National Food Security Policy (2018), provincial agricultural policies, and various frameworks around climate change adaptation and water resource management. Additionally,

10 Ali, A., “Savings and Investment in Pakistan, State Bank of Pakistan Staff Notes,” State Bank of Pakistan, 2016.
<https://www.sbp.org.pk/publications/staff-notes/SavingInvestmentStaffNote-Jan-16.pdf>

¹¹Durand, O., and B. Saeed, “Reforms for a Brighter Future: Discussion Note 4—Unleashing the Agri-Food Sector,” 2023.
<https://thedocs.worldbank.org/en/doc/59dbf031f78c1a096ef5692feac018e9-0310062023/original/Pakistan-Reforms-For-A-Brighter-Future-Policy-Note-4-Unleashing-the-Agri-Food-Sector.pdf>

regulatory reforms such as creation of the Punjab Agricultural Marketing Regulatory Authority (PAMRA) have signaled a shift toward more market-oriented, private-sector-friendly approaches. A complete list of recent policies is given in Table 2. The introduction of these policies reflects a growing recognition among government agencies, development partners, and research institutes that neither Pakistan’s agriculture sector nor the AFS can truly evolve under out-of-date policies, some dating back as far as the pre-partition era of 1939, and that business-as-usual approaches will no longer suffice to address the challenges being faced.

Implementation of these new policies, however, has thus far been limited. During the past decade, the country faced a persistently unstable political environment, with frequent leadership changes, making it difficult to sustain momentum. Shifting policy directions and limited coordination between federal and provincial governments weakened implementation.

Table 2: List of Recent Relevant Policies and Acts

	Policy	Year Introduced	Description
1.	National Food Security Policy	2018	Considered the core document for food security planning. Provides a national strategy on availability, access, utilization, and stability of food.
2.	National Climate Change Policy	2012; updated 2021	Provides a foundational framework for adaptation and mitigation, focusing on vulnerable sectors like water, agriculture, and coastal areas
3.	Pakistan Climate Change Act	2017	Provides the legislative architecture for national climate governance
4.	National Water Policy	2018	Provides a framework for integrated water resource management, aiming to address water-security challenges.
5.	Punjab Agriculture Policy	2018	Provincial agriculture policy
6.	Punjab Agricultural Marketing Regulatory Authority (PAMRA) Act	2018	Introduced to reform and modernize the marketing system in Punjab, replacing the old Agricultural Produce Markets Act
7..	Sindh Agriculture Policy	2018-2030	Provincial agriculture policy
8.	Khyber Pakhtunkhwa Agriculture Policy	2015	Provincial agriculture policy
9.	Khyber Pakhtunkhwa Food Security Policy	2021	Aims to ensure food security and rural livelihoods
10.	Balochistan Organic Agriculture Policy	2024	Provincial agriculture policy

Note: Other guiding documents include policies/acts pertaining to inputs (seed, fertilizer, pesticide) as well as provincial food safety acts and regulations, and national and provincial disaster management acts, preparedness plans, and flood and drought management frameworks.

Moreover, recurring external shocks, such as floods and other climate-related events, continued to divert attention and resources, further exacerbating the situation. Other issues that have contributed to the slow uptake of policy include a top-down blanket approach to policy design,

with limited engagement from relevant stakeholders and without consideration for different characteristics each group may possess.

1.4.1 Recent Wheat Policy Developments

Wheat policy in Pakistan is undergoing a major shift. Wheat had long been managed by the both the federal and provincial governments through a countrywide procurement and minimum support price (MSP) program. However, faced with stringent IMF conditions, the Government has committed to phase out this program and to wind down the Pakistan Agricultural Storage and Services Corporation (PASSCO). As a result, the Punjab government announced in May 2024 that it would no longer procure wheat. However, the MSP was reintroduced in 2025 in response to the recent floods. Further discussion of this policy change and resulting implications are found in Chapter 2.

1.4.2 Regional Tensions and the Indus Waters Treaty

In discussing policy, it is imperative to mention the recent regional tensions between India and Pakistan that have begun to spill over into shared water governance, with serious implications for Pakistan’s agriculture sector.

The Indus Waters Treaty (IWT), signed in 1960 with facilitation of the World Bank, allocated rights over the six rivers of the Indus Basin, giving Pakistan control over the three western rivers (Indus, Jhelum, and Chenab) and India over the three eastern ones (Ravi, Beas, and Sutlej). For decades, this Treaty was respected and upheld, even during times of heightened tensions between the two countries.

In 2025, however, as tensions were growing, India suspended its participation in key mechanisms of the Treaty, including data-sharing and annual meetings, and threatened to halt water flows and construct dams on the western rivers. This raises serious concerns for Pakistan, as about 80% of irrigated agriculture depends upon the Indus River flows, particularly in the provinces of Punjab and Sindh, both of which are critical to national food production.

1.4.3 Example Donor Approaches and Implementation Strategies

In this section, we point out several recent and ongoing project examples to illustrate strategies and techniques used to accomplish project objectives. We do this to highlight possible options in a “toolkit” that might be used in future efforts, and to provide options that might help implement recommendations in Chapter 5.

Perhaps the most encompassing project related to our interests has been the SMART program of the World Bank with the Punjab government, which ran from the end of 2017 to 2024. Evaluations exist for a range of program activities that addressed agricultural productivity, value addition, and climate change.¹² The ADB complemented this effort with several significant projects, located in Khyber Pakhtunkhwa (KP) and the Punjab. The KP project reviewed is the Khyber Pakhtunkhwa Food Security Support Project (KPFSSP)¹³ and the one

¹² This section is drawn from: World Bank, *Implementation Completion and Results (ICR) Report (IBRD-88090-001, ICR00063)*, annexes 7 and 8, 2025. <https://documents1.worldbank.org/curated/en/099021125130542105/pdf/BOSIB-16984764-2911-4c57-8231-2c3832b88d31.pdf>

¹³ Asian Development Bank, *Khyber Pakhtunkhwa Food Security Support Project (KPFSSP)*, Project number 56151-001, 2023. <https://www.adb.org/sites/default/files/project-documents/56151/56151-001-rrp-en.pdf>

in Punjab is the new Punjab Climate-Resilient and Low-Carbon Agriculture Mechanization Project (which we are calling PMP).¹⁴

In most projects, there was a significant **use of digital tools** to address various objectives. The SMART program used an e-voucher system to target subsidies to seed and fertilizer. Similarly, ADB's KPFSSP encouraged adoption of resilient agricultural production practices through the provision of "high-yielding, climate-resilient, and certified seeds and fertilizer," and vegetable production packages. These subsidies are provided through an e-wallet that enables farmers to obtain these subsidized inputs and agriculture production tools. ADB's PMP will include a focus on "policy reforms to improve female laborers' livelihoods by updating the Punjab Agriculture Policy and (using) digital registration."

The use of digital tools is not limited to direct interactions with farmers; these tools can also be used in strengthening the relevant government institutions. For instance, the KPFSSP supports "(i) establishment of a unified sex dis-aggregated digital database of farmers in the province for more targeted extension services delivery, information availability, and financial services; (ii) integration of remote sensing technology in monitoring crop stress by agriculture extension...; and (iii) installation of an ICT-based pest surveillance system for early warning and timely management of climate-induced pest attacks."

Many programs **used targeted levels of expenditures and institutional provision of new policies and strategies to meet targeted objectives**. In the SMART program, value chain improvement was considered achieved when by 25% of wholesale markets were managed privately. Climate-change resilience had specific targets for the percentage of area covered in selected canals that delivered water. Additionally, specific levels or proportions related to spending in the provincial and federal governments Annual Development Plans (ADP) can often be used as targets. SMART included raising the proportions of expenditures on agriculture, on high-value crops, and on climate-smart agriculture, and also stipulated the ratio of expenditures on preventative programs for livestock versus livestock healthcare programs. There were also deliverables related to the numbers of services or assets provided to farmers and a line item for female farmers.

The creation and acceptance of policies can be measured similarly. The Punjab Crop and Livestock Research and Extension policy and strategy, as well as PAMRA, were mandated in SMART. In these cases, success was simply to get them written, agreed upon by the government, and approved by the legislature (if necessary). ADB's PMP on mechanization will work with the Punjab provincial government to develop a "comprehensive policy and regulatory framework to promote standardized and sustainable mechanization.. Also, the PMP has a focus on policy reforms to improve female laborers' livelihoods through updates of the Punjab Agriculture Policy and digital registration.

¹⁴ Asian Development Bank, *Pakistan: Punjab Climate-Resilient and Low-Carbon Agriculture Mechanization Project*, Project Number: 57196-001, September 2025. <https://www.adb.org/sites/default/files/project-documents/57196/57196-001-sddr-en.pdf>

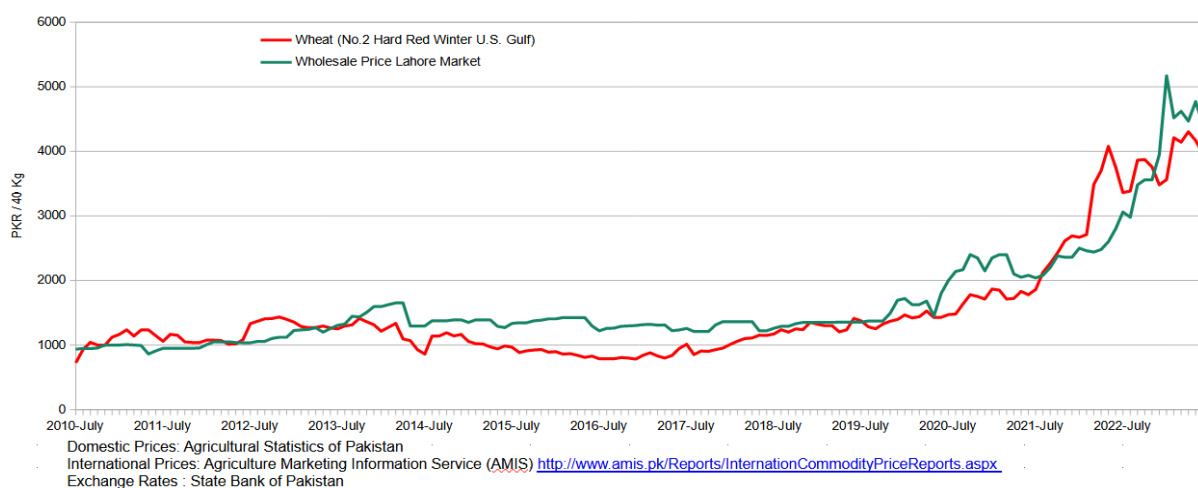
Finally, substantial improvements of laboratories, training institutes, and financial programs are often central in these projects. In PMP, a matching grant program will support the introduction of advanced farm machines with up to 30% of the cost covered, and the SMART program's agriculture insurance programs were essentially subsidized financial programs that also promoted risk management. The KPFSSP will enhance the KP agriculture department's capacity to expand its seed production and multiplication system and the capacity of soil and water testing labs. In PMP, the capacity of public sector research laboratories to measure greenhouse gas (GHG) emissions will be enhanced and a speed breeding facility will also be established to accelerate the development of climate-resilient crop varieties at the University of Agriculture-Faisalabad.

2. Deep Dive: Implications of Wheat Value-Chains and PAMRA for Rural Transformation in Pakistan

2.1 Wheat Value Chains

Wheat is arguably the most important crop in Pakistan, cultivated on more than 22 million acres¹⁵ during the rabi season each year. Annual production has hovered around 26.7 million metric tons (mmt)¹⁶ over the past decade. Wheat's significance, however, goes beyond just agriculture, as it holds critical political and economic importance; it also is a key symbol of the country's broader food security challenges. For decades, wheat has been regarded as a strategic crop. While the government gradually reduced direct intervention in the markets for other food commodities, wheat remained an exception until recently. The crop was tightly integrated into a state-led procurement system and MSP program that influenced both farmers' sowing decisions and market outcomes.

Figure 1: Monthly Wheat Prices in Domestic and International Markets, 2010-2022



In theory, the procurement price was calculated as a markup on the estimated cost of production, with figures derived from government surveys and expert consultations. However, this created distortions between domestic and international market prices. As a result, domestic wheat prices often diverged significantly from international benchmarks, especially during years of global volatility or bumper domestic harvests (see Figure 1).

Figure 1 compares monthly wheat prices in Pakistan (Lahore wholesale market) with international wheat prices (U.S. Gulf No.2 Hard Red Winter). While the overall trend in both markets has been similar, domestic prices remained consistently lower than international prices

15 The 10-year average (2014-15 to 2024-25) is based on data from Agriculture Statistics of Pakistan.

16 The 10-year average, (2014-15 to 2024-25) is based on data from Agriculture Statistics of Pakistan.

from late 2014 to around 2018. After 2018, domestic prices began to rise sharply, often exceeding or closely matching international prices, especially from 2021 onward.

The MSP served not only as a price guarantee but also as a powerful signal across the agri-value chain. It influenced sowing patterns, expected profitability, and even guided the purchasing behavior of flour mills and intermediaries. However, this near-guaranteed return led to several unintended consequences: limited crop diversification, inefficient input allocation, a growing fiscal burden on the government,¹⁷ and ultimately, the stagnation of AFS transformation.

Limited crop diversification is among the most notable outcomes of this long-standing policy. Farmers, particularly medium farmers with some marketable output, have had little incentive to shift away from wheat as long as assured prices and government procurement minimized market risk. Even in agro-ecological zones better suited for other crops, the dominance of wheat persists.

The imbalance is also evident in the allocation of agricultural inputs and subsidies in Pakistan. Over the years, fertilizer subsidies, water usage, and credit support have predominantly been geared toward wheat cultivation. In many regions, agricultural water usage in wheat is disproportionately high, even in areas where wheat's marginal productivity is declining. Similarly, access to credit and mechanization is often structured around the wheat production cycle, leaving alternative crops underfunded, under-mechanized, and unable to reach their full potential.

The overall outcome of these patterns has been the stagnation of rural transformation. While wheat production has kept millions of rural households afloat and food secure in terms of caloric sufficiency, it has done little to improve nutritional and dietary diversity outcomes. Broader development of the overall agricultural economy has also been limited. Few value chains have emerged around wheat, or any other rabi season crop, that could drive broader economic linkages such as off-farm employment, agro-processing, or rural service markets. Additionally, because the government has traditionally handled wheat procurement and storage, there has been little private investment in storage facilities by producers or other actors along the value chain.

2.1.1 The Challenges and Consequences of Exiting the Wheat Procurement and MSP Program

The government-led procurement and MSP program was long criticized for placing a heavy fiscal burden on the government. Policymakers have frequently debated its contribution to reduced market competition, inefficiencies in flour milling, rising public debt, and the government's limited ability to effectively support small farmers and poor consumers. Studies have consistently concluded that the system primarily benefited larger farmers with marketable surpluses, middlemen who bought from small farmers at low prices to recover cultivation loans,

¹⁷Anjum, A., and M.F. Faisal, *The Cost of Government Interference in Agricultural Markets*, Pakistan Institute of Development Economics (PIDE), 2024.

flour millers who received subsidized wheat quotas, and banks that financed the operations and profited from delayed repayments.^{18,19}

Under the current 37-month Extended Fund Facility arrangement with the IMF, Pakistan agreed to gradually exit from direct intervention in commodity markets, including phasing out government procurement of wheat by 2026 to reduce the fiscal burden and improve market efficiency. However, in 2024, Punjab, the largest wheat producing (and procuring) province, moved ahead of schedule. The provincial government, as per tradition, announced the MSP before the sowing season, but later opted to not procure any wheat. The speed and manner in which the decision was carried out is thought to have also been influenced by a mounting circular debt²⁰ tied to commodity operations, which made it financially unviable for the province to continue procurement.

This sudden policy shift left farmers without a guaranteed buyer, despite having planned their production around the announced support price, and they were forced to sell at prices well below the announced MSP. The subsequent 2024/25 season saw a year-on-year decline in wheat cropped area and production, albeit in line with the historical trend. Wheat prices again remained low.

The impacts of this policy change extend beyond the farmers themselves. The potential dissolution of PASSCO, which has historically managed wheat storage for food-deficit regions and the military, puts wheat-deficit provinces in a precarious position. These provinces, which once relied on federal support for wheat storage, now face the daunting task of developing their own storage infrastructure—a process that may take years. Moreover, the shift away from subsidized wheat to reliance on open market purchases will likely increase costs, increasing financial strain on these provinces.

Interestingly, the MSP was reintroduced in 2025 (after the first draft of this report was written) in response to the recent floods, fixed at PKR 3,500 per 40 kg, with a procurement target of 6.25 mmt for strategic reserves, to be carried out via the private sector in order to improve transparency and efficiency. Although an understandable short-term measure, this step has created uncertainty regarding the longer-term direction of wheat policy.

2.1.2 A Deeper Look into Wheat Sales and Storage

Figures 2 and 3 show the production and sales trends across different farm sizes, and interestingly, challenge the common perception that larger farms dominate wheat sales. While they may have historically received a significant share of government procurement, the data show that a substantial portion of marketed wheat comes from small and medium farms. Of the total 24.4 mmt produced, only 41% (9.9 mmt) was sold, with more than half (56%) coming from farms with less than 12.5 acres of land. This indicates that smaller farmers are highly

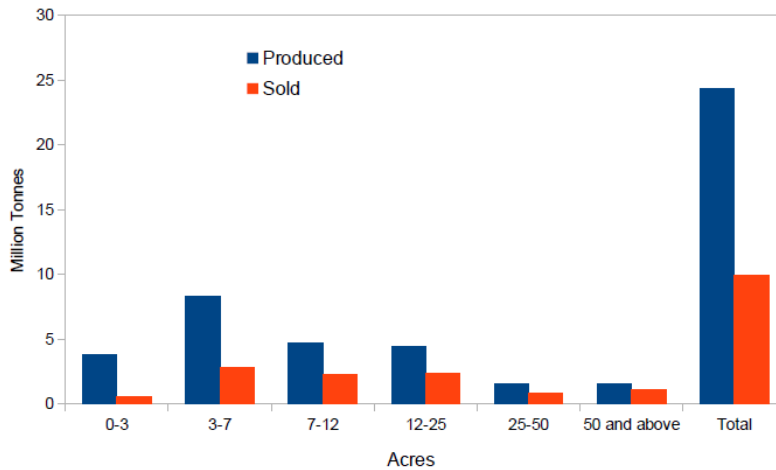
¹⁸ Ibid.

¹⁹ Rana, A.W. *Rationalization of Wheat Markets in Pakistan: Policy Options*. PACE Policy Research Paper 4. International Food Policy Research Institute, 2020. <https://hdl.handle.net/10568/143928>

²⁰ The Sindh government's decision to raise MSP from PKR 2,200 to PKR 4,000 per 40 kg in 2022 to support flood-affected farmers, subsequently prompting Punjab to also do so, was a contributing factor in rising circular debt.

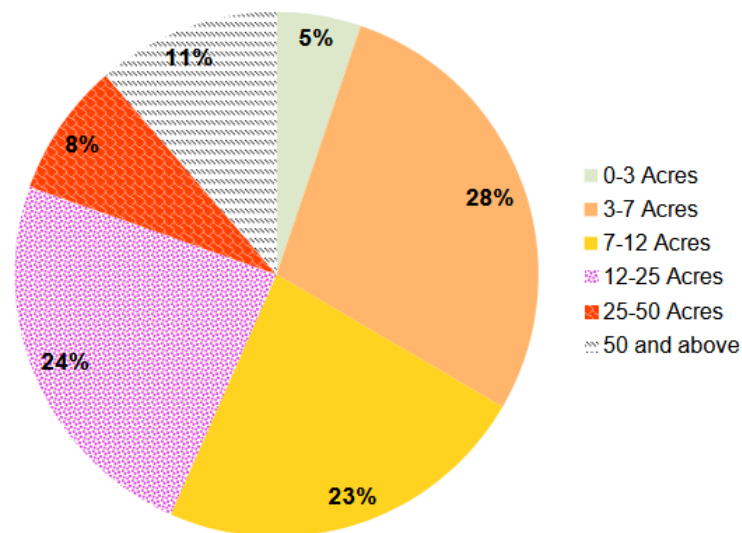
engaged in wheat markets, even if their production volumes are smaller per farm. Most of these sales go through commission agents, not directly to processors or government procurement centers.

Figure 2: Wheat Produced and Sold per Farm-Size Category



Source: Based on production data from HIES 2018-19
Data on percentage of wheat sold from PRHPS Round 3.5 (2014)

Figure 3: Distribution of Wheat Sales per Farm-Size Category



In the past, the government purchased and stored roughly one-fourth of the national wheat output, equivalent to about 6.1 mmt using these figures. While the government is likely to continue buying around 4.0 mmt for strategic reserves, that still leaves about 2.0 mmt that must

now find other buyers or be stored by producers themselves. In hindsight the markets did manage to clear without any government procurement, albeit the price received by farmers just covered the cost of production. As mentioned earlier, in 2025, the government announced a procurement target of 6.25 mmt to build strategic reserves, to be carried out via the private sector.

For the 2024/25 wheat cropping season, the government of Punjab introduced a set of incentives to promote the use of electronic warehouse receipts (EWRs) with the intention of providing secure storage and a reliable liquidity option. The program offered farmers free storage for up to four months in accredited warehouses along with quick access to credit of up to 70% of the wheat's market value against EWR receipts.²¹ The response, however, was underwhelming, as only 11 farmers are reported to have participated in the pilot phase, with a total wheat storage of less than 1,600 metric tons.²² This low response has been attributed mainly to delays in program implementation and awareness, along with lack of access to accredited warehouses by small farmers and high transport and transaction costs. Given these limitations in implementation, the EWR model and approach should not be dismissed at this point. During the consultative process, experts were also of the opinion that the scheme is more likely to benefit larger farmers and millers, who possess the means and information to navigate the system.

2.1.3 Opportunities for Agri-Food Systems Transformation within the Wheat Value Chain

The ongoing shifts in the wheat sector go beyond immediate concerns of farmer profitability or provincial storage capacities, raising deeper questions about the direction of agricultural policy, the future of rural livelihoods, and the role that government can play. As such, these changes create a valuable opportunity for AFS transformation, offering an opening to challenge the status quo and drive meaningful and lasting progress across the rural economy.

To identify potential drivers of change within the agri-food system and understand how the transformation might unfold within the wheat value chain, it is critical to recognize the diversity within value chains, especially with regards to the different categories of farmers and how they engage with other stakeholders.

Wheat producers can be divided into three groups: small and marginal farmers, medium farmers, and larger commercial producers. Each group operates within different market structures, faces unique constraints, and interacts with storage and marketing systems in distinct ways. A snapshot of these groups is given in Table 3.

As summarized in the table, marginal and small farmers mostly grow wheat for their own household needs and sell only limited surpluses. These farmers will store some wheat to meet their consumption needs across the year. Their surplus production is generally sold at harvest, with little to no processing. However, given small farmers' important contribution to

²¹ <https://punjab.gov.pk/node/6416>

²² Profit, "Punjab Government reviews Wheat Policy amid Declining Production and Market Instability, August, 11, 2025. <https://profit.pakistantoday.com.pk/2025/08/11/punjab-government-reviews-wheat-policy-amid-declining-production-and-market-instability/>

production, their storage dynamics should be understood. Small farmers rely heavily on traditional marketing channels involving commission agents and middlemen, rather than formal processors or government buyers. Wheat may also function as a form of currency or store of wealth for them, often used in barter or informal exchanges, which further entrenches reliance on traditional systems.

- Due to limited access to modern storage, credit, and market infrastructure, small farmers are likely to continue operating within this informal system for the foreseeable future. Any agricultural transformation strategy must therefore look to better serve them within the system they already use. Introducing competition among commission agents, improving local market infrastructure, or reducing transport costs could be areas to explore.

Table 3: Schematic of Agri-Food System Transformation through the Wheat Value Chain

Marginal & Small “Traditional” Farmers	Medium Sized “Transitional” Farmers	Larger Sized “Modern” Farmers
<ul style="list-style-type: none"> • Produce mainly for home consumption. Sell surplus. • Little Individual contribution, major collective contribution of wheat in the market. • Poorly integrated into the market • Normally sell to middlemen / commission agents. • Unlikely users of EWRs as they may face high transaction costs (transport etc) • Rely mostly on Informal credit • Likely to continue to function within the traditional system. 	<ul style="list-style-type: none"> • Market oriented. • Better market access than smaller farmers. • Have the capacity to modernize, but might face credit limitations. • May have access to both formal and informal credit • Better situated to benefit from EWRs • Generate rural non-farm demand 	<ul style="list-style-type: none"> • Produce for commercial markets. • Better market access. • Historically better positioned to benefit from government procurement. • Have the capacity to be early adopters of technology and will determine success of modern marketing systems • Have the Capacity to diversify without much credit limitations • Have the capacity to develop adequate storage. • Spending habits similar to that of urban consumers (Mellor and Malik, 2017)

Medium farmers, by contrast, are more commercially oriented and better positioned to engage with emerging modern market mechanisms such as EWRs and accredited storage facilities. While they still face challenges, particularly around credit availability and infrastructure, this group has considerable potential to act as the main agents in many dimensions of an agricultural transformation.

- Targeted policy measures that improve access to affordable credit, enhance market linkages, and invest in storage infrastructure can empower medium farmers to adopt modern practices, reduce postharvest losses, and participate more effectively in formal markets. In doing so, they can stimulate broader economic diversification in rural areas. In a section below, we argue that areas such as contract farming may be slow to develop, given the low off-farm proportions of the AFS found in the country relative to other lower-middle-income countries. Some trends, such as rising urbanization and incomes that raise the demand for quality, will move these possibilities forward; however, the existence of contracts for farmers is not enough, especially with an inefficient legal system.

Large commercial farmers have historically benefited the most from government procurement programs, subsidies, and formal financing. Their capacity to adopt new technologies, build adequate storage, and access broader markets positions them as early adopters and innovators in the sector. In principle, these farmers play an important role in demonstrating the benefits of modern systems, encouraging wider adoption among medium and eventually small farmers.

- However, the wheat sector, with its heavy reliance on the government procurement and MSP programs, has not shown much evidence of transformation. Moreover, focusing policies solely on this group risks deepening rural inequalities if smaller farmers continue to be excluded from modernization efforts.

Storage and marketing infrastructure investment are critical for shaping a transformation of the wheat sector. Much of the country's wheat is still stored in informal, often low-quality facilities. The Punjab government's push toward modernizing storage through use of EWRs is an important step toward building a more efficient and transparent value chain. However, realizing the full potential of this system requires careful attention to design and implementation. It is essential to identify the intended users of the system—whether it be different groups of farmers or even traders or middlemen—and to keep in mind their characteristics and limitations.

- To promote inclusivity, options such as farmer cooperatives could be explored, allowing smallholders to aggregate produce for reduced transaction costs. Such measures could enhance the bargaining power of smaller farmers, and mitigate the risk of capture by dominant market actors, as happened to the government wheat procurement program.

2.2 Developments in the Punjab Agricultural Marketing Regulatory Authority (PAMRA)

Established in 2018 and amended in 2020, PAMRA was created to modernize and restructure the agricultural produce markets in Punjab province. The Authority replaced the very old Punjab Agricultural Produce Markets Act of 1939, which was criticized for creating inefficiencies, upholding monopoly control by commission agents, and limiting farmer access to markets. In contrast, PAMRA's mandate includes licensing a variety of public and private markets, regulating auctions, overseeing grading and food safety standards, and promoting better price discovery through digital platforms that provide market data, and developing the potential for direct sales from farmers and wholesalers to final buyers. PAMRA offers a legal and institutional frame to rethink how agricultural markets function. Further policy development was needed to provide PAMRA with necessary legal and implementation frameworks, and so the Punjab Agricultural Marketing Regulations, 2021, and the Punjab Agricultural Marketing Financial Regulations, 2023, among others, were promulgated with support from the World Bank SMART program.²³

²³ This section is drawn from the World Bank, *Implementation Completion and Results (ICR) Report* (IBRD-88090-001, ICR00063) (annex 7 and 8), 2025. <https://documents1.worldbank.org/curated/en/099021125130542105/pdf/BOSIB-16984764-2911-4c57-8231-2c3832b88d31.pdf>; and *ADB TA 9866-PAK: Preparing the Punjab Resilient Agriculture Value Chain Project*, Finnish Consulting Group and Asian Development Bank, 2024. https://www.adb.org/sites/default/files/project-documents/53070/53070-002-tacr-en_4.pdf

Five years on, however, PAMRA's progress has been limited. While more than 200 private markets have been registered under its framework, concerns remain over their quality, transparency, purpose, and even functioning. (Indeed, it may be that many of these markets were established to meet the SMART program requirement that 25% of central markets be privately managed!) Moreover, despite an ambitious mandate to overhaul the old system, much of the traditional market structure remains intact. As Ahmed and Ali (2024) note, "there are some differences between provinces due to recent legislation, but the core functioning model remains the same. This includes the concept of a physical marketplace, managed by a market committee, relying on commission agents acting as middlemen, with auctioning as the price discovery mechanism." Many public markets are struggling financially, with nearly one-third reportedly running losses or indebted to the Punjab Department of Agriculture.²⁴

Commission agents or *arthis* continue to play a central role in the marketing system; they are the primary intermediaries between farmers and buyers who organize the sale of farm produce and provide essential credit to small and marginal farmers. Farmers largely depend on these agents for credit and loans, often at high interest rates. Arthis also act as informal service hubs, connecting farmers to input suppliers and managing risk during bad crop years by allowing flexible repayment arrangements. Despite their utility, the system remains opaque, with little transparency around pricing or loan terms, and arthis are widely seen as the biggest beneficiaries of the current structure (Ahmed and Ali 2024²⁵; Haq et. al. 2013²⁶; Rana 2018²⁷).

Following the development of PAMRA and the legal and policy refinement of public markets, ADB initiated a project to "establish a modern and holistic wholesale agriculture market in Punjab and support the government's agriculture policy implementation to enhance value addition, quality improvement and reduction in transaction costs. Success of these markets will lead to (i) increased productivity, (ii) improved processing and storage capacity, and (iii) reduced post-harvest losses, to improve the agriculture sector of Punjab."²⁸ The specific objectives of the TA 9866-PAK project was to develop a modern wholesale agriculture market and enhance the capacity of PAMRA to regulate agriculture markets.

In a review of the status of the TA 9866-PAK project in 2021, numerous issues related to land acquisition and compensation for the proposed markets were found, including a "low compensation rate, (ii) incomplete compensation payment, and (iii) outstanding litigation

24 Asian Development Bank, *ADB TA 9866-PAK: Preparing the Punjab Resilient Agriculture Value Chain Project—Agriculture Markets Development Assessment Report*, Finnish Consulting and Group Asian Development Bank, 2024. https://www.adb.org/sites/default/files/project-documents/53070/53070-002-tacr-en_4.pdf

25 Ahmed, S., and M. Ali. "Agricultural Commodity Markets in Pakistan: Analysis of Issues." *The Pakistan Development Review* (2024): 307-324.

26 Haq, A., et al. "Who Is the 'Arthi': Understanding the Commission Agent's Role in the Agriculture Supply Chain." International Growth Centre (IGC) Working Paper, IGC, 2013.

27 Rana, M.A. "Commissions and Omissions: Agricultural Produce Markets in Pakistan." Working Paper 01-18-Policy and Institutional Reforms to Improve Horticultural Markets in Pakistan: ACIAR Project 2014/043, Centre for Development Economics and Sustainability, Monash University, 2018. https://www.monash.edu/_data/assets/pdf_file/0010/1428769/WP1_Rana

28 Asian Development Bank, *ADB TA 53070-PAK: Preparing the Punjab Agriculture Markets Development Project: Technical Assistance Completion Report*, October 2024. <https://www.adb.org/projects/documents/pak-53070-002-tcr>.

cases.” These issues were subsequently found to be complex and significant. Ultimately, the Punjab Agriculture Department proposed two other markets, in Dera Ghazi Khan and Rawalpindi, as alternatives to the Lahore market. Between changes in the Punjab government’s development priorities, including transfer of the land for the Lahore project to the Ravi Urban Development Authority, and legacy issues, similar to those in Lahore, found in Dera Ghazi Khan and Rawalpindi, the entire project was terminated as a failed effort.

Thus, the ADB experience highlighted major issues in land acquisition for modern agriculture markets, and it certainly casts doubt on the legal status of the 200 or so private markets that were developed in the first few years of PAMRA. ADB also supported value chain studies that were produced under the TA project. The following reports were prepared by the consultants; (i) Assessment Report on Punjab Agriculture Markets; (ii) Commodity Value Chain Study: Pulses Value Chain Study Report; (iii) Commodity Value Chain Report: Oilseeds Value Chain Study; (iv) Commodity Value Chain Study; and (v) Vegetable Value Chain Study.

2.2.1 Status, Consequences, and Lessons Learned

PAMRA has the legal and institutional space for market creation and design of alternative market structures. At present, however, most markets, whether private or public, do not have the grading and packing capacity needed to make this transition. Also, the failure of the ADB project has highlighted the very difficult land titling setting that is limiting the dramatic development needed to make the transition to a modern value chain that generates an increased share of off-farm income. However, it is hoped that the higher revenues from outsourcing fee collection will permit improvements.

Another key recent development has been the removal of geographical restrictions previously tied to public markets, at least in Punjab province. Under the old system, markets were notified within specific areas, giving them exclusive jurisdiction over a surrounding zone, including administrative responsibility for commission agents and private actors. Now, an objective was included in the original PAMRA legislation of limiting markets only to their physical premises, enabling commission agents and private actors to establish new collection centers or markets outside previously controlled territories. This change is expected to foster competition, particularly when combined with the potential for electronic trading platforms and warehouse receipt systems. A further hope is that more fruit and vegetable markets can be set up locally, as they are often criticized as being too far from sources of production, necessitating long travel times and costs that also lead to larger post-harvest losses.

PAMRA has recently started outsourcing the collection of fees to improve revenue collection. In one test market, outsourcing these fees led to a tripling of income from that source, according to the representative from PAMRA. Additional legislation is also being drafted to authorize sanitation fees, regulate warehouse accreditation (including food safety protocols), and to allow online sales by both central markets and licensed warehouses.

PAMRA also intends to introduce standard grading and packaging procedures, which should further reduce post-harvest losses and improve farmer earnings, especially for horticulture.

However, for these changes to be effective, implementation must go hand-in-hand with stronger oversight, institutional capacity, and farmer outreach.

Though slow in uptake, with adequate support PAMRA is well positioned to lead modernization of market infrastructure, thereby influencing how farmers engage within the value chain and how they access finance.

2.3 Extended Off-Farm Agri-Food System and Value Chain Perspectives

This section provides three perspectives on AFS issues. The first looks at the ways that actors in different value chains interact with markets, reviewing the role of contracts and the growing potential of corporate farming in Pakistan. The second compares the off-farm and on-farm proportions of AFS GDP across a broad range of countries at different levels of development, and it looks at the different components of off-farm activities in Pakistan, with a comparison to other countries. The final section gives some perspectives across time on the evolution of Pakistan's GDP AFS and compares it to the experience of the United States and some more recently transitioning economies.

2.3.1 Perspectives on Market Engagement Across Different Value Chains: Contracts and Corporate Farming

The earlier section on the wheat value chains outlined how market engagement by farmers changes with farm size. Small and marginal farmers typically engage through the traditional value chain of middlemen and local commission agents. Medium farmers produce a marketable surplus and engage in transitional value chains; for these farmers, there are opportunities for limited vertical coordination, as these they can sell to millers, wholesalers, and small and medium enterprises that require basic quality compliance but still operate under informal exchanges. However, such coordination is still rare in Pakistan, apart from the government's wheat procurement contracts. In contrast, large farms operate in the modern value chain, where formal contracts, private standards, vertical integration, use of warehouse receipts, and an export orientation is most likely to dominate.²⁹

Small traditional farmers could potentially improve their bargaining power through collective action and by negotiating as a group rather than through isolated sales. These farmers could be organized into farmer organizations and collectively engage in transitional value chains that require basic quality standards and consistent supply. Studies have shown membership in farmer groups has a positive income effect as compared to nonmembers and also a positive effect on general wellbeing.^{30, 31} However, the same studies note that the price advantages of collective marketing were small and benefits were not uniform across members. Given the high costs of managing farmer organizations in terms of coordination, management capacity, and

29 Barrett, C.B., T. Reardon, J. Swinnen, and D. Zilberman, "Agri-Food Value Chain Revolutions in Low- and Middle-Income Countries." *Journal of Economic Literature* 60, 4 (2022): 1316–1377.

30 Fischer, E., and M. Qaim, "Linking Smallholders to Markets: Determinants and Impacts of Farmer Collective Action in Kenya, *World Development* 40, 6 (2012): 1255–1268. <https://doi.org/10.1016/j.worlddev.2011.11.018>

31 Ahmed, M.H., and Mesfin, H.M., *The Impact of Agricultural Cooperatives Membership on the Wellbeing of Smallholder Farmers: Empirical Evidence from Eastern Ethiopia*, *Agricultural and Food Economics* 5, 6 (2017). <https://doi.org/10.1186/s40100-017-0075-z>

leadership, there may be a trade-off: while collective action can open doors to better markets, they also create administrative and financial burdens, which may negate the gains.

There is also a growing body of literature that recognizes the role contract farming can play in further developing value chains and better integrating various actors. Through contract farming, firms provide inputs and technical assistance in return for purchase rights to the output. This creates vertical coordination that links small and medium farms to processors or markets that they cannot otherwise access. Studies have found that contract farming can significantly improve production quality, farm-gate prices, and net-incomes.³² Specifically for Pakistan, a recent study on organic rice farmers demonstrated that contract farming can significantly increase technical efficiency.³³ Another study looking at both potato and maize contract farming outcomes found potato contracting to be associated with significantly higher incomes, whereas maize contracting increased neither incomes nor productivity.³⁴

Interestingly, recent research finds that in the context of developing countries, it may be more sustainable for contract arrangements to develop organically between farmers and buyers, rather than being imposed by government policy and procedures. Evidence from West Bengal, India, shows that externally promoted contracts often introduce rigid production requirements and strict quality standards that smallholders struggle to meet, thus making the arrangement less resilient.³⁵ Another multicountry review finds that contract farming promoted by government, NGOs, or donors tends to suffer from weak enforcement mechanisms, complicate the terms and conditions, and demand interactions with a legal system that is less than transparent and efficient.³⁶

Corporate farming is another model of agricultural production in which large agribusinesses or corporations lease or purchase land to manage farms directly. They have been promoted in the past as means to increase efficiency, adopt advanced technology, achieve economies of scale, and also to provide stable employment opportunities in rural areas. It is argued that by consolidating resources, corporate farming can facilitate export-oriented production and meet stringent quality standards that smaller farmer may struggle to achieve. On the other hand, corporate farming is criticized for possibly marginalizing smallholder farmers, reducing local control over land and resources, reducing output prices to levels unsustainable for smaller farmers, and eventually exacerbating socioeconomic inequalities. India's unfavorable experience with corporate farming has raised concerns within Pakistan as well as activities under the Green Pakistan Initiative gain momentum. Rather than complete dismissal or

32 Tefera, D.A., and J. Bijman. "Economics of Contracts in African Food Systems: Evidence from the Malt Barley Sector in Ethiopia." *Agricultural and Food Economics* 9, 26 (2021). <https://doi.org/10.1186/s40100-021-00198-0>

33 Mazhar, R., B. Xuehao, T. Dogot, R. Skominas, V. Tanaskovik, H. Azadi, and Z. Wei, "Contract Farming and Technical Efficiency: A Case of Export-Oriented Organic Rice Farmers in Pakistan," *Land* 11, 11 (2022): 1-10. <https://doi.org/10.3390/land11111953>

34 Khan, M.F., Y. Nakano, and T. Kurosaki, "Impact of Contract Farming on Land Productivity and Income of Maize and Potato Growers in Pakistan," *Food Policy* 85 (2019) 28–39. <https://doi.org/10.1016/j.foodpol.2019.04.004>

35 Ray, N., G. Clarke, and P. Waley, "The Impact of Contract Farming on the Welfare and Livelihoods of Farmers: A Village Case Study from West Bengal," *Journal of Rural Studies* 86 (2021): 127–135. <https://doi.org/10.1016/j.jrurstud.2021.06.003>

36 Oya, C., F. Schaefer, D. Skalidou, C. Kea, and M. Raul. "Effects of Certification Schemes for Agricultural Production on Socio-Economic Outcomes: A Systematic Review," *World Development* 112 (2018) 282–312. <https://doi.org/10.1016/j.worlddev.2018.08.001>

acceptance, the need for the hour is of sustainable strategies that balance the interests of both corporate as well as small and medium sized farmers.

2.3.2 Perspectives on International Comparisons to Pakistan’s Agri-Food System

This section compares Pakistan’s off-farm and on-farm proportions of AFS GDP with a broad range of countries at different levels of development. It also looks at the different components of off-farm activities, with a comparison to other countries.

The figures that follow are drawn from Diao and Thurlow (2025), found in Appendix 1. Figure 4 shows the relationship between proportions of GDP in primary agriculture versus the off-farm contribution to the AFS. The latter includes processing, input supply, food services, and trade and transport. On average, including all countries in Thurlow et. al. (2025), the AFS accounted for 12.6% of GDP, with 7.4% of GDP from the off-farm portion (see footnote 1). Thus, on average, nearly 60% of the AFS GDP contribution is off-farm. However, there are substantial differences across categories of countries. In low-income countries (LIC), the share of total AFS in GDP is 43.7%, with 27.4% from on-farm value (almost 63% of the total AFS contribution to GDP).

With economic development, economies transform away from agriculture, and thus in lower-middle-income countries (LMIC) the overall AFS drops to 29% of GDP and continues to drop in upper-middle-income countries (UMIC) to 19.4%, as compared to 43.7% in the LIC. High income countries (HIC) have AFS contributions to GDP of just 7.4%, with most in the off-farm sub-sectors. While the portion of GDP derived from AFS declines steadily with per capita GDP, the transformation accelerates as countries become UMIC and evolves into high-income countries (HIC), as total AFS drops to 19.4% of GDP in UMIC, and faster to 7.4% in HIC.

Figure 4: Shares of Agricultural and Off-Farm AFS GDP in Total GDP (%) in AFS GDP (%)

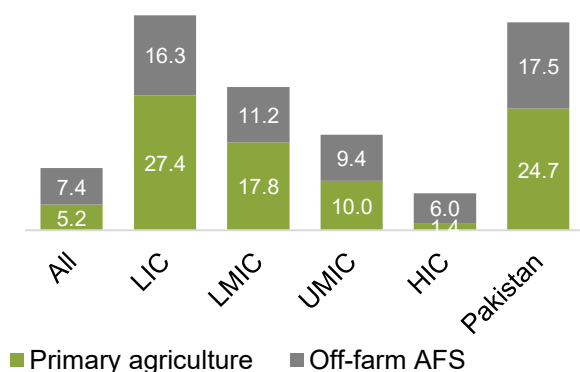
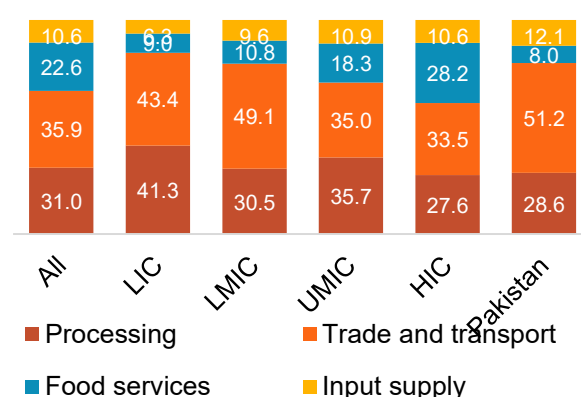


Figure 5: Share of Off-Farm Components



Source: IFPRI’s Agrifood System Database (Thurlow et al. 2025 and the 2023 Social Accounting

Matrix for Pakistan, IFPRI 2024).

Note: LIC = low-income country; LMIC = lower-middle-income country; UMIC = upper-middle-income country; and HIC = high-income country.

In addition to the total AFS proportions in the economy, it is important to consider the ratio between off-farm and primary agriculture portions of GDP. For example, the share of off-farm value added as a proportion of the total AFS GDP contribution is 34.2% in the LIC, 48.5% in the UMIC, and rises rapidly to 81.1% in HIC. Thus, we would expect the ratio in Pakistan to be lower than that seen in the UMIC or HIC.

However, Figure 4 clearly shows that Pakistan is an outlier even among its cohort of countries. While average income in the country has reached the level of an LMIC, the proportions and levels of off-farm GDP in Pakistan's AFS are similar to those of an LIC. Figure 5 shows the proportions of different off-farm activities in the AFS, with the breakdown in Pakistan similar to other LMIC. However, in terms of input supply, Pakistan uses about 2.5% more value added in its AFS than the average LMIC. Travel and transportation is also about 2.1% higher in Pakistan than in other countries in the group, while the processing GDP contributions are about 1.9% lower. Food services are also lower in Pakistan, by 2.8%. Because the overall share of the AFS in total GDP is larger than in the average LMIC, these percentages constitute larger contributions to GDP in Pakistan.

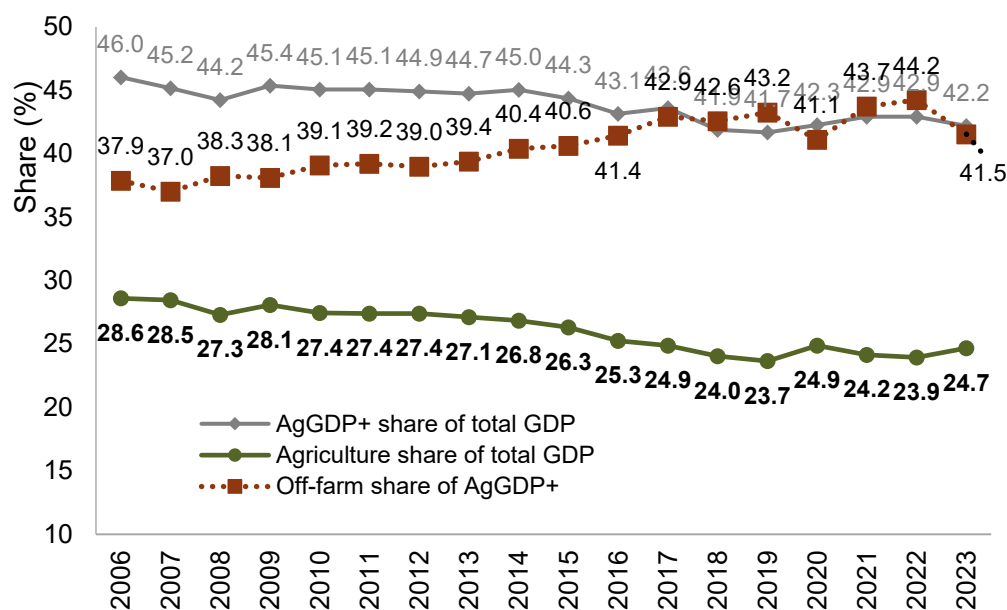
These differences can be viewed several ways, with either positive or negative implications, and they may reflect specific situations in Pakistan. For example, the greater proportion of GDP in input supply could mean that higher quality inputs are being provided to farmers in Pakistan, but this theory is questionable given the lower growth in output per laborer and yields in Pakistan than in its neighbors. Alternatively, the resources tied up in input supply could be related to industrial concentrations of power in fertilizer and energy. Likewise, it may be that travel and transport require more resources in Pakistan because of the geographic complexity of the country, but it also may be that regulations across provinces and in central markets tie up excess resources in that activity. On the other hand, activities that would appear to be indicative of progressing modern value chains, such as food services and processing, are lower in Pakistan relative to the LMIC average.

2.3.3 Perspectives on Off-Farm Proportions in Pakistan and Selected Countries Over Time

This section provides several perspectives on the off-farm proportions in Pakistan as well as in selected other countries. In contrast to preceding discussion, these figures look at Pakistan across time rather than applying a cross-country analysis.

First, Figure 6 shows both the share of AFS (or AgGDP+ in this Figure) and of the on-farm component (agriculture) in the total economy. The third series in the figure shows the proportion of the off-farm component relative to the total AgGDP+ value. In 2006, AgGDP+ accounted for 46% of the total economy, of which 37.9% or slightly more than one-third was off-farm GDP, and 63% was on-farm. By 2023, the on-farm contribution to total GDP had dropped to 24.7% from 28.6%, but the off farm share in AgGDP+ had risen by 3.6%, to 41.5% from the 37.9% in 2006. This represents a slow but significant shift toward a higher off-farm contribution to GDP; however, this share is still 6.5% below the UMIC average, and at this rate, it would take another 30.7 years to reach the UMIC ratio.

Figure 6: AFS and Agricultural Shares of Total GDP and Off-Farm Share of Pakistan's AFS GDP (2006 to 2023)



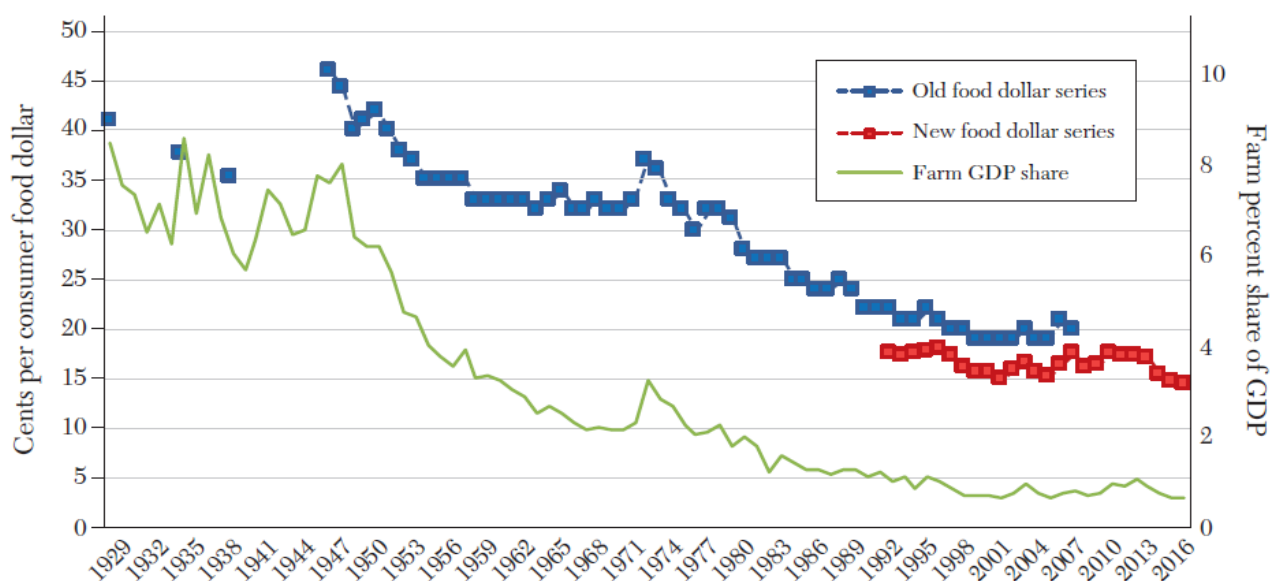
Source: Thurlow et al. 2025, using 2023 Social Accounting Matrix for Pakistan (IFPRI 2024).

Note: AgGDP+ in the figure refers to AFS GDP. Agriculture refers to primary production.

For perspective, Barrett et. al. (2022) show the changes in the United States in the farm value of a “food dollar” from 1929 to 2016 (Figure 7). In 1950, about 40% of each dollar of food expenditure was found in the farm portion. Thirty years later, in 1980, the farm value had declined by 15 percentage points to 25% of a consumer’s food dollar (while at Pakistan’s rate it would have only have dropped by 6.5 percentage points). However, because the United States was similar to a UMIC, with agriculture contributing only 8% to the economy’s GDP, we may be seeing the rapid evolution that occurs later in the transition.

Barrett et. al. (2022) also point out that this type of transition is accelerating relative to the pattern in the United States as later entrants to the transition benefit from the existence of local and regional supermarket chains, food service industries, and processing firms. With sufficient attention and support, Pakistan could be on the cusp of a transition that leads to and benefits from growth in income.

Figure 7: US Farm Share of Consumer Food Expenditures and Gross Farm Value Added Share of GDP



Source: Barrett et. al. (2022).

2.4 Concluding Comments

Reforming the wheat procurement program and loosening the notified areas for central markets will open several opportunities to begin a transition to a modern system. This dynamic has been severely constrained by the markets and the procurement program, which hampered the marketing system’s evolution. To recap, the loosening of these constraints should allow more experimentation and lead to better quality outputs and returns for farmers, given appropriate support, with large opportunities for the private sector and donors to step up. Of course, there are many uncertainties in this progression.

In order to best take advantage of the evolution of value chains in wheat and other commodities, attention needs to be paid to the direction of change. This evolution is generally not reflected in agricultural statistics, which are focused on farm-level values. To see the growth in the relevant industries and commodities, something like the food dollar analysis done by the U.S. Department of Agriculture (USDA) would be very informative, especially if disaggregated along the lines illustrated in Figure 8. Setting up the series with appropriate levels of disaggregation would allow projects in Pakistan to be targeted more precisely and resource constraints and surpluses examined.³⁷

Figure 8: 2023 US Food Dollar: Industry Group (Nominal)

37 USDA Food Dollar Series, <https://www.ers.usda.gov/data-products/food-dollar-series>



Source: USDA Food Dollar Series, <https://www.ers.usda.gov/data-products/food-dollar-series>

3. Deep Dive: Economic Effects of Climate Change in Pakistan’s Agriculture Sector Using IFPRI’s CGE-W Model

This chapter looks at possible effects of climate change on the AFS and its transformation in Pakistan. It first reviews assessments of expected changes in rainfall, temperature, and inflows of surface water from the Karakorum mountain range. The effects from rising temperatures include impacts on crop yields, labor productivity, and land quality, changes in water requirements due to those rising temperatures, and seasonal shifts in rainfall, which may change the potential productivity of different crops. Additionally, the changing climate has potentially strong effects in Pakistan on floods and droughts. These may come from changing rainfall levels, intensity, and patterns and from changes in glacial melt over the next several decades.

The floods that struck Pakistan in 2010, 2022, and again in 2025 demonstrate the country’s extreme and growing vulnerability to climate change. Despite contributing less than 1% of global greenhouse gas emissions, Pakistan is in the top 10 countries most vulnerable to climate change. While each disaster brought widespread devastation, the 2022 floods were the largest by several times in scale and intensity.

The second part of this chapter analyzes key anticipated changes related to climate change and agriculture in Pakistan using IFPRI’s CGE-W (Computable General Equilibrium – Water) model. The CGE-W has been used extensively in Pakistan since 2013 to capture the possible economic effects of climate change. At the end of the chapter, we compare the economic costs of various climate change factors over 25 years and the costs of a hypothetical set of three floods across the same timeframe.

3.1 Overview of Key Impacts of Climate Change in Pakistan

This section provides a review of expected changes in surface water inflows and rainfall, drawn from literature that looks at future changes in flows from variable glacial melt, changes in snowmelt, and variations in the levels of precipitation, as well as the expected change in temperature and evaporation rates.

Temperature change and outlook. With rising CO₂ and other emissions, temperatures will rise, with the increase depending on the scale of emissions mitigation. A recent summary of temperature and precipitation projections is included in the Climate Risk Country Profile of the World Bank³⁸ for Pakistan, using different assumptions on mitigation (RCP 2.6 to RCP 8.5). All simulations of temperature change are similar until about 2040, when they begin to diverge substantially, depending on mitigation assumptions. By the end of the century these scenarios diverge by almost 5°C, from 21° to 26°. The rising temperature has several direct and indirect effects, especially on water resources in Pakistan. The direct effects of heat can reduce crop yields, affect the productivity of human laborers and livestock feeding, and lead to an increase

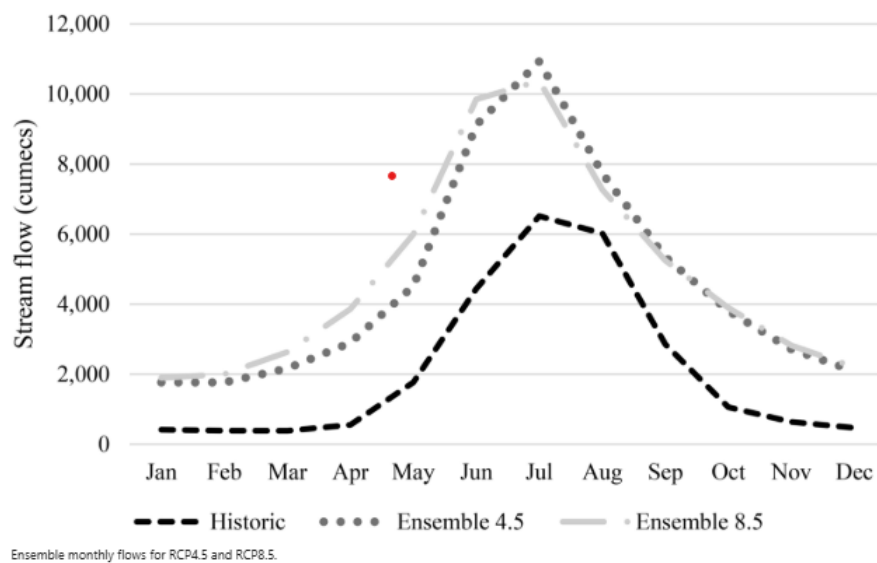
38 As reported in World Bank and ADB, *Climate Risk Country Profile: Pakistan*, Figure 7, 2021. <https://www.adb.org/sites/default/files/publication/700916/climate-risk-country-profile-pakistan.pdf>

in pests. These effects are evaluated in the CGE-W model and through literature reviews in the following sections.

Water resources are also affected. There are at least three dimensions to these effects: (1) changes in rainfall patterns, amounts, and intensity; (2) changes in glacial melt, which naturally speeds up as temperatures rise; and (3) changes in irrigation water requirements for crops, which increase with higher temperatures. These are all considered in this review, with our main focus on the effects on agriculture and by implication, issues related to the transformation of the AFS. The simulation results are provided in a separate section that follows this review.

Surface water inflows into Pakistan. A recent analysis by Hasan et. al. (2025) is illustrated in Figure 9, which shows a basic and compact summary of the estimated pattern of inflows into the Indus basin within a typical year, historically and with expected increases in glacial melt, snow melt, and rainfall.³⁹ About 70% of the surface water comes into the basin between June and September, which has sparked discussion of the need for more water storage capacity for many years. At this point, the storage capacity of large dams is only 30 days of water, an amount that is being reduced by sedimentation each year.

Figure 9: Inflow Patterns into the Indus Basin



Source: Hasan et. al. (2025).

The upper two lines show growth in water inflows in two different IPCC projections. These are ensemble 4.5 based on a moderate warming level and ensemble 8.5 based on the highest warming. Overall, the results present a rising peak with perhaps a small shift forward in the summer in the warmest projection scenario. Based on Figure 9, peak flows grow consistently with rising heat in the RCP 4.5 but there is little further change in moving to the higher warming in RCP 8.5 According to the World Bank climate review for Pakistan, temperature follows the

39 Hasan, H., M.Z.U.R. Hashmi, S.I. Ahmed, and M. Anees, "Assessing Climate Sensitivity of the Upper Indus Basin Using Fully Distributed, Physically-Based Hydrologic Modeling and Multi-Model Climate Ensemble Approach" *Scientific Reports* 15, 1 (2025): 4109. <https://www.nature.com/articles/s41598-024-84975-z>

same pattern as in the figure above, ranging from a minimum of 8°C in winter to about 30° in July and August. Rainfall, like surface water flows, is highest in July and August, and so is a contributor to those peak flows. There is some increased precipitation in January through April, with the lowest rainfall from October to December.

As the World Bank report and others note, there is great uncertainty about changes in the levels of rainfall throughout the 21st century. In some projections, growth in total rainfall occurs, but the clearer outcome is the rising intensity of rainfall events, which will lead to drier periods within the year if overall precipitation does not increase. Thus, rising temperatures can lead to more extreme droughts as well as floods. (The rising intensity is reviewed below.) The monsoon rains are likely to shift westwards, and there will be heavier storms because warmer air holds more moisture. This effect is especially evident in the Arabian Sea, where rising sea surface temperatures amplify moisture transport toward Pakistan during the monsoon season.

Glacial melt, the Karakorum anomaly, and the Indus Water Treaty. The rising peaks of surface inflows shown in Figure 9 are comprised of snow melt and glacial melting as well as monsoon rainfall. The implied outlook is that flows will continue to grow throughout the 21st century with roughly the same pattern. To the degree that flows are comprised of glacial melting, at some point, the “Water Tower” of glaciers in the Hindu Kush, Karakoram, and Himalayan mountain ranges will begin to decline with potentially disastrous effects.

However, research has noted the existence of a “Karakoram anomaly,” namely that glaciers in that range do not seem to be melting as fast as in the Himalayas. This is spelled out in detail in the following figure (Figure 10) taken from Nie et. al (2021).⁴⁰ The two panels of the figure show estimates of the mass change in glaciers in the different mountain ranges and the estimated glacial mass remaining at the end of the 21st century. The blue dots, generally associated with the Karakoram range, show small declines or even increases in the size of glaciers, with parts of the range retaining 85% of the glacial mass by the end of the century. This contrasts dramatically with the red dots that indicate declines in glacial mass and remaining levels, especially in the Himalayas, where the glacial melt supports the Ganges and Brahmaputra Rivers. In those cases, the declines per year are dramatic and, in many areas, little to no glacier mass is expected to remain at the end of the century.

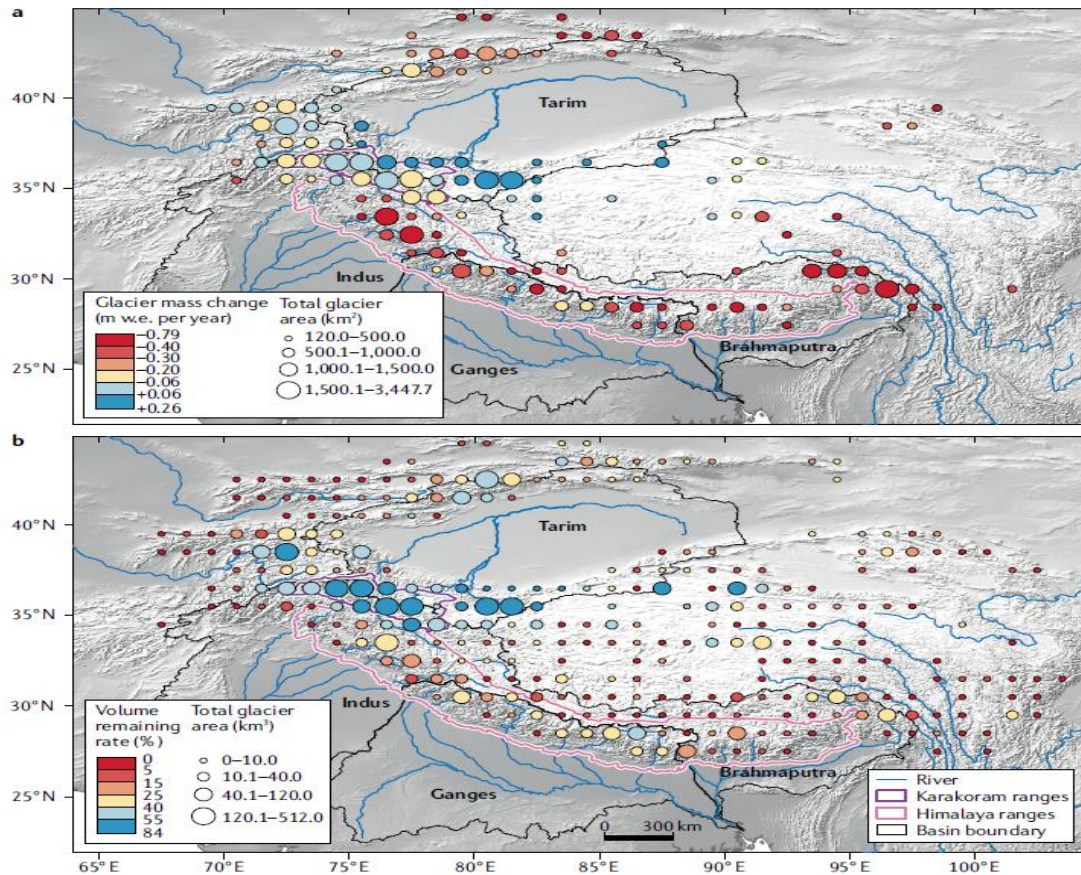
Glacial melt also adds to flooding, as rising temperatures in mountainous regions accelerate glacier melt. This leads to an increased risk of glacial lake outburst floods (GLOFs) and adds to river discharge, overwhelming river systems and compounding flood risks.

These divergent outlooks have contributed to stresses between Pakistan and India regarding the Indus Water Treaty (IWT), which has been the main agreement allocating waters to the countries since 1960. According to many observers, the treaty needs to be updated to consider climate change effects that were not present when the treaty was set up. In April 2025, India put the IWT in abeyance and ceased following its mandated requirements, a move made in response terrorism in Kashmir rather than climate change concerns. While the future of the treaty and how it might evolve is extremely unclear at this point, it can be expected that pressure

40 Nie, Y., H.D. Pritchard, Q. Liu, et al., “Glacial Change and Hydrological Implications in the Himalaya and Karakoram.” *Nature Reviews Earth & Environment* 2, 2 (2021): 91-106.

to reallocate water will continue over the next decades, and the flows could possibly be affected by political economy challenges that are likely to be unrelenting.

Figure 10: Mass Change Estimates Across Glaciers in Different Mountain Ranges: Current vs. End of 21st Century



Source: Nie et. al. 2021.

3.2 The 2022 Floods: An Example of Increasing Extreme Events

In addition to the longer-run effects on agriculture, the growing prevalence of extreme droughts and floods is a rising concern. Indeed, floods in 2025 were large but overall costs seem to be just about one-quarter the level experienced in 2022. However, 2025 brought a winter drought hit, with some parts of Pakistan receiving 55% less rainfall than average in January, and the Tarbela Dam fell to its minimum operational level, or the dead storage level, on March 19, 2025. In addition to drought conditions, hydropower generation was compromised during that time. As the monsoons hit in late May and June, storage in Tarbela grew rapidly and spillways had to be opened to release water on July 14, and the dam reached its maximum storage on August 21.

A warmer atmosphere can hold more moisture, leading to heavier precipitation events. Observational data suggests a 22% increase in the intensity of 30-day maximum rainfall events in a climate that has warmed by 1.3°C compared to pre-industrial levels. Some models project increases of as much as 40-80% in the intensity of heavy rainfall events.⁴¹ Future projections indicate that 30-day heavy rainfall events are expected to become even more intense if temperatures warm by 2.6°C. Regionally, in 2025, Punjab received 57% more rainfall compared to its average, leading to the eighth wettest July since 1978, while Gilgit Baltistan received 52% more rainfall in July this year than its average. Furthermore, on July 5, Chilas (Gilgit-Baltistan) in northern Pakistan registers a record-breaking maximum temperature of 48.5°C.⁴²

The World Bank Climate Risk Country Profile notes that an extreme drought occurring once in 100 years under the current climate may have a return period of 1 in 50 years under 1.5°C of warming or 1 in 20 years under 3°C of warming. New records in stream flows in the Upper Indus Basin are expected to reoccur every 12 to 15 years, although the recent experience suggests record-breaking flows may occur even more frequently. Attribution studies confirm that human-caused climate change likely intensified the deadly floods of 2022 and 2025, which were driven by extreme monsoon rainfall. The rainfall observed during these events was significantly heavier than it would have been without global warming.⁴³

The floods that struck Pakistan in 2010, 2022, and again in 2025 demonstrate the country's extreme and apparently growing vulnerability to climate change. While each disaster brought widespread devastation, the 2022 surpassed 2010 in scale and intensity, pointing to a possible trend of increasingly severe weather events. Yet, Pakistan contributes less than 1% of global greenhouse gas emissions.

The consequences of flooding have been examined most recently and in depth by the Ministry of Planning, Development and Special Initiatives in its Pakistan Floods 2022: Post-Disaster Needs Assessment (PDNA), which was supported by ADB, the European Union, the United Nations agencies, and the World Bank, along with numerous government agencies, civil society organizations, and individual participants. It was a massive effort, and there have been numerous follow-on reviews, critiques, and assessments in the literature given the scale and catastrophic outcomes related to the 2022 flood. The analysis is structured around four areas: social (housing, education and health), infrastructure (partly transport and communication), productive sectors (with agriculture and water resources), and a cross-cutting sector (gender, governance, and social protection areas). Some key results include:

41 Zachariah, M., et al., "Climate Change Intensified Heavy Monsoon Rain in Pakistan, Exacerbating Urban Floods that Impacted Highly Exposed Communities," Scientific Report, Imperial College London, 2025.
<https://spiral.imperial.ac.uk/entities/publication/78780ae7-ab6e-4309-90ae-656e59fb0a04>

42 <https://www.dawn.com/news/1922323#:~:text=The%20PMD%20recorded%20a%20maximum,Bunji%20was%2046.1%20C%20B0C>

43 Zachariah, M., et al. (2025), See Footnote 41. Also, see <https://dawn.com/news/1939068/manmade-disaster> for another opinion on the high costs of the 2025 flood.

- The 2022 floods were catastrophic, with an estimated one-third of the country underwater, 33 million people affected, and nearly 8 million displaced. In contrast, the severe 2010 floods affected 20 million people and displaced 6 million.
- Damages exceeded US\$14.9 billion, with economic losses estimated at \$15.2 billion. Key sectors affected were housing, with \$5.6 billion in damages, agriculture, livestock and water resources, with \$4.2 billion in damages, and transportation, with \$3.2 billion in damages.
- About 4.4 million acres of farmland were damaged, wiping out much of the country's cotton, rice, sugarcane, and wheat crops. Sindh province alone accounted for a quarter of the country's agricultural output but was one of the worst-hit regions. Over 1.2 million livestock animals were killed.
- The 2022 floods disproportionately impacted the country's most vulnerable populations. The floods took the lives of more than 1,700 people, one-third of whom were children. The national poverty rate was estimated to rise by 3.7% to 4.0%, with 8.4 and 9.1 million more people in poverty. Also, 94 districts (about half the nation's total) were "calamity hit," including 19 of the 25 poorest districts in the country. Women suffered notable losses to their livelihoods, particularly those associated with agriculture and livestock, and their vulnerability to gender-based violence increased.
- Budgetary limitations meant that funds for recovery were nowhere near the amounts needed, though significant investments were made by donors and the government. According to the Ministry of Finance, only PKR 70 billion went directly to families. One consequence was that Sindh raised its wheat support prices as compensation during the following Fall season, which led in part to the wheat program collapse as Punjab tried to match the high support price in Sindh.

3.3 Effects on Agriculture and Its Transformation.

Crop yields are affected by minimum and maximum temperatures as much as average temperatures, and at moderate warming levels, some crops could experience gains in yield. Weight gain in livestock tends to be highest when temperatures are cooler. Less research has looked at worker productivity and soil conditions, but higher temperatures have been shown to reduce labor productivity and increase the extent of dry soils and salinity. As an example, for a high carbon emission scenario, example models simulate yield declines for maize of up to 10% (APSIM) and 19% (SWAT); for rice yields of 4% (APSIM) to 26% (SWAT), and for cotton yields, 1% (APSIM) but with a potential yield increase of 11% (SWAT), until 2050, relative to the baseline scenario (1996–2005).⁴⁴ In sum, maize and rice will see large declines with high increases in temperature, but cotton may in fact see its yields increase.

Our research shows that farmers tend to shift into cotton when rice or sugarcane crops decline. The past 15 years have shown continued decreases in cotton production, which came from effects of poor seed, differential taxes with sugarcane, a competitor crop, and between imported

⁴⁴ Becker, R., C. Schüth, R. Merz, et al., "Increased Heat Stress Reduces Future Yields of Three Major Crops in Pakistan's Punjab Region Despite Intensification of Irrigation," *Agricultural Water Management* 281 (2023): 108243.

and domestically produced cotton, and challenges in Pakistan's textile sector.⁴⁵ For our simulations to be likely, some of these impediments will need to be fixed.

The long-term effects of drought, including increased soil salinity and erosion, are decreasing soil fertility. Drought conditions also directly impact livestock health by causing a scarcity of water and food, leading to lower production efficiency and a decline in milk and meat yields. In 2025, a report indicated a 20% increase in livestock mortality in the Tharparkar region compared to the previous year.

3.3.1 Analytical Results from the CGE-W Model

This section uses IFPRI's CGE-W (Computable General Equilibrium–Water) model to analyze key changes anticipated in Pakistan as a result of climate change and agriculture. The CGE-W has been used extensively in Pakistan since 2013.⁴⁶ We used a previous version with a starting date of 2013-14 because it has characteristics related to the labor force and land that are not in our current version. However, we did a brief comparison to test the basic responses in both versions, which we found to be similar enough to permit use of the earlier version.

The CGE-W can model different rates of evaporation to proxy temperature change, water inflows to the system, and rainfall and groundwater use. To explore the effects of selected climate change impacts described earlier in the chapter, we evaluate four simulations that show different characteristics of climate change implied. We simulate these characteristics across 25 years, from 2014 to 2040. The results can include production values, government and household income/ expenditures, and trade performance, to name just a few. The model has three regions for crops and includes 64 production activities and 16 household groups.

These simulations are the following:

Base Scenario. This scenario keeps initial levels of temperature, inflows to the Indus basin from the rim stations, and rainfall levels in 2013/14 the same as the original model. For this exercise, the capacity of tubewell water is maintained at 50 million acre feet (MAF) and temperatures (or evaporation) remain the same as in the base year.

S1: Increased temperature and decreased total factor productivity (TFP). For this scenario, we raised temperature by 7% across 25 years. The model data include monthly increases from 2014, which are scaled up to reach a 7% increase after 25 years in 2040. This value was identified by examination of the RCP 4.5 and RCP 8.5 from 2035 until 2060 in Figure 7 in the Country Climate Report of ADB and the World Bank (see footnote 38).

Research often identifies a reduction in yields due to rising temperature, with one example showing 10% to 20% declines for Pakistan's main crops. We extended the lower end increase

45 Rana, A. W., Ejaz, A., and Shikoh, S. H. (2020). *Cotton crop: A situational analysis of Pakistan*. Intl Food Policy Res Inst. <https://doi.org/10.2499/p15738coll2.133702>.

46 The CGE-W combines the code from IFPRI's standard CGE model with WAPDA's hydrology structure in the Indus Basin Model Revised. Details on aspects of the structure and data inputs can be found in Davies, S., et. al. "The Economywide Impacts of Increasing Water Security Through Policies on Agricultural Production: The Case of Rice and Sugarcane in Pakistan," IFPRI Discussion Paper 02226, IFPRI, 2023; and Appendix D in Young, W.J., et. al., *Pakistan: Getting More from Water*; Chapter 6. World Bank, 2019, <https://openknowledge.worldbank.org/handle/10986/31160>. IFPRI is in discussion with the Pakistan Institute of Development Economics (PIDE) to collaborate on a long-run basis.

across all crops to reflect a possibly broader heat effect. Therefore, all initial TFP values were reduced by 10%, so that the growth in yields are 0.9% per year, rather than 1.0% for most crops.

S2: Includes S1 (higher temperature and lower TFP) with reduced surface water. A reduction of available surface water from rainfall and inflows to the Indus River and its tributaries at the entry of the basin (the rim stations) could be a major challenge related to climate change. We reduced the values of these water sources by 7% over 25 years to be symmetric with the rise in temperature. This is probably a relatively rapid decrease in these sources of water.

While this chapter indicated that rainfall levels are quite uncertain, and inflows from glacial melt and rainwater in the Upper Indus Basin could be at least consistent and perhaps grow during this century, the biggest concern is a shortage of water for agriculture due to either changes in the IWT, hydrological and weather outcomes, or other non-irrigation demands. Therefore, this scenario reflects that concern.**S3: S2 with reduced agricultural land growth.** This simulation takes scenario S2 and reduces the growth in the land input from 0.6% per year to 0.5%. This 20% reduction in the initial growth rate for land resources in all sizes of farms was made to reflect possible rising salinity and aridity from a warmer climate, with more evaporation and drying of land.

S4: S3 with reduced productivity of agricultural labor. One direct effect from rising temperatures is the reduced productivity of labor caused by heat stress, and labor's productivity is key to overall output and profitability of agricultural enterprises. Extending S3, S4 evaluates productivity of labor on small, medium, and large farms, rather than on the total amount of the resource itself.

Production value effects of alternative climate change simulations. These simulations are presented in Table 4. The base values from 2014 to 2040 are presented first to show the growth in various crops under the baseline assumptions, while the remaining columns include changes relative to those base values in 2040. The base growth rates are affected by the initial values of production, productivity increases, and several tax rates imposed to make the base outcomes more consistent with historical trends. Other assumptions about demand and trade elasticities also play a role.

Relative to historical experience, the growth rate in cotton and wheat are high while those in rice, sugarcane, and fruits and vegetables (FV) are low. Basmati rice is the most heavily traded agricultural product, and as domestic prices rise in a simulation, exports of basmati rice become less competitive and so its rate of increase in production value is somewhat low. We believe that this base simulation nonetheless provides an adequate context to evaluate the individual incremental and combined effects of climate change.

The first simulation evaluated the results of raising the temperature so that it grows by 7% to the last year of the simulation (2040). We also reduced the TFP growth by 10% for all crops starting in the first year. The results show a reduction in the real value of output for all crops, with the largest absolute declines in rice, followed by wheat, other crops, and FV. The total production value dropped by 2.2%, with rice declining by more than 5%, and FV also declining by more than the average. The major factors driving the large effects in rice are the crop water

requirements, which are highest for rice and thus are most affected by temperature increases, and export prices for the large portion of basmati rice sold abroad. These international prices decline relative to domestic prices and so production drops significantly.

These relative changes are similar across simulations, but the magnitudes grow as more dimensions of climate change are included. The lost production at the end of S1 is PKR 129.6 billion, a 2.2% decline in output. The loss grows in each simulation to reach 4.1% of output in S4, with a decline in production of PKR 245 billion relative to the base simulation.

The last line of the table provides a simple calculation of the total effect over time. It assumes that half the final value in 2040 represents the average yearly value across a given simulation, which is then multiplied by 25 years to get the total values over all years. So, for example, in S2, the total value of losses in production over the 25 years was PKR 1,984 billion. We later use these figures for comparisons with the costs of flooding and droughts.

Household expenditures. The CGE-W model is a whole economy model, so it includes expenditures of all household groups along with production and resource use results. These are shown in Table 5. Households are grouped into three categories: (1) farm households, split into small farms (with less than 12 acres) and all other farms, (2) other rural households, split into rural workers and other rural inhabitants, and (3) urban households, split into lower income and higher income households. The values in the first column show the total base income in 2040 for each household group (Income is not split into per capita values as population is not used directly in the model).

There are consistent trends in expenditures found in all household categories across the four simulations, which, except farm households, are increasingly negative. The more restrictive scenarios, S3 and S4, have all water resources cut back, evaporation increased, while TFP, land and labor resources, and productivity growth decrease. These increased impacts reduce household expenditures by PKR 259 billion in S1, reaching PKR 477 billion in S4.

The high-income urban families see the largest absolute decline in expenditures from climate change, but it is a lower percentage of their income as they are the wealthiest families. Table 5 shows that the decline in S4 is PKR 234 billion, which is 2.4% of the PKR 9,772 billion they spend in 2040. In contrast, the losses in expenditures for rural workers reach 4.3% of total household income in S4. Other rural nonfarm households, which have higher incomes, still have expenditure losses of 3.7% at the end of S4. Low-income urban families see a 3.5% decline in expenditures, amounting to PKR 48 billion in 2040.

Quite surprisingly, expenditures for farm families fell by only small amounts. Relatively, the smallest farmers did the best, which can be attributed to the dependence on grains, especially wheat, with lower demand elasticities and fewer FV or other crops. Their small losses, however, are offset by the more substantial declines affecting nonfarm families. Thus, as the impacts outside of agricultural families are large, a broader consensus to mitigate the effects of climate change is warranted. Moreover, rising prices of food products and lower demand for all goods and services will be seen as climate change becomes more severe.

It is useful to compare the previous losses in production related to climate change effects and those in the household analysis. In all cases, the production losses as a subset are relatively

small compared to the household losses. Essentially, the production and consumption linkages outside of agriculture to the rest of the economy create substantial extra costs for households. For instance, the total losses in production for the S3 scenario are PKR 206.4 billion, while household expenditures declined by PKR 330 billion, 60% more than the production losses.

Water use in alternative climate change simulations. Table 6 shows the water results, with the base values of consumptive use in 2014 and 2040 provided in the first columns. The third column shows the incremental growth in the base scenario, which has a very high response in cotton followed by wheat, sugarcane, and other crops (much of which is fodder for animals). This value is for consumptive use and is close to the 64.8 million acre feet (MAF) given in Young et. al. (2019) for beneficial use of water (See footnote 46).

Cotton, sugarcane, and maize impacts are consistent across the climate change simulations. Wheat is large but varies across each simulation. FV and other crops have slowly declining water use gains as the simulations become more restrictive. Most notable is that the water use in rice continually drops in response to its high crop water requirements with climate change, as the two rice varieties drop from a gain of 1.5 MAF in the base to 0.13 in S4, a decline of more than one MAF. FV has less growth in water use as scenarios progress from S1 to S4. Other Crops have reduced use in all scenarios, with the largest decrease in reaction to the reduction in land resources.

With the addition of a 7% increase in temperature, crop agriculture requires nearly five MAF additional water resources in S1. Total water use declines somewhat in S2 mostly due to decreased water use in Other Crops (mostly fodder). S2 is the scenario with reduced water availability, and it seems to cause more small reallocations rather than a large decline. In S3, total water use drops by 1.16 MAF due to restricted land growth, which appears to reduce water demand concurrently. In S4, labor productivity reductions do not have a further effect on water usage but do cause a large economic effect.

*Table 4: Changes in Crop Production Values for Alternative Climate Change Scenarios
2014-2040 (billions of PKR)*

	Base scenario			S1: Temp Up 7%, TFP -10%		S2: S1, Rain and Inflows - 7% (over 25 years)		S3: S2 and Land Growth -0.1 % p.a.		S4: S3, and Farm Labor Prod -0.1% p.a.	
	2014	2040	% Chg	2040 S1 Chg ¹	% Chg	2040 S2 Chg.	% Chg	2040 S3 Chg.	% Chg	2040 S4 Chg.	% Chg
Wheat	941	1,856	2.7	-26.2	-1.4	-27.3	-1.5	-36.3	-2.0	-47.9	-2.6
Basmati Rice	379	613	1.9	-33.6	-5.5	-35.8	-5.8	-60.2	-9.8	-66.1	-10.8
IRRI Rice	175	289	2.0	-14.2	-4.9	-18.9	-6.5	-24.2	-8.4	-25.8	-8.9
Cotton	318	764	3.5	-9.6	-1.3	-25.4	-3.3	-12.5	-1.6	-17.1	-2.2
Sugarcane	349	613	2.3	-9.5	-1.6	-14.7	-2.4	-17.5	-2.9	-19.0	-3.1
Maize	131	258	2.7	-3.8	-1.5	-3.9	-1.5	-5.2	-2.0	-6.8	-2.6
Other Crops	448	891	2.8	-16.6	-1.9	-16.7	-1.9	-22.9	-2.6	-29.8	-3.3
FV	413	698	2.1	-16.1	-2.3	-16.2	-2.3	-27.6	-4.0	-32.6	-4.7
Total	3,154	5,981	2.6	-129.6	-2.2	-158.7	-2.7	-206.4	-3.5	-245.0	-4.1
Aggregate Loss (PKR Bill) ²				1,620		1,984		2,580		3,063	
Aggregate Loss Bill. USD (\$1=PKR 215) ³				7.5		9.2		12.0		14.3	

Table 5: Household Expenditure Changes with Four Climate Change Scenarios

Results from the IFPRI CGE-W Model (PKR Billions)					
	Base Scenario	S1: Temp Up 7%, TFP -10%	S2: S1, Rain and Inflows - 7%	S3: S2 and Land Growth -0.1 % p.a.	S4: S3, and Farm Labor Prod -0.2% p.a.
Small Farms (lt 12 Acres)	2,865	-3.4 ¹	-2.1	0.4	-7.4
Other Farms	2,463	-7.2	-6.2	-9.3	-11.6
Total Farm	5,328	-11	-8	-9	-19
% of Total Farm Expenditures		-0.20	-0.16	-0.17	-0.36
Rural Workers	1,191	-7.6	-9.4	-13.4	-19.2
Other Rural	4,570	-85.3	-98.6	-102.8	-157.7
Total Rural	11,090	-93	-108	-116	-177
% of Total Rural Expenditures		0.84	0.97	1.05	1.60
Low Income Urban	1,383	-26	-30	-29	-48
High Income Urban	9,772	-130	-148	-175	-234
Total Urban	11,155	-155	-178	-205	-281
% of Total Urban Expenditures		-1.39	-1.60	-1.83	-2.52
Net Losses All Groups (2040)		259	294	330	477
Aggregate Losses ² (PKR Billion)		3,235	3,680	4,123	5,968
Losses in Billions USD (\$1=PKR 215) ³		15.05	17.11	19.18	27.76

Notes: ¹The value is the change in household expenditures for each scenario in 2040 relative to the base 2040 value in the first column. ²The aggregate loss is based on the 2040 value for a scenario, divided by 2 to get the average value for each year, and then multiplied by 25 years. So, for S1 259/2*25=3,235. ³The exchange is the same as used in the Post Disaster Needs Assessment.

Table 6: Water Use Changes with Four Climate Change Scenarios

Results from the IFPRI CGE-W Model (Millions of Acre Feet (MAF))							
Crop	2014 Water Use	2040 Base Water Use	Base Chg (MAF)	S1: Temp Up 7%, TFP -10%	S2: S1, Rain and Inflows - 7%	S3: S2 and Land Growth -0.1 % p.a.	S4: S3, and Farm Labor Prod -0.1% p.a.
				Simulation Value Added to Base Increase in Column 4			
Wheat	11.4	13.0	1.66	1.36	1.53	1.25	1.33
Basmati Rice	8.7	9.4	0.76	0.55	0.66	0.26	0.23
IRRI Rice	12.8	13.5	0.74	0.60	0.67	-0.01	-0.10
Cotton	8.7	12.9	4.15	1.28	1.20	1.23	1.26
Sugarcane	9.7	11.3	1.58	0.98	0.94	0.91	0.92
Maize	0.4	0.5	0.09	0.06	0.08	0.07	0.07
Other Crops	5.8	6.9	1.07	-0.20	-0.71	-0.29	-0.28
Fruit & Veg	6.2	6.4	0.14	0.34	0.44	0.22	0.19
Total	63.68	73.88	10.21	4.96	4.80	3.64	3.63

3.4 Comparing 2022 Flood Costs to 25 Years of Chronic Climate Losses

This analysis permits us to make comparisons between investments in resilience against floods versus a sustained investment to adapt to the chronic effects of climate change, such as drought resistant seeds, training and support for agricultural laborers, land investments, and better irrigation approaches. Table 7 presents the relevant elements from the analyses reported above along with loss figures from the 2022 and 2025 floods.

The first two blocks of the table show the losses associated with crop production and household income for each of the four scenarios analyzed; it shows greater losses in both categories with each added dimension, although with different incremental effects. The production losses grow from

PKR 1,620 billion to PKR 3,063 billion as more long-term effects of climate change are added to the simulations. The largest increase is from S2 to S3, which analyzes land availability growth dropping from 0.6% per year to 0.5%. The overall decline in household income over 25 years increases from PKR 3,235 billion in S1 to PKR 5,968 billion in S4, but the biggest effect occurs with the decrease in labor productivity in S4. Perhaps this value includes more effects than might be specifically a heat effect on labor. This, however, is a reduction in productivity specifically linked to agricultural labor and therefore could be fairly accurate.

Table 7: Comparing Losses from Floods vs. Chronic Climate Effects (by Simulation and Flood Event)

	S1: Temp Up 7%, TFP -10%	S2: S1, Rain and Inflows - 7% (over 25 years)	S3: S2 and Land Growth - 0.1 % p.a.	S4: S3, and Farm Labor Prod -0.1% p.a.
Aggregate Production Losses by Simulation				
PKR Bill. ¹	1,620	1,984	2,580	3,063
USD Bill. ²	7.5	9.2	12	14.3
Aggregate Household Losses by Simulation				
PKR Bill. ¹	3,235	3,680	4,123	5,968
USD Bill. ²	15.1	17.1	19.2	27.8
Economic Losses from Floods				
	2022	2025	Average x 3 events	
PKR Bill. ¹	1,699	264	981*3= 2,943	
USD Bill. ²	7.90	1.23	4.56*3= 13.67	

Notes: ¹The aggregate loss is based on the 2040 value for a scenario, divided by 2 to get the average value for each year, and then multiplied by 25 years;

²The exchange is the same as used in the Post Disaster Needs Assessment at PKR 215=\$US1.00

The costs associated with floods are taken from the extensive post-disaster needs assessment (PDNA) done for 2022. The assessment for 2025 has so far been less elaborate.⁴⁷ The economic losses in 2022 were US\$7.90 billion (only for crops, but including damages to crops like grain storage and fruit trees) and in 2025 were US\$1.23 billion (including livestock). These are reported in the third block of the table, which is then averaged under the assumption that such a value is more likely than either the high value of 2022 or the low value of 2025. Each flood is then

⁴⁷ <https://reliefweb.int/report/pakistan/pakistan-2025-monsoon-floods-support-plan-relief-and-early-recovery-october-2025-april-2026>

estimated to create US\$4.56 billion in costs to agriculture, or PKR 981 billion using the 2022 exchange rate from the PDNA. If three events occur in 25 years, this leads to PKR 2,943 billion (US\$13.67 billion) in losses overall, which is less than all the costs calculated for households in the climate change scenarios. In terms of production costs, which is a concept similar to the economic losses from floods, S3 finds a total loss of PKR 2,580 billion, close to the estimated losses from floods of PKR 2,943, while the production losses found in S4 exceed the flood losses. While the cost of the floods may be somewhat more accurate, a simple result would be that these costs are equivalent.

3.5 Concluding Comments on Climate Change Analyses

The final section of this chapter looks at the uncertainties associated with the estimations provided here, then reviews several implications, and finally summarizes the recommendations coming from this chapter.

Uncertainties in the estimations. The estimated economic losses from the three flood events assumed here are subject to much uncertainty. These could be larger, like the 2022 losses, which would mean costs are over US\$20 billion for three events and would be greater than all losses from chronic climate change effects except for household losses in S4. If they are actually lower, then the number and severity of the chronic climate change effects would determine the relative importance of these two categories of losses for investment. Of course, how many floods there are within a given 25-year period is critical.

The assumptions we used to simulate the chronic effects may be inaccurate. Some may be too low, such as the reduction of available land, which was simulated simply by slowing the growth rate, and did not contract available land. Others may be too high, such labor productivity, which led to high losses in household income. Also, we assumed that water availability dropped rather than expanded as most of the reviews considered in the chapter suggested, assuming scarcity is the bigger concern than too much water, aside from floods. Also, water reductions and temperature increases were modeled to occur across a relatively short period of time, as the projections assumed that 7% decreases/increases occurred in 25 years, although the temperature increases were seen to grow this fast in the World Bank projections. The losses reported for livestock due to the 2022 floods are not included in our figures from the 2022 assessment, nor is there any livestock yield loss due to heat stress, so no effects on either side of the comparison are added. Finally, shifts in remittances to households were not tracked, but they might shift for numerous reasons, affecting household expenditures either positively or negatively.

Selected implications. The scarcity of water is almost certainly going to become more acute through both demand and supply side effects. With higher temperatures, Pakistan may require an additional 5.0 MAF of water to meet the greater requirements. These demand-side effects will arise in the face of possibly tighter supply. Thus, better agricultural inputs and land quality, crop diversification, and better water management are all needed improvements. Some impacts may be seen soon, so preparation needs to be thought through early. With population still growing still at

2% and industry and environmental demands growing, water demand outside of the agriculture sector will surely increase.

Rice is the most dependent on exports for demand of any crop, so the slowing growth in output for that crop due to climate change will complicate export promotion efforts. Expanded FV and Other Crops production will enhance nutrition, but the climate change effects are significantly negative. These crops are also beneficiaries of many crop diversification strategies, so more effort will be needed under climate change.

The government's ability to pay compensation for flood damages is a major concern. Because floods are large but random events, it is difficult for the government to cover much of the cost in a short period, even though it appears reasonable priorities about where to put scarce resources have been applied. Inevitably, the pressure is high to fix issues as quickly as possible and spend on poverty alleviation and housing recovery. Yet consistent programs to address the long-term effects of climate change and to systematically build resilience to future floods better fit the country's funding capacity and in fact will yield higher payoffs than addressing each flood as it comes along and letting programs lapse in years between floods.

To the degree that water flows are comprised of glacial melting, at some point, the "Water Tower" of glaciers in the Hindu Kush, Karakoram and Himalayan ranges will begin to decline with potentially disastrous effects. However, research has noted the existence of a Karakoram anomaly, with glaciers in that range appearing to be melting more slowly than in the Himalayas. These divergent outlooks have contributed to stresses between Pakistan and India in the long-standing IWT.

A summary of recommendations. The floods from extreme rain events have led to huge costs that occur within several weeks and are far beyond what the government is able to manage. Moreover, over the long run, the payoffs from reducing losses in labor productivity or avoiding salinization of land can be just as high as benefits from flood compensation. Therefore, our ***first*** recommendation is to develop a balanced and long-term investment to enhance resilience to floods and address the growing chronic effects of climate change on factors of production, with expenditures scaled according to the expected benefits. With a growing population, and with industry and environmental demands and crop water requirements growing as well, the demand for water will continue to grow. There may also be tighter supply despite the Karakoram anomaly. Our ***second*** major recommendation is to develop programs to manage water scarcity on both the demand and supply sides, with pricing, ownership rights of water, taxes, and infrastructure development reflecting scarcity and the increase of extreme events.

The remaining recommendations from this chapter are related to the chronic effects of climate change that include declining yields from rising heat and a reduction in land quality and availability from increasing salinity, which is in large part related to heat. Also, rising temperatures contribute to heat stress, which lowers labor productivity. Thus, the ***third*** set of recommendations suggests a review of research and extension programs, with private sector input. The review should assess if

those programs understand problems due to heat stress and help to develop practices for farmers to combat salinity and to find the most cost-effective ways to deal with heat stress in field work, especially as it affects female laborers, who often have the most labor intensive roles, such as for weeding, transplanting rice, and cotton picking.

Finally, the analysis showed negative climate change impacts on all major and minor crops, which become larger as more effects are imposed. Rice loses the most value with climate change due to its high crop water requirements and high labor use. Following rice, fruits and vegetables and Other Crops (pulses and fodder) have relatively large absolute and percentage declines, thus making it harder to improve nutrition. Given these effects, the *fourth* set of recommendations suggests efforts be expanded in developing and disseminating needed climate-sensitive agricultural practices. These developments should encompass examining and testing the sensitivity of crops to climate change dimensions so as to identify the importance of various factors (land, labor, yields, or water). As climate change has major effects on rice and irrigation, investigating improved water management options, including alternate wetting and drying and bed and furrow systems, is warranted.

4. Challenges to Transformation of the Agri-Food System

A large share of Pakistan's population resides in rural areas and is directly or indirectly engaged in agricultural activities. The country's long-term development thus hinges on how effectively the agriculture sector can evolve, not only to meet economic, food, and nutrition goals but also to serve as a pathway out of rural poverty. However, the sector struggles to adapt to changing realities, as the challenges it faces today have persisted for decades. Structural inefficiencies in agricultural value chains, inadequate post-harvest systems, limited market access, and deep-rooted reliance on traditional practices continue to act as constraints to the sector reaching its true potential. The recent changes in policy, such as the rollback of the government wheat procurement and MSP program, have further highlighted these issues, which will only be compounded further by climate pressure and extreme weather events.

This **chapter** highlights some key challenges hindering continued agricultural development in Pakistan, particularly in regard to the changing policy landscape within the agriculture sector. Chapter 5 will then explore where opportunities can be leveraged to support the rural transformation process.

4.1 Value Chain Challenges

Much inefficiency in Pakistan's agriculture sector stems from the way value chains are structured and operated. From input supply to production to marketing, inefficiencies at each stage lead to postharvest losses, lack of reliable storage and transportation, limited market proximity, and informal marketing networks. Each of these are briefly discussed below.

4.1.1 Storage Constraints

Post-harvest losses in Pakistan are high, mainly due to poor storage practices across the value chain. Farmers, especially smallholders, lack access to adequate storage facilities, often relying on open-air or informal storage. The limited use of certified warehouses and absence of an effective warehouse receipt system is another constraint. In 2024/25, despite a pilot launched by the Punjab government to promote EWRs, uptake remained extremely low. One plausible reason could have been a lack of clarity with regards to who the actual vs. intended users of such a program would be. A meeting with representatives from the International Finance Corporation (IFC) revealed that millers are seen as likely primary users of such infrastructure, with smaller farmers facing entry barriers due to transaction sizes and consolidation needs. The conversation highlighted that profitability in storage hinges on utilization, and that effective implementation requires infrastructure flexibility and credible financial linkages.

During various meetings, stakeholders pointed out that storage, especially for grains, need not always be silo storage. What matters more is that storage facilities, whatever their form, are well managed and protect against weather and disease risks. This becomes especially important during

extreme weather events and floods. Many farmers store wheat for year-round consumption, and inadequate storage can lead to significant losses.

Implication: Without adequate storage, farmers are forced to sell produce immediately after harvest, when prices are at the lowest, thus limiting their bargaining power and reinforcing dependency on middlemen. A large proportion of smaller farmers grow wheat for home consumption and thus store some across the year. These systems are typically rudimentary. Poor storage systems also lead to higher losses during extreme weather events and floods, threatening livelihoods and food security, as is the case in recent flood-affected areas of the country.

4.1.2 Fragmented and Informal Marketing Channels

Agricultural marketing in Pakistan continues to operate either through informal channels with limited transparency, competition, and price formation for farmers or through ties to the long-standing agriculture produce markets (APMs) established under the Punjab Agricultural Produce Markets Act of 1939, with similar acts for other provinces. Despite some updates in 1978, the mechanisms largely remained the same. Most small and medium farmers rely heavily on commission agents (arthis) who are tied to a local APM but often operate without formal contracts or transparent pricing.

While reforms like PAMRA were introduced to modernize markets, most central markets continue to operate under outdated models. One study found a lack of even the most basic features.⁴⁸ For instance, only 40% of markets had parking facilities, while just 20% had storage facilities. Only 4% had weighbridges to weigh produce, and 87% used paper to record transactions. It is not surprising then that digital platforms, contract farming, and structural trading systems remain underdeveloped, or inaccessible to most farmers.

Implication: Farmers remain stuck in low-value transactions, with limited ability to improve their terms of trade. Over time, these inefficiencies impede improvements in rural incomes, investments, and agricultural growth. They also contribute to excess transport costs and higher post-harvest losses.

4.1.3 Wheat Value Chain Uncertainty

The wheat value chain in Pakistan is undergoing significant change, especially following the rollback of the government's wheat procurement program. For decades, the government had played a central role in stabilizing the market by purchasing wheat at the MSP. However, under fiscal constraints and IMF-backed reforms, this policy is being phased out, starting with Punjab's unexpected withdrawal from procurement in 2024. The abrupt exit left farmers without a guaranteed buyer despite an announced MSP, forcing many to sell at lower prices in open markets.

48 Asian Development Bank, *TA 9866-PAK: Preparing the Punjab Resilient Agriculture Value Chain Project, Agriculture Markets Development Assessment Report*, Finnish Consulting Group and Asian Development Bank, March 2024.

Interestingly, the MSP has been reintroduced in 2025 (after the first draft of this report was written) in response to the recent floods, fixed at PKR 3,500 per 40 kg with a procurement target of 6.25 mmt to build strategic reserves, to be carried out via the private sector in order to improve transparency and efficiency. Although an understandable short-term measure, this step has created uncertainty regarding the longer-term direction of wheat policy.

Such policy shifts expose deep vulnerabilities in the wheat value chain, from pricing uncertainty and farmer distress to confusion among market players who had long operated under a state-supported system. Storage and distribution channels, once tied to public procurement, now lack clear direction, and wheat-deficit provinces are likely to face financing challenges without federal support.

Implication: Although the 2024/25 wheat season did not see a drastic fall in cultivation and production of wheat as compared to historical trends, the longer-term implications are still unfolding. Wheat remains critical for national food security, and in the absence of government procurement and storage, alternative mechanisms need urgent attention. Without this, the system risks becoming more volatile, especially for smaller farmers and food-insecure regions that have traditionally relied on government-managed stocks.

4.1.4 Lack of Grading and Standardization Mechanism.

Standardized grading systems remain absent across most agricultural markets in Pakistan, hindering fair pricing and market efficiency. Produce is often sold in bulk without much regard for differences in quality, and prices are largely determined through informal negotiations or auctions dominated by middlemen. This setup puts farmers who invest in higher-quality production at a disadvantage. Moreover, as pointed out during the Consultative Workshop, in the absence of grading and standardization, setting up EWRs and digital trading also becomes challenging.

Although the PAMRA framework allows for the introduction of grading and quality assurance mechanisms, implementation on the ground has been limited. As mentioned earlier, in many markets, basic infrastructure for quality testing, certification, or packaging is missing, as without storage facilities or weighbridges to weigh produce, modern approaches cannot be used. This not only discourages innovation and good agricultural practices but also makes it difficult for Pakistani produce to compete in higher-end domestic and export markets.

Implication: Without a reliable system for grading and standardization, farmers have little incentive to improve quality, and markets remain inefficient.

4.2 Challenges in Market Access

Accessing markets remains one of the most persistent bottlenecks in rural Pakistan's agricultural landscape. For many farmers, particularly small and medium farmers and those in remote areas, the journey from farm to market is hindered by long distances, poor road infrastructure, limited transportation options, and lack of aggregation facilities. These challenges not only increase

transaction and logistics costs but also reduce farmers' ability to negotiate fair prices or tap into higher-value markets. During the Consultative Workshop, Representative Ministry of Planning, Development, and Special Initiatives pointed out that the issue was more pronounced for perishable produce like fruits and vegetables, where delays or inefficiencies can lead to rapid post-harvest losses. The issues of market location and transport costs are further discussed below.

4.2.1 High Transport Costs and Losses

Transporting agricultural produce, particularly fruits, vegetables, and other perishables, remains one of the most costly and inefficient steps in Pakistan's agri-food value chains. Farmers often rely on transport services that lack proper handling equipment, cold storage, or even basic protection from weather. As a result, produce quality deteriorates rapidly during transit, leading to both physical losses and reduced market prices.

During the Consultative Workshop, participants were of the opinion, as collected through the Mentimeter, that these challenges are further exacerbated when farmers are located far from markets or collection centers, increasing their dependence on intermediaries who often control the terms of trade. For many crops, the lack of reliable and affordable transport discourages farmers from even attempting to reach higher-value markets, reinforcing a cycle of low-margin production and localized sales.

Implication: Without investment in rural transport infrastructure and cold chain systems, both farmer incomes and consumer access to quality food will remain constrained, limiting the potential for rural transformation and market diversification

4.2.2 Market Location and Infrastructure

It was pointed out by multiple stakeholders during the Consultative Workshop that beyond just limited access to formal markets, the spatial disconnect between farms and location of markets remains a major barrier. Many formal markets were originally designed to serve specific notified areas, often bypassing newer or smaller farming clusters that have since emerged. As a result, farmers in such areas are forced to travel long distances to reach a central mandi, which tends to be a costly and inefficient process, especially for those producing perishable crops.

Policy changes under PAMRA have opened the system of central markets to private entities in the Punjab province, and other provinces are likely to follow suit. While a step in the right direction, the pace of these reforms has been uneven, and many private markets have not been able to flourish as per expectations. Moreover, according to representative PAMRA, although more than 200 private markets have thus been established, quality and transparency are a concern.

Implication: Distant markets and inadequate infrastructure increase costs and losses, particularly for fruit and vegetable producers. Strengthening local markets and infrastructure, alongside PAMRA's reforms, is essential to enhance market efficiency and farmer incomes.

4.3 Policy and Institutional Gaps and Knowledge Constraints

Despite ongoing efforts, many of Pakistan’s agricultural market reforms face challenges in effective implementation. Limited private sector investment slows the pace of modernization, while farmers continue to suffer due to a lack of insufficient access to timely information and extension services needed to improve productivity. Weak monitoring mechanisms further impede progress, and unpredictable or *ad hoc* policy decisions add to the uncertainty faced by producers and traders alike. Each one of these challenges is discussed below.

4.3.1 Weak Implementation of Market Reforms

The PAMRA Act itself can be considered a major reform, and establishing the Authority itself and its organizational structure is an achievement. The Authority’s roles are to regulate public or private auctions in the APMs, prescribe grading standards and good agricultural practices, and collect registration fees for an APM, collection center, virtual market or service provider. By the end of 2024, PAMRA had registered about 200 private firms but many of these never started operating or were real estate operations. This of course took time away from more useful efforts. PAMRA officials noted that they have tightened the registration process and only added 70 new markets with much tighter standards in the past year.

Administrative bottlenecks, limited capacity at the local level, and vested interests of established entities often delay or dilute reform efforts. As a result, the intended benefits of these reforms remain unrealized in many markets.

Implication: Weak implementation slows progress toward transparent, competitive markets, leaving smallholder farmers vulnerable to exploitation and limiting overall sector growth.

4.3.2 Limited Private Sector Investment in Market Reforms

The modernization of agricultural markets requires significant private sector participation, especially in areas such as infrastructure development, digital platforms, and value-added services. However, limited investment from private players has constrained the scaling up of these initiatives. Challenges include regulatory uncertainty, inadequate incentives, and limited awareness of market opportunities.

The PAMRA experience with the 200 new private markets has been instructive, where it was learned that more engagement and review is required for successful input from the private sector. The Authority is also charged with roles in research and information provision, establishing model auction markets, promoting alternative marketing channels and contract farming, all which will demand sustained private sector inclusion. Finally, the possibilities for more local collection markets and more rural APMs will require better private and public partnerships than have developed so far.

Implication: Without robust private sector involvement, market reforms risk stagnation, reducing the scope for innovation and improvements in market efficiency.

4.3.3 Limited Access to Information and Extension Services

Access to timely, relevant, and accurate information remains a critical challenge for farmers in Pakistan. Agricultural extension services, which can provide technical guidance, market information, and training, are often underfunded and unable to reach farmers effectively. This gap restricts farmers' ability to adopt better practices, understand market trends, and make informed production and marketing decisions.

Implication: Poor access to information keeps farmers trapped in low productivity cycles and impedes their capacity to respond to changing market demands and climate risks.

4.3.4 Monitoring Challenge

Effective monitoring and evaluation are essential to track the progress of market reforms and agricultural programs. However, Pakistan's agricultural sector faces significant challenges in quality data collection, analysis, and reporting. This weak monitoring reduces accountability, hinders timely policy adjustments, and limits evidence-based decision making.

Implication: Without strong monitoring, reforms risk being poorly targeted or ineffective, slowing overall agricultural development and rural transformation.

4.3.5 Unpredictable and *Ad Hoc* Policy Interventions

Frequent and unpredictable changes in agricultural policies, such as sudden shift in subsidies, or import and export tariffs and quotas, create uncertainty for farmers, traders, and investors. These *ad hoc* interventions discourage long-term planning and investment, leading to inefficiencies and market distortions. A very dramatic recent example is perhaps the decision by Sindh to double the wheat procurement price in September after the 2022 floods to give farmers some compensation after the very large losses to crops. This forced other provinces to match their levels, and created confusion in the markets and stress on government budgets that ultimately was a part of the reason the MSP program collapsed. This again was seen in 2025, when, after abolishing the MSP, it was reintroduced to support farmers post floods.

Implication: Policy unpredictability negatively impacts farmer confidence and market stability, impeding sustainable growth and rural development.

4.4 Nutrition Gaps

Food security in Pakistan has, for the most part, revolved around meeting caloric needs, primarily through wheat and milk consumption. While this has helped ensure basic energy requirements for much of the population, it has also masked the deeper issue of nutritional insecurity. The heavy reliance, both in how food is produced and consumed, on a narrow range of staples has come at the cost of dietary diversity. As a result, fruits, vegetables, and protein-rich foods remain under-consumed as they are often more expensive, less accessible, or simply not part of regular diets.

This imbalance contributes to Pakistan's persistently high rates of malnutrition, including stunting, wasting, and widespread micro-nutrient deficiencies, especially among women and children. Part of the problem lies in structural limitations: nutrient-rich crops are harder to grow, store, and transport without cold chains and market linkages. And while wheat has long benefited from state procurement, subsidies, and policy support, other food groups have not received the same attention.

Implication: Even if Pakistan is food secure in terms of caloric intake, the lack of nutrition security poses a serious risk to public health and human development. For rural transformation to be meaningful, the focus must expand beyond grain yields to include support for more diverse and nutritious food.

4.5 Climate Change Challenges

The deep dive into climate change (Chapter 3) addresses four dimensions that affect the agricultural economy, and indirectly the broader national economy. These include reduced yields in crops from rising temperatures, heat stress that reduces labor productivity, and rising evaporation leading to greater aridity and salinity in soils and thus a reduction in land resources. It also examines the possible effects of reduced rainfall and surface water inflows on crop production. Our analysis shows the incremental effects of each dimension on agricultural output and household expenditures, which are large. The challenges are grouped into the following topics.

4.5.1 Increased Weather Variability and Extreme Events

The growing prevalence of extreme droughts and floods has become a rising concern, and, at one point it appeared that floods in 2025 could be larger than previous occurrences, including 2010 and 2022, but that was not the case in the end. Just this year, after a winter drought where some parts of Pakistan in January 2025 saw 55% less rainfall than average, the monsoons in late May and June led to maximum storage reached and spillways opened to release water. A warmer atmosphere can hold more moisture, leading to heavier precipitation events. While there is great uncertainty about changes in the levels of rainfall throughout the 21st century, a clear outcome is rising intensity of rainfall events, which can lead to drier periods within the year as well if overall precipitation does not increase.

Implication: The resulting floods from extreme events have led to huge costs experienced within several weeks, and which are far beyond what the government is able to manage. During the 2022 floods, only 2.7 million families (with about 16 million people) or just around half of the 33 million affected persons received just PKR 25,000 (or US \$116). While there was also short-term support given to prepare farmers for the following season and for other immediate requirements, the total support may have reached US \$500 million, which was quite low in comparison to the US \$7.15 billion in crop losses.

Inevitably, pressure is high on the government to fix issues as quickly as possible and to spend on poverty alleviation and housing recovery after such events. Yet consistent programs to address the long-term effects of climate change and to systematically build resilience to future floods better

fits funding availability, and, in fact, will yield higher payoffs than addressing each flood as it comes along and letting programs lapse in years between.

4.5.2 Growing Water Scarcity amid Rising Demands

With population growing at about 2%, and industry and environmental demands growing, demand outside of agriculture will surely increase. Additionally, with higher temperatures, Pakistan may require an additional five MAF of water to meet higher requirements, based on our simulations in Chapter 3. These demand side effects will arise in the face of possibly tighter supply.

To the degree that flows are comprised of glacial melting, at some point, the “Water Tower” of glaciers in the Hindu Kush, Karakoram and Himalayan ranges will begin to decline with potentially disastrous effects. However, research has noted the existence of a “Karakoram Anomaly” where glaciers in that range do not seem to be melting as fast as in the Himalayas. These divergent outlooks have contributed to stresses between Pakistan and India in the IWT that governed water allocation for the two countries since 1960. India put the treaty in abeyance in the Spring of 2025 and has not been adhering to many of its rules since.

The peaks of surface inflows in the summer months may continue to grow throughout the 21st century with roughly the same pattern but with one that may be 60% higher. This concentration is in fact a creation of scarcity as more water flows when there is already an excess.

Implication: The scarcity of water is almost surely going to become more acute through both demand and supply side effects. The full range of options needs to be considered, from use of better agricultural inputs to diversification and with better water management. Some of these drivers may be seen soon, so preparation needs to be thought through early.

4.5.3 Heat-Related Effects on Output and Household Incomes

Other influences from climate change outside water issues have significant effects on agricultural production. These include declining yields from rising heat, a reduction in the quality of land and its availability from increasing salinity and aridity. Rising temperatures also can lower labor productivity due to heat stress. As labor and land are key factors of production, and yields are essentially a measure of TFP, problems in these areas lead to reduced output and lower incomes. Our analysis showed that each factor led to reductions in total household incomes of PKR 40-47 billion from lower labor productivity and land availability in the 25th year of our simulations.

Implication: The agricultural economy in Pakistan is already dealing with low yield and production levels relative to potential, and climate change pressures will make this even harder. Research and extension programs must understand the extent of these problems and gain private sector input. One former government irrigation engineer commented in a consultation that rising salinity in the soil is a slow process and is not noticed at the early stages. It is also hard to get rid of, even with soil amendments.

4.5.4 Needed Climate-Sensitive Agricultural Practices

The simulations in this analysis showed negative climate change impacts on all major and minor crops, which became larger as more effects were imposed. In terms of losses in production value, rice lost the most in both absolute and percentage declines in production value because of its high water and labor use, the inputs most negatively affected by climate change. Following rice, fruits and vegetables and Other Crops (pulses and fodder) had relatively large absolute and percentage declines, especially as the base values were not at the larger end for these two crops. Wheat also had a large loss in production, but this was mainly due to the size of the crop rather than its percentage decline. Sugarcane and cotton saw intermediate declines both in percentages and in an absolute sense.

Implication: Rice has the largest export proportion of any crop, so climate change is a detriment to export promotion efforts. Expanded fruits and vegetables and Other Crops production will enhance nutrition, but the climate change effects are significantly negative. These crops are also beneficiaries of many crop diversification strategies, so more effort will be needed than when there is no climate change.

5. Final Perspectives: Opportunities and Recommendations

This chapter highlights key areas where policy reform, institutional innovation, and public and private sector investment and engagement can unlock meaningful progress toward rural transformation. Building upon the previously outlined challenges, as well as the deep dives into the wheat sector, PAMRA reforms, and climate change issues, it offers actionable recommendations for each opportunity identified.

5.1 Leveraging Wheat Sector Reforms for Diversification and Value Addition

5.1.1 Encouraging Crop Diversification in a Post-Procurement Era

With the phasing out of government wheat procurement and MSP, there is an opportunity to encourage more diverse rabi cropping systems in appropriate zones. Without the guaranteed returns in wheat, farmers are likely to explore alternative options, if provided with a stable, predictable policy environment. This can reduce wheat overproduction and shift marginal areas toward higher value crops, such as mustard, canola, fodder, sesame, and potato, as suggested by Workshop participants through Mentimeter feedback.

With the right incentives, demonstrated proof of concept examples, advisory services, and input access, this transition could promote more efficient land use and enhance dietary diversity and eventually better nutritional outcomes.

Recommendations:

1. Ensure policy stability in the wheat markets by reserving the MSP mechanism only as a contingency option for times of severe crises.
2. Identify agro-ecological zones suitable for alternative rabi crops and invest in pilot diversification packages tailored to those areas.
3. Align market development strategies with diversification efforts by proposing, testing, and encouraging localized value-addition services and assessing the various farmer-processor linkage models, including contract farming.
4. Ensure extension activities are developed using evidence-based research results to build farmer knowledge around alternative high-value crops.

5.1.2 Expanding Value Addition and Processing

Rollback of wheat procurement and support policies is likely to lead to crop diversification, if the initiative is adequately supported, as discussed above. This is a valuable opportunity to invest in localized value chains and processing industries that can handle a wider range of crops, with a strong focus on high-nutrition fruits and vegetables.

Value addition can also open new consumer markets, both domestic and export-oriented, especially when quality standards and grading are considered. Value addition also creates employment opportunities, especially for women and youth, and can help diversify rural livelihood opportunities.

Recommendations:

1. Conduct a scoping study or establish a task force to identify high-potential commodities, investment gaps, public-private partnership opportunities, and farmer-processor linkage models.
2. Provide financial and technical support for setting up agro-processing units and local collection markets in diversified crop zones along with business and technical training through extension programs for farmer cooperatives and processors.
3. Promote standards and certification systems to access export markets.

5.2 Formalizing and Modernizing Market Systems

5.2.1 Strengthening PAMRA to Support Market Development

The establishment of PAMRA itself marked a significant policy shift in Punjab's agricultural marketing. However, it is likely that the PAMRA initiative was implemented hastily, primarily to meet tangible targets under the SMART program, without adequate due diligence. Its full potential, thus, remains untapped. Within the current departmental setup, PAMRA is best suited to evolve into a platform that standardizes auctions, digitizes market data, and regulates licensing and grading more effectively. These can expand market access for farmers, particularly for perishable crops. While there appears to be a recognition of improvements by PAMRA personnel, an ADB technical assistance project shows the substantial effort still needed.⁴⁹

Recommendations:

1. Strengthen PAMRA's institutional capacity to encourage improved public and private markets, regulate auctions, oversee grading and food safety standards, and promoting better price discovery. This can be done through targeted technical assistance, staff training, and financial support.
2. Develop and operationalize a monitoring and reporting system for PAMRA's diverse efforts.
3. Provide financial and technical support for encouraging rurally located fruit and vegetable markets.

⁴⁹ The experience here is outlined in detail in ADB's TA 9866-PAK: Preparing the Punjab Agriculture Markets Development Project. The completion report and other relevant documents can be found at <https://www.adb.org/projects/documents/pak-53070-002-tcr>

5.2.2 Developing Electronic Warehousing and Digital Market Platforms

Investing in EWR systems and digital platforms can strengthen market stability and empower farmers by allowing more flexibility in timing their sales. Electronic warehousing can enable safer, standardized storage, especially in flood-prone areas. Receipts can act as collateral for credit, hence possibly reducing the reliance on informal, usually more expensive, credit lines. Ultimate users may possibly not be farmers, rather other participants in the wheat marketing system, like millers, traders, and even futures markets participants.

Meeting with representative from Pakistan Mercantile Exchange (PMEX) revealed that PMEX has been tasked with facilitating a spot market for trading at EWRs, enabling wheat stored in accredited warehouses to be exchanged on an electronic platform with real-time price discovery and mobile access for farmers and traders. This venture represents a modest but meaningful step toward modernizing the wheat sector. If scaled properly, especially with quality certification, integration with broader market reforms through PAMRA, and linkages to digital marketplaces, this system can serve as a critical buffer in volatile years.

There was a consensus among participants at the Consultative Workshop that deep consideration is needed in terms of which farmer or trader groups are most likely to utilize these platforms, and any incentives offered to attract usage should be packaged accordingly.

Recommendations:

1. Support public-private partnerships to pilot bundled services that combine warehousing, logistics, and digital market access in selected high-potential districts.
2. Promote financial literacy and awareness among farmers and traders to increase adoption of EWRs and digital trading platforms, using local extension networks and farmer organizations.
3. Integrate digital trading platforms with warehousing systems, allowing producers to access buyers while their goods are securely stored.

5.2.3 Encouraging Medium and Large Farmers as Catalysts

Given the diverse characteristics of actors within the agri-food sector, a standardized policy approach is unlikely to fully tap into the unique potential, needs, and capacities of each group. Tailored-strategies are therefore needed for different farmer groups, to account for how each interacts and is likely to interact with the market, as discussed in Chapter 2.

Medium and larger-scale farmers, particularly those with access to land, capital, and networks can play an important role in driving adoption of improved marketing models and other technologies and innovations. If well supported and engaged, their early uptake of storage innovations, contract farming models, or tech-enabled trading platforms can create spillover benefits for smaller farmers in the same value chains.

Literature also finds that through their economic activity and spending patterns, medium-sized farmers create spillover effects that benefit smaller, more vulnerable farmers. Moreover, as these

medium-sized farmers raise their own incomes, they spend and reinvest in rural areas. This helps drive demand for locally produced goods and services, thus creating jobs in the process, and reducing poverty in surrounding communities.⁵⁰

Recommendations:

1. Establish a farmer registration database to identify and support medium and large farmers as leaders for digital platforms, EWRs, and modern post-harvest technologies.
2. Ensure that market regulations (e.g., PAMRA rules, warehouse accreditation) are accessible and clearly communicated to farmers looking to formalize operations.
3. Facilitate partnerships between these farmers and agribusinesses, exporters, or processors to promote inclusive value chains.

5.2.4 Strengthening Farmer Organization and Cooperative Models to Improve Bargaining Power of Small Farmers

Small and marginal farmers, who make up a vast majority of Pakistan’s farming community, interact differently with value chains and the market system as compared to their larger counterparts. As discussed in Chapter 2, they are more likely to remain embedded within traditional, informal marketing systems due to ease of access and higher transactions costs associated with tapping into formal markets. However, collectively, these farmers represent a significant share of the country’s agricultural output and, if organized effectively, have the potential to negotiate better prices, reduce input costs, and access more structured and transparent market opportunities. Strengthening farmer groups and cooperative models can therefore serve as a critical lever to bring smallholders into more modern, efficient value chains. Doing so would not only improve their income prospects but also support more inclusive rural transformation.

Recommendations:

1. Assess and support the formation of farmer cooperatives to enable collective bargaining and market access, where deemed more efficient than current practices.
2. Invest in capacity building of farmer groups to improve their management and ability to engage with buyers, financial institutions, and service providers.
3. Enable linkages between cooperatives and market infrastructure and digital platforms, allowing them to access storage facilities, possibly participate in electronic trading, and benefit from real-time price information.

50 Mellor, J.W., and S.J. Malik, “The Impact of Growth in Small Commercial Farm Productivity on Rural Poverty Reduction,” *World Development* 91, C (2017): 1-10. <https://doi.org/10.1016/j.worlddev.2016.09.004>

5.3 Expanding Climate-Smart Agriculture

5.3.1 Balancing Investment in Flood Programs vs. Adaptation Programs

The floods resulting from extreme events have led to huge costs that occur within several weeks and are far beyond what the government can provide compensation for. Yet, inevitably, the pressure is high to fix many issues as quickly as possible and to spend on poverty alleviation and housing recovery. Programs to address the long-term effects of climate change and systematically build resilience to future floods are more consistent with Pakistan's funding streams and will yield higher payoffs than compensating a small amount for each flood as it comes along. The analysis here shows that the payoffs from reducing losses in labor productivity or avoiding salinization of land can be just as high over the long run as benefits from flood compensation, albeit more benefits go to higher-income households than the protection afforded by increased resilience in the face of floods, which protects more vulnerable populations.

Recommendations:

1. Convince policymakers that adaptation to the long-term costs of climate change effects will yield equal and perhaps better economic value than some flood investments (based on analysis in Chapter 3).
2. Prepare a balanced and long-term investment to enhance resilience to floods and address the growing effects of climate change on factors of production, with expenditures scaled according to the expected benefits.
3. Reallocate current subsidies to create stable financial flows for investment in both flood resilience and climate change.
4. Implement behavioral change and awareness programs to inform inhabitants of flood plains and other encroachments of options and their liabilities.

5.3.2 Addressing Water Scarcity amid Increased Water Demand

With a growing population, and with industry and environmental demands and crop water requirements growing as well, the demand for water will continue to grow. There may also be tighter supply despite a Karakoram anomaly, where glaciers do not seem to be melting. However, with a more rapidly declining supply in the Himalayas and without the IWT, a future with less water for Pakistan is certainly possible. This set of recommendations is for developing programs to manage scarcity on both the demand and supply sides.

Recommendations:

1. Assess ways and infrastructure alternatives to make better use of the peak surface inflows in the summer months if they increase with roughly the same pattern but with the peaks 60% higher.

2. Manage the scarcity of water on both the demand and supply sides, with pricing, ownership rights of water, taxes, improved productivity, and infrastructure development all designed to handle scarcity and the increase in extreme events.
3. Promote, using research-based results, a range of options and strategies from better inputs to diversification and better water management, recognizing that some crops may not be worth growing under certain scenarios.

5.3.3 Addressing Issues Related to Heat Stress

Other effects from climate change beyond water issues could have significant impact on agricultural production, including declining yields from rising heat and a reduction in land quality and availability from increasing salinity, which is also in large part related to heat. Also, labor productivity is lowered by heat stress due to higher temperatures. Pakistan's agricultural economy is already dealing with low yields, and pressures on each of these key variables will make this even harder.

Recommendations:

1. Ensure research and extension programs' understanding of heat stress-related problems is up to date and includes private sector input. Pursue development of heat-tolerant crop varieties.
2. Develop programs to help farmers see how salinity affects fields and set up programs to combat salinity using preventive approaches.
3. Determine the most cost-effective ways to deal with heat stress in field work. As women probably have longer days and more repetitive tasks, customizing programs by gender may be effective.
4. Review and incorporate the objectives and evolving approaches in the upcoming ADB mechanization project in Punjab. The third and fourth objectives relate directly to females but may not directly reflect issues of heat stress.

5.3.4 Needed Climate-Sensitive Agricultural Practices

Finally, the analysis shows negative climate change impacts on all major and minor crops, which increase as more effects are imposed. Rice losses the most value with climate change due to its high crop water requirements and high labor use. Following rice, fruits and vegetables and Other Crops (pulses and fodder) have relatively large absolute and percentage declines, thus making improved nutrition harder to achieve. Given these effects, this set of recommendations suggests efforts be expanded in developing and disseminating needed climate-sensitive agricultural practices.

Recommendations:

1. Examine the sensitivity of crops to climate change dimensions to identify the importance of each factor. Programs could analyze whether land, labor productivity, or water suffer the worst effects, and therefore which should be priorities.
2. Investigate improved water management options especially for rice, including alternate wetting and drying, and for other crops, bed and furrow systems.
3. Revisit the National Adaptation Plan's focus on agricultural strategies to develop more concrete implementation steps.

5.4 Building Institutional Capacity and Data Systems

5.4.1 Strengthening Research and Agricultural Extension Services

With changes in market structures, opportunities for crop diversification, and climate uncertainty, the role of agricultural extension services is increasingly critical. Farmers require timely, localized, and practical information from evidence-based results to fully benefit from these changing dynamics. Without updated extension systems, even the best policy reforms may fail to reach the farm level.

Recommendations:

1. Utilize digital tools and mobile platforms to deliver real-time, localized information to farmers. These efforts could include strategies to deal with flood risks.
2. Broaden extension content to include diversified crops, climate-smart practices, and post-harvest management. With rising heat stress, more attention and innovation in extension activities should be given to labor productivity.
3. Establish public-private partnerships to scale innovative, farmer-focused extension models.

5.4.2 Using Data and Research for Targeted Policy

With the shifts in crop patterns, evolving market structures, and climate variability, the need for timely data collection has become critical. Improving data collection and accessibility can support more responsive and evidence-based policies. Collaborations with research institutions, such as the Pakistan Institute of Development Economics (PIDE), and with provincial agricultural research boards could enable more adaptive policy-making for smarter, targeted rural development strategies. This would avoid blanket programs and instead enable differentiated support for smallholders, transitioning producers, and large commercial farmers.

Recommendations:

1. Establish a comprehensive digitized farmer registry that captures their geographical location, farm size, cropping patterns, and level of technology adoption. This registry can be used for targeting various policies and programs.

2. Develop integrated national and provincial agri-data platforms that consolidate production, storage, utilization, export, and climate data for real-time policy use.
3. Formalize partnerships with research institutions to conduct regular policy-relevant studies and impact evaluations that inform government decision-making
4. Track the evolution of the off-farm AFS using a “food dollar” series, collected annually, to identify the transitions to higher value added contributions by different crop and livestock activities. It could be based on a registry of agribusinesses of different sizes and roles in their respective value chains.

5.5 Unlocking Youth and Women’s Participation

As strongly indicated during the Consultative Workshop and also through the Mentimeter, rural transformation cannot be fully realized without integrating youth and women within the AFS. Gender inclusive value chains are not only equitable, but also enhance productivity and resilience. While women already play key roles in harvesting, processing, and food preparation, they are often excluded from decision-making, market transactions, and financial services. Supporting their involvement through skills training, micro-credit, and women-led cooperatives can improve household incomes and nutritional outcomes.

Similarly, Pakistan’s large rural youth population represents an untapped asset. As agriculture becomes more technology driven, new pathways can be explored for youth engagement. Digital skills training, access to mobile-based market tools, or logistics-related entrepreneurship (e.g., transport, storage, and packaging) can open up nontraditional roles for rural youth within agriculture.

Recommendations:

1. Support women in agriculture by facilitating women-led agri-entrepreneurship, cooperative ventures, and smallholder enterprises through tailored training, finance, and inclusive market platforms.
2. Introduce digital-skills and agri-entrepreneurship training for rural youth through vocational programs and public-private partnerships.
3. Design targeted schemes to promote youth engagement in agribusinesses or digital advisory services.

6. A Summary of Key Recommendations with Stakeholder Input

This chapter summarizes the main insights developed in Chapter 5 in matrix form and includes stakeholder input from a dissemination and validation workshop held in December 2025. In that workshop, the results from Chapter 5 were presented in matrix form to stakeholders for their input. The matrix was then adjusted to include those comments and in some cases revisions to the findings. The following section summarizes the topics and priorities of the stakeholders, while the next section shows the matrix itself.

6.1 A Summary of Stakeholder Comments and Priorities

Key findings of the report were presented at a dissemination and validation workshop on December 11, 2025, to a diverse group of stakeholders, including members of the Ministry of National Food Security and Research’s Technical Working Group on Food Systems Transformation. Breakout sessions were organized to assess the three key areas of recommendations, that is, leveraging wheat sector reforms for diversification and value addition; formalizing and modernizing agricultural market systems; and investing in climate-smart agriculture. Key discussion points from each group were then presented in a plenary session. These are captured in Table 8 and summarized in this section.

Table 8: Participants in Each Breakout Session

Leveraging Wheat Sector Reforms for Diversification and Value Addition	Formalizing and Modernizing Market Systems	Investing in Climate Smart Agriculture
Mubarik Ali	Shingo Kimura	Nazim Ali
Ghulam Sadiq Afridi	Nazeer Ahmed	Muhammad Imtiaz
Naeem Ullah	Faiz Rasool	Sitara Gill
Arif Rehman	Safyan Kakakhel	Iqra Akram
Umer Saeed	Mansoor Ali	Tehseen Qureshi
Farah Naz	Yahya Gulraiz	Ishfaq Ahmad
Muhammad Danish	Munib Baig	Ahmad Nawaz

The first group deliberated on IFPRI’s recommendations regarding leveraging wheat sector reforms for diversification and value addition. For the first recommendation, the group noted that there is an immediate need for small-scale value addition at the local level, as these efforts would require fewer resources and would lead to better returns to rural farmers. The group also concluded

that though EWRs are critical for the overall AFS transformation, in the short run, small-scale village level (or door-step) storage facilities are required.

On the second recommendation, the group also noted that efforts have already been made in identifying potential commodity clusters across different agro-ecological zones, and this knowledge should be used as a starting point for promoting diversification of crops. Canola and rabi pulses were pointed out as specific examples to focus on. Finally, the group noted that extension services under the private sector, such as those provided by input companies, should be further encouraged along with the use of demonstration plots for dissemination of knowledge.

The second group discussed recommendations for formalizing and modernizing market systems. They emphasized that beyond the enactment of PAMRA, there is a strong need for capacity enhancement across all stakeholders along the market chain, from market committees to the staff within PAMRA itself. They explained the importance of developing a clear action plan or road map for PAMRA and attributed its underwhelming performance thus far to its lack of an operational plan. As an example, the Punjab Food Authority was discussed, which has become self-sustaining. According to the group, this is the first action that needs to be taken immediately.

For the next recommendation, the group highlighted the absence of a clear “champion” for EWRs as a key bottleneck and recommended engaging provincial IT boards to host and maintain digital marketing platforms, while integrating financial institutions, fintech, and agritech startups to strengthen market linkages.

With regards to the recommendation of encouraging medium and large farmers as the catalyst of change, while they agreed with the key action points, they noted that a farmer registration database already exists, which should be updated and expanded, alongside the development of a comprehensive database of agribusinesses and exporters to improve market access.

Additional recommendations within the group discussion included providing subsidies and tax incentives to private entities facilitating farmers, offering loans to farmers to enable self-arranged transportation from farm to market, and incentivizing the development of backward linkages, led primarily by processors

The third group focused on climate change recommendations based on results from Chapter 3. In the first topic, balancing investments in resilience to floods versus adaptation programs, the group felt it was necessary to convince policymakers of the equivalence of long-term costs of climate change and the economic value of flood investments because government traditionally underinvests in long-term adaptation measures and prefers visible, infrastructure-heavy investments (dams, embankments). They felt the priority would be to, first, reallocate subsidies toward resilience and adaptation, as using feasible income streams of the government well is the best starting point. (Shifting subsidies may in fact take a “pay for results” program like the World Bank’s SMART program.) Overall, the group supported a balanced investment plan that clearly quantifies existing subsidies, since subsidy reallocation is essentially an investment. Behavioral change and warnings to floodplain inhabitants would be part of this investment, in part perhaps

because donors may prefer investing in behavior-change programs (training, crop choice, education).

The second climate change area addressed dealt with water scarcity amid increased water demand. The recommendations listed possible ways forward including pricing, ownership rights to water, taxes, improved productivity, and infrastructure development, which were generally supported by the group. The group was especially interested in the supply side issues of water scarcity and recommended scaling up sensor-based, high-efficiency irrigation systems and diversifying monitoring systems, as well as expanding research and innovation in water-saving practices. The heat stress recommendations that attracted most interest were for improving crop water management practices and stress-tolerant varieties through a scaling-up of pilots and research into large-scale programs. In contrast, the participants made few comments on salinity, the drying of agricultural land, or effects of heat stress on labor productivity. Yet these topics were shown to be major factors affecting production losses, and the current director of the International Water Management Institute (IWMI) stressed the salinity consequences and issues as being important. The group generally felt that a fourth area looking at climate-sensitive agricultural practices did not need more research but rather scaling-up and implementation.

6.2 Matrix of Key Recommendations with Stakeholder Feedback

The following table gives the recommendations described in Chapter 5 and also summarizes the feedback received by stakeholders in the Workshop breakout sessions. The first column reproduces the general recommendations for the three partitions found in Chapters 2, 3 and 5. The second column shows the binding constraints and drivers that cause the issue to be a challenge, and the need for recommendations to improve performance. The third column provides the detailed action items associated with each category, which were put forward to the stakeholder groups as in the table. The fourth column shows examples of the participating institutions, which came from discussions by the stakeholders as well as from the author's contributions and from the ADB working group, and which are listed in the acknowledgments at the beginning of the paper. The final column notes the participant comment to one or several of the key action items listed. The main implications of this table have been discussed in the section above.

Table 9: Recommendation Matrix with Breakout Session Participant Feedback

1. Leveraging Wheat Sector Reforms for Diversification and Value Addition				
(a) Recommendations	(b) Drivers / Binding Constraints causing the issue	(c) Key Actions for Implementation	Participating Institutions	Participant Comments
1.1 Encouraging Crop Diversification in a Post-Procurement Era	Historical procurement and support price policies have distorted market incentives toward select crops.	Ensure policy stability in the wheat markets by reserving MSP mechanism only as a contingency option for times of severe crises.	Private Sector Provincial Food Departments Banks / Financial Institutions	Small-scale storage facility at doorstep Existing electronic warehouse receipt system needs to be strengthened Incentivize flour mills to procure and store wheat
	Weak value chain development, storage, and market linkages due to distorting central market policies.	Identify agro-ecological zones suitable for alternative rabi crops and invest in pilot diversification packages tailored to those areas.	Provincial Extension Departments Research Institutions Chamber of Commerce	Promote canola by providing seed, training, and processing facility Promote rabi pulses Promote vegetable processing
	Weak extension services and limited access to improved technology for diversified crops.	Align market development strategies with diversification efforts by proposing, testing and encouraging localized value addition services and assessing the various farmer-processor linkage models, including contract farming.	SMEs Microfinance banks / financial institutions	Promote cluster-based value addition.
	Inadequate risk management instruments discouraging diversification.	Ensure extension activities are developed using evidence-based research results to build farmer knowledge around alternative high-value crops.	Provincial Extension Departments Private sector extension services	Train extension workers on value addition of high value crops Use demo-plots and media for knowledge dissemination.

1. Leveraging Wheat Sector Reforms for Diversification and Value Addition

(a) Recommendations	(b) Drivers / Binding Constraints causing the issue	(c) Key Actions for Implementation	Participating Institutions	Participant Comments
1.2 Expanding Value Addition and Processing	Inadequate rural infrastructure, including cold chain infrastructure.	Conduct a scoping study or establish a task force to identify high-potential commodities, and clusters investment gaps, public-private partnership opportunities, and farmer-processor linkage models	Academia SMEs and Bank/ financial institutions	Re-visit scoping studies that have already been conducted around commodity clusters and formulate an action plan for ways forward.
	Weak linkages between producers and processors, Limited access to finance and technical expertise for small and medium agro-enterprises.	Provide financial and technical support for setting up agro-processing units and local collection markets in diversified crop zones along with business and technical training through extension programs for farmer cooperatives and processors.	Public and Private R&D institutions	Promote R&D and innovation in clusters and value-chains Create an enabling environment
		Promote standards and certification systems to access export markets.	PSQC Ministry of Science and Technology	Promote establishment of private sector laboratory Increase the utilization of existing labs

2. Formalizing and Modernizing Markets Systems

(a) Recommendations	(b) Drivers / Binding Constraints causing the issue	(c) Key Actions for Implementation	Participating Institutions	Participant Comments
2.1 Strengthening PAMRA to Support Market Development	Institutional capacity gaps within PAMRA, including limited technical expertise, and inadequate financial resources.	Strengthen PAMRA's institutional capacity to encourage improved public and private markets, regulate auctions, oversee grading and food safety standards, and promoting better price discovery. This can be done through targeted technical assistance, staff training, and financial support.	PAMRA, Donor Agencies Private research institutions	In addition to PAMRA, there is a need for capacity enhancement of all stakeholders, starting from market committees all the way up. Develop an action-plan or road map to implement PAMRA effectively. Other self-sustaining structures, such as the Punjab Food Authority, should be studied as an example.
	Lack of a comprehensive monitoring and reporting system to track market performance and enforce standards.	Develop and operationalize a monitoring and reporting system for PAMRA's diverse efforts.		
		Provide financial and technical support for encouraging rurally located fruit and vegetable markets.		

2. Formalizing and Modernizing Markets Systems

(a) Recommendations	(b) Drivers / Binding Constraints causing the issue	(c) Key Actions for Implementation	Participating Institutions	Participant Comments
<p>2.2 Electronic Warehousing and Digital Market Platforms</p>	<p>Limited awareness and understanding of EWRs and digital trading benefits among small and medium farmers.</p>	<p>Support public-private partnerships to pilot bundled services that combine warehousing, logistics, and digital market access in selected high-potential districts.</p>	<p>Provincial agricultural departments Provincial IT boards Agribusinesses, SMEs, financial institutions and banks</p>	<p>There is no “champion” of EWRs, hence no driving force to push them forward. Engage provincial IT boards for hosting and maintaining digital marketing platforms. Integrate financial institutes, fintech, and agritech startups. Focus on key action 3.</p>
	<p>Lack of integration between storage facilities and trading platforms prevents farmers from realizing full value of stored goods.</p>	<p>Promote financial literacy and awareness among farmers and traders to increase adoption of EWRs and digital trading platforms, using local extension networks. farmer organizations, and progressive central markets.</p>		
		<p>Integrate digital trading platforms with warehousing systems, allowing producers to access buyers while their goods are securely stored.</p>		

2. Formalizing and Modernizing Markets Systems

(a) Recommendations	(b) Drivers / Binding Constraints causing the issue	(c) Key actions for Implementation	Participating Institutions	Participant Comments
2.3 Encouraging Medium and Large Farmers as Catalysts	<p>Weak linkages between farmers with agribusinesses, exporters, and processors.</p> <p>Regulatory complexity deters farmers from formalizing operations.</p>	<p>Establish a farmer registration database to identify and support medium and large farmers as leaders for digital platforms, EWRs, and modern post-harvest technologies.</p>	<p>Provincial agricultural departments</p>	<p>A farmer registration database already exists, which should be updated and further developed for the purpose listed here.</p> <p>Develop a database of agribusinesses and exporters to enhance market access.</p> <p>Provide subsidies and tax reductions to private entities that are facilitating farmers</p> <p>Provide loans to farmers to arrange their own transportation from farm to market.</p> <p>Incentivise development of backward linkages, with processors leading the charge.</p>
		<p>Ensure that market regulations (e.g., PAMRA rules, warehouse accreditation) are accessible and clearly communicated to farmers looking to formalize operations.</p>	<p>Provincial IT boards</p> <p>Agribusinesses, SMEs, financial institutions and banks</p>	
		<p>Facilitate partnerships between these farmers and agribusinesses, exporters, or processors to promote inclusive value chains.</p>		

2. Formalizing and Modernizing Markets Systems				
(a) Recommendations	(b) Drivers / Binding Constraints causing the issue	(c) Key Actions for Implementation	Participating Institutions	Participant Comments
2.4 Strengthening Farmer Organization and Cooperative Models to Improve Bargaining Power of Small Farmer	Limited management and financial skills among small farmers. Poor integration between farmer organizations, market infrastructure, and digital platforms limits access to finance, storage, and price information.	Assess and support the formation of farmer cooperatives to enable collective bargaining and market access, where deemed more efficient than current practices.	Private sector Provincial agricultural departments	There is a lack of trust / confidence among different actors for cooperative models to fully develop. One solution could be to strengthen farming commodity clusters as a first step and let linkages develop. Instead of pushing for cooperative models, approach the issue backwards, with private sector in lead and the demand of a certain produce catalyzing farmer cooperatives.
		Invest in capacity building of farmer groups to improve their management and ability to engage with buyers, financial institutions, and service providers.		
		Enable linkages between cooperatives and market infrastructure and digital platforms, allowing them to access storage facilities, possibly participate in electronic trading, and benefit from real time price information.		

3. Investing in Climate-Smart Agriculture

(a) Recommendations	(b) Drivers / Binding Constraints causing the issue	(c) Key Actions for Implementation	Participating Institutions	Participant Comments
3.1 Balancing Investment in Flood versus Adaptation Programs	CGE results show that adaptation to long-term costs of climate change could yield economic values surprisingly close to flood investments	Convince policymakers that adaptation to the long-term costs of climate change effects will yield equal and perhaps better economic value than some flood investment	Provincial P&D departments as lead; Irrigation, PDMA departments and donor supported analytical teams	Convincing is needed because government traditionally underinvests in long-term adaptation measures such as climate-resilient varieties, Water-efficient technologies and prefers visible, infrastructure-heavy investments (dams, embankments).
		Prepare a balanced and long-term investment to enhance resilience to floods and address rowing effects of climate change on factors of production, with expenditures scaled based on expected benefits.		The group finally supported Option 2, with Option 3 integrated into it. The approach would be to develop an investment plan that clearly quantifies existing subsidies major infrastructure options (e.g., dams, embankments) as well as amounts going into adaptation.
		Reallocate current subsidies to create stable financial flows for investment in both flood resilience and climate change.	Legislative bodies; donor support with pay for results programs in provincial departments	Initially prioritize Option 3 to reallocate subsidies toward Build Back Better (BBB) efforts and Adaptation measures, as using the current income streams of the government well is the best starting point.

		Implement behavioral change and awareness programs to inform inhabitants of flood plains and other encroachments of options and their liabilities.	Provincial Ag and Irrigation departments as leads; PDMA departments and donor supported analytical teams	Many middle-class households live in peri-urban and floodplain areas, increasing exposure. Donors (e.g., ADB) prefer investing in behavior-change programs (training, crop choice, education).
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3. Investing in Climate-Smart Agriculture

(a) Recommendations	(b) Drivers / Binding Constraints causing the issue	(c) Key Actions for Implementation	Participating Institutions	Participant Comments
3.2 Addressing Water Scarcity Amid Increased Water Demand	Climate change, population and income growth.	Assess ways and infrastructure alternatives to make better use of the peak flows of surface inflows in the summer months if they increase with roughly the same pattern but with the peaks 60% higher.	Agriculture Departments Ministry of Water Resources (with World Bank support) IWMI	Policy & investment
	Rising crop production in the face of climate change will demand more water unless water saving options are pursued.	<p>The scarcity of water will have to be managed on both the demand and supply sides, with pricing, ownership rights of water, taxes, improved productivity and infrastructure development all designed to handle scarcity and the rise of extreme events.</p> <p>Promote, using research-based results, a range of options and strategies from better inputs to diversification and better water management.</p>		<p>Priority actions need to include scaling up sensor-based high efficiency irrigation systems and diversifying monitoring systems, as well as expanding research and innovation in water-saving practices. Awareness programs will play a role as well. The Original option 3 is merged into Option 2 as a sub-component of key actions based on participant comments.</p>

3. Investing in Climate-Smart Agriculture

(a) Recommendations	(b) Drivers / Binding Constraints causing the issue	(c) Key Actions for Implementation	Participating Institutions	Participant Comments
3.3 Addressing issues related to heat stress		Assess research and extension programs' understanding of problems due to heat stress is up to date and includes private sector input. Pursue development of heat tolerant crop varieties.	Relevant Stakeholders are Agricultural Research Departments FSC&RD, PARC Private sector input providers	The priority option of the stakeholder group is the first one, with a focus to improve crop water management practices + stress-tolerant varieties through a scaling up activities. These would include Expanding pilots and research into large-scale programs. Promoting adoption through technology dissemination and extension.
		Develop programs to help farmers see how salinity expands in fields and set up programs to combat programs using preventive approaches.		The participants made few comments on the topics of salinity, or the drying of agricultural land, or effects of heat stress on labor productivity. Yet these topics were shown to be factors affecting production losses. The current director of IWMI stressed the salinity consequences and issues.
		Determine the most cost-effective ways to deal with heat stress in field work. As women probably have longer days and more repetitive tasks, customizing programs by gender may be effective.		

	<p>Review and incorporate the objectives and evolving approaches in the upcoming ADB mechanization project in Punjab. The third and fourth objectives relate directly to females but may not reflect directly issues of heat stress.</p>		<p>The current ADB mechanization project does not yet include objectives to mechanize women's work in agricultural activities specifically. This can be incorporated in the current start-up phase of that project.</p>
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3. Investing in Climate-Smart Agriculture

(a) Recommendations	(b) Drivers / Binding Constraints causing the issue	(c) Key Actions for Implementation	Participating Institutions	Participant Comments
3.4 Needed climate sensitive agricultural practices		Examine the sensitivity of crops to climate change dimensions so that the importance of each factor can be identified. (Programs could analyze whether land, labor productivity, or water create biggest effects, and therefore what should be priorities).	Provincial P&D departments as lead; Irrigation, PDMA departments and donor supported analytical teams	Stakeholders agreed this is a mature area of knowledge—multiple assessments already exist. People have examined and investigated but it's time to implement!
		Investigate improved water management options especially for rice, including alternate wetting and drying, and for other crops, bed and furrow systems.		
		Revisit the National Adaptation Plan's focus on agricultural strategies to develop more concrete implementation steps.		Therefore, this third Key Action on Implementation is prioritized to shift from analysis to on-ground action.

4. Building Institutional Capacity and Data Systems				
(a) Recommendations	(b) Drivers / Binding Constraints causing the issue	(c) Key Actions for Implementation	Participating Institutions	Participant Comments
4.1 Strengthening Agricultural Extension Services	<ul style="list-style-type: none"> - Under funded and under staffed provincial extension departments - Weak integration of research, digital information systems, and farmer feedback loop. 	Utilize digital tools and mobile platforms to deliver real-time, localized information to farmers.		
		Broaden extension content to include diversified crops, climate-smart practices, and, post-harvest management. With rising heat stress, ore attention and innovation in extension activities should be given to labor productivity.		
		Establish public-private partnerships to scale innovative, farmer-focused extension models.		
4.2 Using Data and Research for Targeted Policy	<ul style="list-style-type: none"> - Absence of an integrated agri-data system linking production, storage, trade, and climate information across relevant stakeholders. - Weak coordination between research institutions, line departments, and policymakers. 	Develop integrated national and provincial agri-data platforms that consolidate production, storage, utilization, export and climate data for real-time policy use		
		Formalize partnerships with research institutions to conduct regular policy-relevant studies and impact evaluations that inform government decision-making		
		Track the evolution of the off-farm AFS using a “food-dollar’ series collected annually, to identify the transitions to higher value added contributions by different crop and livestock activities. grams.		

5. Unlocking Youth and Women's Participation

Unlocking Youth and Women's Participation	<ul style="list-style-type: none"> - Cultural and social norms limit women's mobility and access to land, inputs, and credit - Weak integration of youth and women into market and extension services. 	Support women in agriculture by facilitating women-led agri-entrepreneurship, cooperative ventures, and smallholder enterprises through tailored training, finance, and inclusive market platforms.		
		Introduce digital-skills and agri-entrepreneurship, training for rural youth through vocational programs and public-private partnerships.		
		Design targeted schemes to promote youth engagement in agribusinesses or digital advisory services.		

7. Alignment with ADB Strategy 2030 Operational Priorities

To turn the recommendations in Chapter 5 into meaningful action, the government will require support and coordination. As mentioned, strengthening extension services to promote crop diversification and climate-smart agriculture, building institutional capacity, and fostering stronger linkages with the private sector will be critical. However, given current fiscal and resource constraints, the provincial governments will require external support. ADB can play a critical role in this regard through financing and capacity development.

A stronger private sector role is also envisioned to truly drive the AFS transformation agenda forward. Increasing the contribution of off-farm activities in agricultural GDP will require value addition across the AFS, from processing and packaging to storage and marketing. While the government must provide an enabling policy environment, it is the private sector that will ultimately invest in new technologies, scale-up agribusiness models, and create employment opportunities in rural areas. ADB can help facilitate this public-private partnership by fostering dialogue and supporting pilot projects.

The analyses, opportunities, and recommendations presented in this report are thus purposefully aligned with ADB's Strategy 2030, as presented in Table 10.

The recommendations also align closely with priority areas of other development partners, such as the World Bank's outcomes under the Country Partnership Framework for Pakistan (2026–2035): reduced child stunting; reduced learning poverty; increased resilience to climate change; cleaner energy and better air quality; more public resources for inclusive development; and increased productive private investment. Through actions such as strengthening climate-smart agriculture, supporting market modernization, targeting subsidy reforms, and promoting inclusive opportunities for women and youth, our strategies reinforce these six goals.

Table 10: Alignment of Recommendations with ADB Strategy 2030 Operational Priorities

Strategy 2030's Operational Priorities	Identified Opportunities within the AFS	Comments
OP5: Promoting Rural Development and Food Security	<p>5.1 Encouraging Wheat Sector Reforms for Diversification and Value Addition</p> <p>5.1.1 Encouraging Crop Diversification in a Post-Procurement Era 5.1.2 Expanding Value Addition and Processing</p> <p>5.2 Formalizing and Modernizing Market Systems</p> <p>5.2.1 Strengthening PAMRA to Support Market Development 5.2.2 Electronic Warehousing and Digital Market Platforms 5.2.3 Encouraging Medium and Large Farmers as Catalysts 5.2.4 Strengthening Farmer Organization and Cooperative Models to Improve Bargaining Power of Small Farmers</p>	<p>The report proposes leveraging wheat sector reforms to diversify crop systems and expand value-addition opportunities. Recommendations like shifting toward post-procurement era diversification and enhancing processing value chains (Sections 5.1.1 and 5.1.2) are designed to directly support rural competitiveness and food security.</p>
OP3: Tackling climate change, building climate and disaster resilience, and enhancing environmental sustainability	<p>5.3 Expanding Climate Smart Agriculture</p> <p>5.3.1 Balancing Investment in Flood versus Adaptation Programs 5.3.2 Addressing Water Scarcity Amid Increased Water Demand 5.3.3 Addressing Issues Related to Heat Stress 5.3.4 Needed climate sensitive agricultural practices</p>	<p>Recognizing the growing pressures from extreme weather and resource scarcity, the report recommends scaling climate-smart agriculture practices. Sections 5.3.1 through 5.3.4 offer targeted strategies to balance flood response, adapt to water scarcity, and mitigate heat stress in agricultural production systems.</p>
OP6: Strengthening governance and institutional capacity	<p>5.2 Formalizing and Modernizing Market Systems</p> <p>5.2.1 Strengthening PAMRA to Support Market Development 5.2.2 Electronic Warehousing and Digital Market Platforms 5.2.3 Encouraging Medium and Large Farmers as Catalysts 5.2.4 Strengthening Farmer Organization and Cooperative Models to Improve Bargaining Power of Small Farmers</p> <p>5.4 Building Institutional Capacity and Data Systems</p> <p>5.4.1 Strengthening Research and Agricultural Extension Services 5.4.2 Using Data and Research for Targeted Policy</p>	<p>The report emphasizes building stronger institutions and data systems through enhanced market infrastructure under PAMRA (Section 5.2) and improved extension and policy capabilities (Section 5.4) to enable better coordination, transparency, and adaptability across agricultural governance.</p>
OP2: Accelerating progress in gender equality	<p>5.5 Unlocking Youth and Women's Participation</p>	<p>The discussion on unlocking youth and women's participation (Section 5.5) proposes inclusive investment in women-led agribusiness, digital</p>

		platforms for youth, and cooperative models, ensuring that women and young people benefit equitably from rural transformation.
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8. Conclusion

Pakistan's economic history is a story of both progress and persistent challenges. While the country has advanced to lower-middle-income status and is gradually shifting toward more off-farm activities, its agriculture sector has not kept pace with regional competitors. Stagnant yield growth, low productivity per worker, and inefficient water use have all limited agriculture's contribution to broader economic gains. Agriculture in Pakistan is facing a new set of opportunities today in the form of policy reform, market modernization, and climate resilience, which, if acted upon, have potential to transform the sector toward a more diversified, competitive, and resilient agri-food system.

Crop diversification beyond wheat is essential for both economic resilience and better nutritional outcomes. A stable policy environment would give farmers the confidence to shift toward higher-value and more nutritious crops. Moreover, investment in localized processing and value addition will also be critical. Rollback of the wheat procurement and minimum support price policies presents the opportunity to rethink long-standing production incentives, thus enabling farmers to respond more directly to market signals.

Market reforms under the Punjab Agriculture Marketing Regulatory Authority (PAMRA), created as an initiative in the World Bank's SMART program, presents another opportunity. Although reforms under the PAMRA have been slow, they represent a significant opening for improved competition, standardized auctions, better data, and more efficient price formation. Strengthening market access, improving and expanding storage networks, and developing well-functioning price mechanisms will be essential to support the ongoing transition toward a more robust agri-food system.

The report also emphasizes that climate change will play a growing role in shaping the future of Pakistan's agri-food system. The expected increase in extreme events, such as floods, and the effects of heat stress, rising salinity, and higher crop water requirements will require front-loaded investments in resilience. Simulations show that reducing losses in labor and water productivity, and adopting heat and drought tolerant practices can yield benefits comparable to disaster compensation.

The path forward must also center around people. Engaging smallholders through collective models, ensuring women and youth are empowered participants in the food system, and equipping farmers with knowledge and tools to adapt to a changing climate will be critical. Better data and stronger institutions will be needed to guide adaptive policy responses as crop patterns and markets evolve.

The report aligns with the broader development goals of the Asian Development Bank's Strategy 2030, particularly in the strategic objectives of Promoting Rural Development and Food Security; Tackling Climate Change, Building Climate and Disaster Resilience, and Enhancing Environmental Sustainability; Strengthening Governance and Institutional Capacity; and Accelerating Progress in Gender Equality.

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Appendix 1. Pakistan's Agrifood System: Structure and Drivers of Transformation

Xinshen Diao and James Thurlow

Introduction

Pakistan experienced modest economic growth in the two decades since early 2000s. Focusing on the period between 2006 and 2023, the average annual economic growth was around 3.5% (Pakistan Bureau of Statistics 2024). Growth slightly accelerated in the years just before 2020, with an annual growth rate around 4.0%. Like many other countries in the world, the global COVID-19 pandemic led to a decline in Pakistan's economy in 2020. While economic growth recovered in 2021 and 2022, it became stagnant in 2023, when the economy was hampered by global commodity market disruptions related to the war in Ukraine and the global recession in 2023 (Arndt et al. 2023; Diao and Thurlow 2023). According to a World Bank projection, Pakistan's GDP growth rate is expected to be less than 2.0% in 2024 and possibly reach 2.5% in 2025, remaining below the country's potential. With slow to modest growth in the past two decades, Pakistan's economy did not show significant structural shift, with only modest changes in the share of agriculture in the total economy, and shares for manufacturing and services remaining largely unchanged too. Stagnant structural change in the broad economy is accompanied by a lack of transformation within the agrifood system (AFS). In this report, we assess the past performance of the country's AFS and analyze the relationship between the lack of transformation in Pakistan's AFS and in the broad economy.

The AFS is a complex network of actors who are connected by their roles in supplying, consuming, and governing agrifood products and jobs. When economies transform, agrifood systems are expected to evolve along with countries' broader development (Diao, Hazell, and Thurlow 2010; Timmer 1988). Subsistence farming typically dominates agriculture during the earliest stages of development; as agricultural productivity rises, however, farmers start to supply surplus production to markets, thus creating job opportunities for workers in the nonfarm economy, both within and outside of agrifood sectors (Haggblade, Hazell, and Dorosh 2007). Rising rural incomes generate demand for more diverse products, leading to more processing, packaging, transport, trading, and other nonfarm activities. In the early stages of transformation, the agriculture sector serves as an engine of rural and even national economic growth. Eventually, urbanization, the nonfarm economy, and nonagricultural incomes play more dominant roles in propelling AFS development, with urban and rural nonfarm consumers creating most of the demand for agricultural outputs via value chains that connect rural areas to towns and cities (Dorosh and Thurlow 2013). The exact nature of this transformation process varies across countries because of the diverse structure of their economies and the unique growth trajectories of their various agrifood and nonfood subsectors.

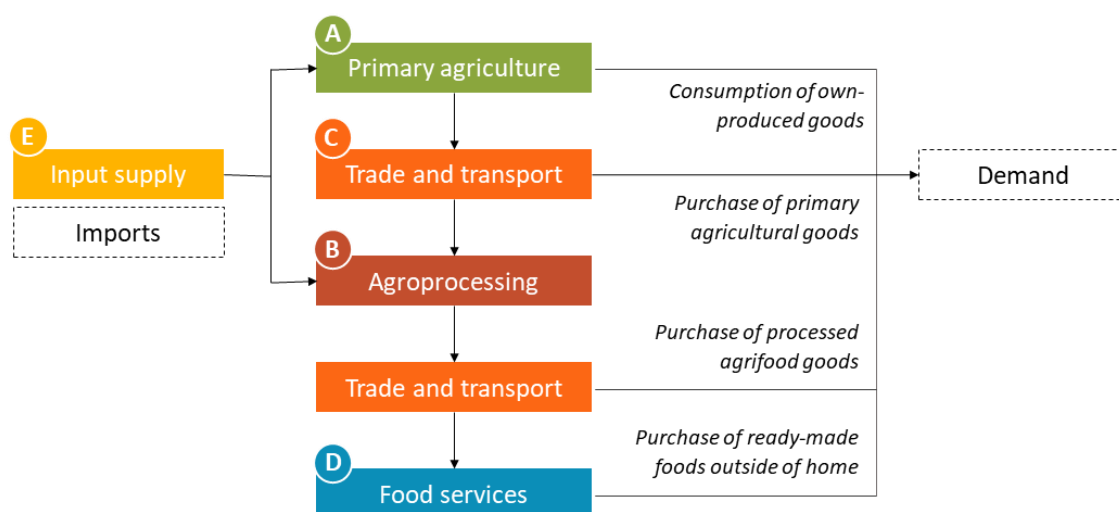
In this report, we describe the current size and structure of Pakistan's AFS and historical performance within the AFS, focusing on the period of 2006 to 2023. We also evaluate the potential contribution of different value chains to possibly accelerate agricultural transformation and inclusiveness. We start by offering a simple conceptual framework of the AFS and then compare Pakistan's AFS to that of other countries at different stages of development. We go on to disaggregate Pakistan's AFS across agricultural value chains, taking into

consideration their different market structures and historical contribution to economic growth and transformation. Finally, we use a forward-looking economywide model to assess the diverse contributions that specific value chains can make to each of a set of broad development outcomes. We conclude by summarizing our main findings.

A Simple Conceptual Framework of the Agrifood System

A country's AFS is a complex network of actors who are connected by their roles in supplying, using, and governing agrifood products (see Fanzo et al. 2020 for a detailed conceptual description of the AFS). In this report, rather than examining all components of Pakistan's AFS, we employ a narrower focus. We first measure its size, structure, and historical contribution to economic growth and transformation through a data-driven exercise; second, we use the International Food Policy Research Institute (IFPRI) Rural Investment and Policy Analysis (RIAPA) model (IFPRI 2023) to assess the effectiveness of AFS growth (led by productivity gains in different agricultural value chains) in promoting multiple development outcomes in Pakistan. Our measurement of the AFS is done from a supply-side perspective; that is, we use national accounts and employment statistics to either track or simulate growth and employment changes over time. By disaggregating the AFS into several value chain groups, this analysis offers a unique and useful perspective on the drivers of AFS growth and transformation.

Figure A1.1 A simple conceptual framework of the agrifood system



Source: Thurlow et al. (2023).

Figure A1.1 provides a simple conceptual framework of the AFS, made up of five components, A to E. *Primary agriculture* (A) comprises the supply and demand of all agricultural products, including crops, livestock, fisheries, and forestry products. *Agroprocessing* (B) is part of the manufacturing sector and includes those subsectors that process agriculture-related food or nonfood products. *Trade and transport services* (C) includes those services associated with the transporting, wholesaling, and retailing of agrifood products between farms, firms, and final points of sale. *Food services* (D) includes services, such as meals prepared at restaurants, food stalls, or hotels. Finally, *input supply* (E) is the portion of *domestically produced intermediate inputs* that is used directly in agricultural and agroprocessing production such as fertilizers and financial services.

Using this conceptual framework, it is possible to measure the size and structure of Pakistan's AFS from a supply-side perspective. Following the definitions of Thurlow et al. (2023), AFS GDP is the sum of the GDP contributions of the five components (A to E), while AFS employment is the total number of jobs across those components. With economic growth and transformation over time, there will be changes in the relative contributions of the various on-farm and off-farm components of the AFS. A transforming economy, for example, will typically be characterized by more rapid growth in the off-farm components of the AFS; there will thus be an increased contribution by off-farm components to the AFS and a relative decline in the contribution of primary agriculture. By disaggregating AFS GDP and employment by specific agricultural value chains, we can further assess the contribution of each of those value chains to AFS growth and transformation.

Current Structure of Pakistan's Agrifood System

Table A1.1 presents the current structure of Pakistan's AFS based on official national accounts data and sectoral employment statistics for 2023 (Pakistan Bureau of Statistics 2024; ILO 2024), as compiled in a 2023 social accounting matrix (SAM) for Pakistan (IFPRI 2024). National estimates are broken down into estimates for the AFS and the rest of the economy. The AFS GDP and employment are further broken down into the on-farm (primary agriculture) and off-farm components. The estimates for the national manufacturing, services, and trade and transport services subsectors at the bottom of the table include activities in both the AFS and non-AFS sectors, thus providing a perspective on the relative size of the off-farm AFS components within the overall manufacturing and services sectors.

As shown in the table, the AFS accounted for 42.2% of Pakistan's national GDP and about half (49.4%) of total employment in 2023. Primary agriculture alone contributed 24.7% of GDP and 35.8% of total employment, while the four off-farm components of AFS contributed 17.5% to GDP and 13.7% of employment. With modest economic growth, Pakistan's economic structure has barely changed, and the share of primary agriculture in the total economy changed modestly. The share of agricultural employment in total employment remains high, at about 11 percentage points higher than the share of agricultural GDP in total GDP, indicating lower labor productivity within agriculture than in the rest of the economy. While the off-farm components of AFS GDP are sizable, at 17.5 percent of total GDP, the agroprocessing component, which is part of the manufacturing sector, is only 5.0 percent of national GDP, about one-third of total manufacturing GDP.

The comparison of on- and off-farm GDP and employment shares shows that labor productivity in the off-farm components of the AFS is higher than on-farm labor productivity. The continuous movement of farm workers into these off-farm components—a process of agricultural transformation—may thus be beneficial to household incomes.

Table A1.1 Current structure of Pakistan’s agrifood system and economy (2023)

	GDP		Employment	
	Value (US\$ billion)	Share (%)	Workers (million)	Share (%)
Total economy	284	100	76.9	100
Agrifood system	120	42.2	38.0	49.4
Primary agriculture (A)	70	24.7	27.5	35.8
Off-farm AFS	50	17.5	10.5	13.7
Processing (B)	14	5.5	3.1	4.1
Trade and transport (C)	25	9.0	5.2	6.8
Food services (D)	4	1.4	1.5	1.9
Input supply (E)	6	2.1	0.7	0.9
Rest of economy	164	57.8	38.9	49.7
Total manufacturing	41	14.3	11.4	14.8
Total services	152	53.4	29.7	38.6
Total trade and transport	71	25.1	15.7	20.4

Source: Authors’ calculation based on the 2023 Social Accounting Matrix for Pakistan (IFPRI 2024).

Notes: A to E correspond to the five agrifood system (AFS) components from Figure 1. Total manufacturing is for the whole economy, including food processing, and total services are also for the whole economy.

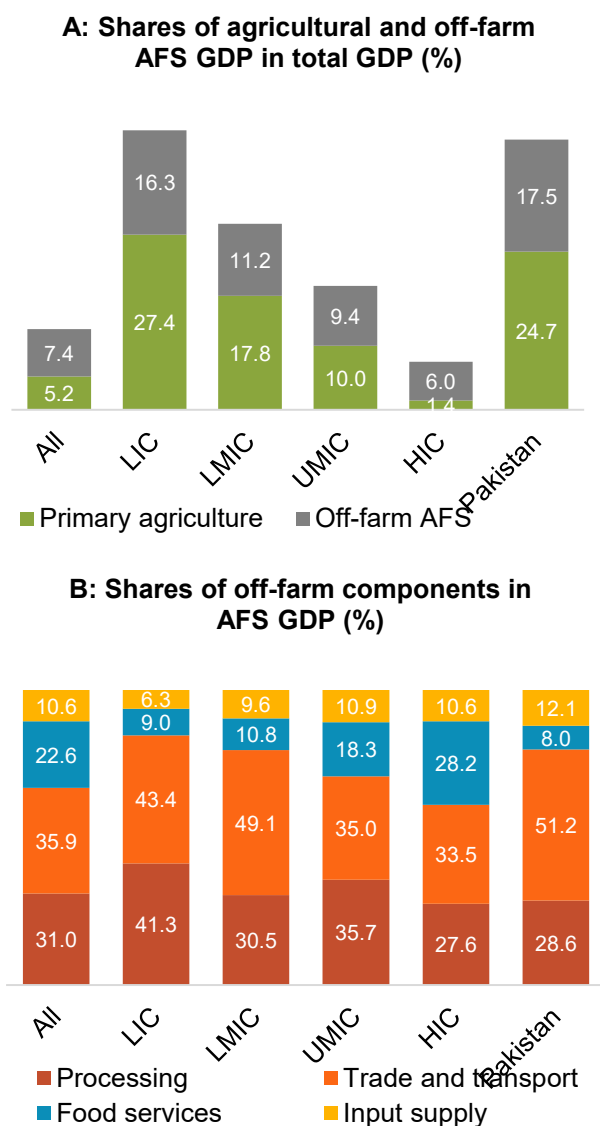
Comparing Pakistan’s Agrifood System to Other Countries

The structure and economic contribution of a country’s AFS vary at different stages of development. Evidence is provided in Figure A1.2, which compares the 2021 AFS structure of low-income (LIC), lower-middle-income (LMIC), upper-middle-income (UMIC), and high-income countries (HIC) with Pakistan in 2023.⁵¹ Pakistan is an LMIC, while its on-farm and off-farm components of AFS and their contribution to national GDP are all higher than those of its peer countries in LMIC and are close to the LIC group (Panel A). Within the four off-farm

⁵¹ Data are not available for 2023 for many countries, and we therefore use 2021 data for the four groups of countries in this section as reference points.

components of the AFS, Pakistan’s agroprocessing is slightly lower than that in other LMICs, while the trade and transport component is relatively larger (Panel B).

Figure A1.2 Comparing Pakistan’s agrifood system to other countries



Source: IFPRI’s Agrifood System Database (Thurlow et al. 2025) and the 2023 Social Accounting Matrix for Pakistan (IFPRI 2024).

Note: LIC = low-income country; LMIC = lower-middle-income country; UMIC = upper-middle-income country; and HIC = high-income country.

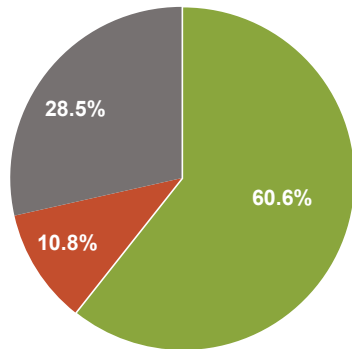
Unpacking the Demand Side of Pakistan’s Agrifood System

In Figure A1.3, the structure of Pakistan’s AFS from the supply side, as measured by AFS GDP (Panel A), is compared to the structure of the AFS from the demand side, as measured by household consumption of agrifood products (Panel B). While 60.8% of AFS GDP is from primary agriculture, primary agricultural commodities account for only 49.1% of household demand. In contrast, household demand for processed agrifood products accounts for 20.0% of total agrifood demand, even though the associated sector accounts for only 10.8% of AFS GDP. On the trade side, however, processed agrifood products account for more of Pakistan’s total agrifood exports, at 69.0%, and account for less in total agrifood imports, at

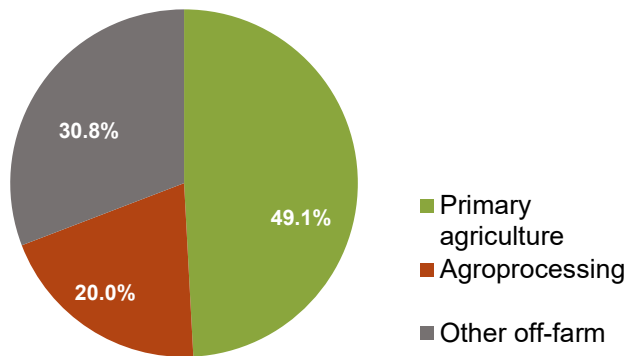
29.0 percent (Panels C and D). Despite this large share in exports, Pakistan actually imports more processed food products than it exports, US\$4.39 billion imports vs. US\$2.70 billion exports. The country has a substantial deficit in its total agrifood commodity trade balance as well as in processed agrifood commodities: Pakistan imports US\$6.17 billion of total agrifood products and exports US\$3.92 billion, that is, agrifood imports are almost twice the size of agrifood exports.

Figure A1.3 Composition of agrifood system GDP, household demand, and trade (2023)

A: AFS GDP

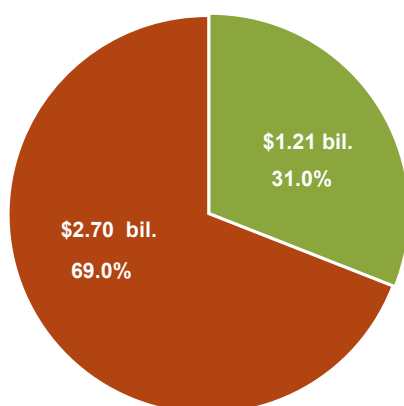


B: Household agrifood demand

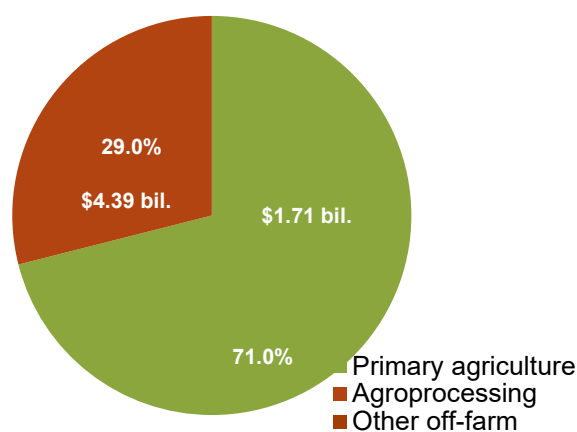


- Primary agriculture
- Agroprocessing
- Other off-farm

C: Agrifood exports (\$3.92 billion)



D: Agrifood imports (\$6.17 billion)



Source: Authors' calculation based on the 2023 Social Accounting Matrix for Pakistan (IFPRI 2024).

Disaggregating the Agrifood System across Value Chains

For a more detailed assessment of structural and historical growth patterns within the AFS, we group Pakistan's agrifood system into 15 value chain groups (see Table A1 in the Annex for details on how individual value chains or subsectors are mapped to value chain groups). The 15 value chain groups are further categorized into three subgroups based on their trade orientation. Exportable and importable value chains are defined as those value chains with export–output and import–consumption ratios above the national average, respectively. Trade in both primary and processed agrifood products is considered in the calculation of these trade ratios. The remaining value chains with both export–output and import–consumption ratios below the national average are classified as less-traded value chains.

Table A1.2's first row shows that both export–output and import–consumption ratios are low in Pakistan, an indication that agrifood production and consumption rely less on trade in general. The table then shows the 15 value chain groups, categorized into exportable, importable, and less-traded value chains. It also reports the contributions of each value chain group to the AFS, primary agriculture, and off-farm AFS GDP. Consistent with Figure A1.3, Table A1.2 shows that Pakistan has a deficit in agrifood trade with an import–consumption ratio of 3.7%, higher than the export–output ratio of 2.9%. Of the 15 value chains, 4 are classified as exportable value chains with their export–output ratios exceeding the national average for

AFS value chains. Excluding cottonseed and cottonseed oil, the oilseed value chain has a high export–output ratio, while we consider it an importable value chain because of the higher import–consumption ratio. While the fruit and nut value chain is identified as exportable, its export–output ratio is only 4.8%. The maize value chain that is listed as exportable also has a small export–output ratio (8.2%). The four exportable value chains together account for a modest share of total AFS GDP (15.4%), as well as similar modest shares of

Table A1.2 Pakistan’s agrifood system composition by trade orientation of value chain (2023)

	Share of GDP (%)			Exports / output (%)	Imports / demand (%)
	AFS	Primary agriculture	Off-farm AFS		
Total				2.9	3.7
Exportable	15.4	13.8	17.8	12.6	1.1
Rice	6.8	4.5	10.3	15.6	0.3
Fruits and nuts	5.2	6.5	3.2	4.8	2.3
Maize	1.8	1.6	2.1	8.2	1.9
Fish	1.6	1.2	2.2	25.6	1.0
Importable	11.3	8.1	16.4	2.6	17.9
Pulses	0.8	0.3	1.6	1.2	36.8
Oilseeds	0.7	0.2	1.5	16.4	39.6
Cotton	6.2	4.9	8.2	0.9	15.3
Other crops	1.5	0.6	2.9	9.6	16.1
Forestry	2.1	2.1	2.0	1.1	5.3
Less traded	73.2	78.1	65.8	1.0	1.1
Wheat	10.3	5.5	17.6	0.1	2.8
Vegetables	10.1	11.9	7.3	2.7	2.3
Sugar	4.1	3.1	5.7	1.6	0.1
Poultry	4.8	2.9	7.7	0.2	0.1
Other livestock	12.9	15.0	9.7	2.8	0.2
Milk	31.1	39.8	17.8	0.0	

Source: Authors’ calculation based on the 2023 Social Accounting Matrix for Pakistan (IFPRI 2024).

Note: Maize is mainly used in the feed industry in Pakistan. We aggregated cottonseed into the cotton value chain. Cottonseed oil accounts for a large share of edible oil consumption in Pakistan. For this reason, we also consider edible oil, a processed food product, as part of the off-farm component of cotton value chain. Cotton is mainly an intermediate good making cotton yards, the part of the textile sector in the Pakistan SAM. Because yards are a small part of the textile sector’s value added, we did not consider the textile sector as part of the AFS in the analysis and this table. Thus, while putting all edible oil as part of the cotton value chain may overestimate the off-farm component of the cotton value chain, excluding yards would underestimate this component.

primary agriculture and off-farm AFS GDP (13.8% and 17.8% respectively). Three of the four exportable value chains have an off-farm AFS GDP share higher than the primary agriculture GDP share, and this is particularly the case for the rice value chain, as both domestically consumed and exported rice requires milling, packaging, trading, and transport services.

While Pakistan has a large deficit in total agrifood trade, the rice value chain is a sizable exportable value chain with its export–output ratio of 15.6%, much higher than the export–output ratio for the entire AFS.

Of the 15 value chains, 5 are classified as importable, dominated by the cotton value chain. Cotton is an important cash crop and cottonseed oil is the most important edible oil consumed by Palestinian consumers. Also, the textile industry is one of the important manufacturing sectors in Pakistan while 30–40% of cotton used in yard-making in the textile industry is imported, meaning cotton identified as an importable value chain. Unlike exportable value chains, four of the five importable value chains have double-digit import–consumption ratios. This is particularly true for the value chains for pulses and for oilseeds that include groundnuts, sesame, soybeans, and other small items of oilseeds (excluding cottonseeds), and 36.8% and 39.6% of pulse and oilseed domestic demand are met by imports respectively. The five importable value chains together account for 11.3% of AFS GDP, the smallest group of value chains in AFS GDP. Products of importable value chains often require processing. The five importable value chains together account for 16.4% of off-farm AFS GDP, double their share in primary agricultural GDP (8.1%).

The remaining 6 of the 15 value chains are classified as less traded. Many less-traded value chains are large, and together they account for 73.2% of AFS GDP and a larger share of primary agriculture GDP. That is, Pakistan’s agrifood GDP is dominated by less-traded value chains, and they more than twice the size of trade value chains together in AFS GDP. In addition to the wheat, sugar, and poultry value chains, the other three large less-traded agrifood products require less off-farm processing and trade and transport-related services. Given the fact that Pakistan imports more processed agrifood products than it exports, expansion of agroprocessing in some less-traded value chains, together with further promotion of some exportable and importable value chains, could effectively drive agricultural transformation by boosting value addition and off-farm employment in AFS.

Structural Change and Drivers of Agrifood System Growth

The previous sections have provided a snapshot of the current structure of Pakistan’s AFS, the disaggregation of the AFS across the 15 value chain groups, and the trade orientation of those value chains. We have demonstrated that Pakistan’s agrifood system is less dependent on international trade, with both export–output and import–consumption ratios very low for the system as a whole. Between total agrifood exports and imports, Pakistan has a significant deficit in processed agrifood trade. The AFS system is dominated by less-traded value chains, and exportable and importable value chains are small groups. Prioritizing growth in some less-traded value chains by expanding their off-farm components, together with support to exportable and importable value chains that have large off-farm components, could therefore be an effective strategy for expanding off-farm value addition and jobs, which would contribute positively to AFS transformation.

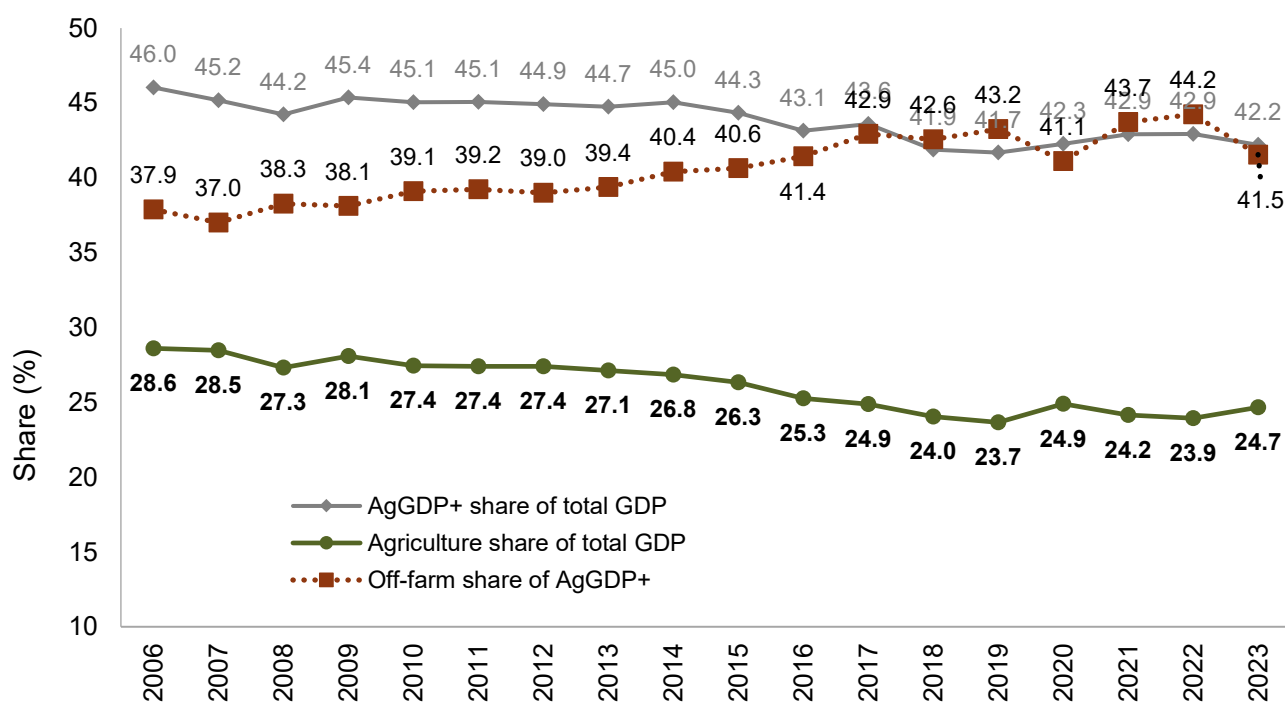
In this section, we assess the performance and structural change of Pakistan’s AFS in the 2006–2023 period. Labor productivity is typically lowest in primary agriculture, and higher in off-farm activities, such as in the agrifood processing and food services, and in sectors outside the AFS. Economic growth and urbanization are associated with relatively faster growth in these nonagricultural sectors, which can help create higher-paying jobs for both rural and

urban households. As such, even smallholder farm households with family members who obtain off-farm employment may benefit from structural transformation.

Figure A1.4 compares the shares of agriculture and AFS GDP in Pakistan’s national GDP with off-farm GDP share in the total AFS. The figure shows the trends between 2006 and 2023. Agricultural GDP share of total GDP declined by only 4 percentage points in 18 years, from 28.6% in 2006 to 24.7% in 2023. A similar stagnation can be seen for the share of the AFS in total GDP (46.0% and 42.2% in 2006 and 2023 respectively). Within AFS GDP, shares for off-farm components rose modestly, from 37.9% in 2006 to 41.5% in 2023.

Figure A1.5 compares agricultural GDP and agricultural employment shares in this period. The share of agricultural employment has fallen more rapidly than the agricultural GDP share, from 43.4% in 2006 to 35.8% in 2023, a decline of about 8 percentage points. However, measured as percentage change, the total decline is just 17.5% in 18 years, slightly faster than 14% for the total decline shown for agricultural GDP in the same period. Most declines in agricultural employment share occurred in the years after 2016 (42.3% in 2016), when broad economic growth accelerated slightly. However, compared to the agricultural GDP share of 24.7% in 2023, the agricultural employment share of 35.8% is still 11 percentage points higher in 2023, indicating low labor productivity within agriculture. The lack of transformation within the AFS is consistent with modest economic growth and lack of structural change in the broader economy in this period, as we briefly discussed in the introduction of this report.

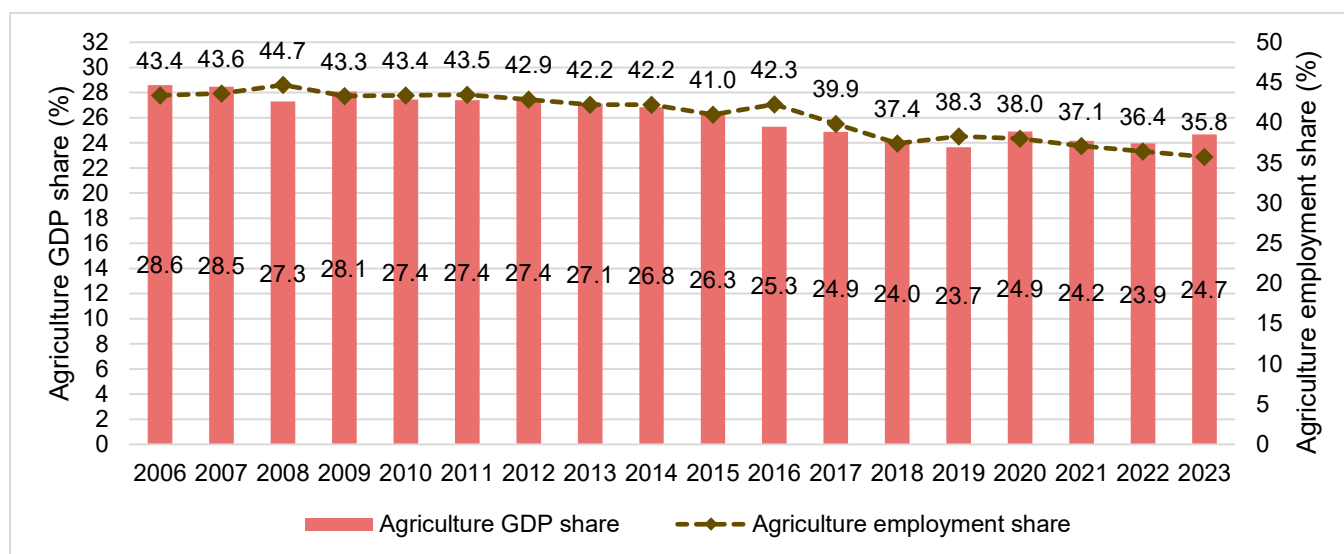
Figure A1.4 Agrifood system and agricultural shares of total GDP, and off-farm share of AFS GDP (2006 to 2023)



Source: Authors’ estimates using the 2006-2023 Social Accounting Matrixes for Pakistan (IFPRI 2024).

Note: AgGDP+ in the figure refers to AFS GDP.

Figure A1.5 Agricultural GDP and employment shares of the total economy (2006 to 2023)



Source: Authors' estimates using the 2006-2023 Social Accounting Matrixes for Pakistan (IFPRI 2024).

Table A1.3 evaluates the growth performance across AFS value chains for the 2006–2023 period. As before, value chains are grouped according to their trade status, that is, exportable, importable, and less-traded. Overall, the 15 value chains of Pakistan’s AFS grew at 2.8% per year in this period, slower than the growth of the total economy (3.5%) in this period. The off-farm components of the AFS grew faster (3.3%) than primary agriculture (2.4%), but still slower than the total economic growth rate of 3.5%. Agrifood processing, a subcomponent of the off-farm component of the AFS, had a similar growth rate of 3.1% per year.

The low growth rate of AFS GDP is driven by the declines in the cotton value chain, whose AFS GDP falls by 1.8% annually in 2006–2023 and both primary and off-farm components of its AFS GDP all fall. We group vegetable oils into the cotton value chain’s processing sector, because cottonseed oil is an important vegetable oil for Pakistan’s consumers. However, imported vegetable oils are mainly palm oil, whose low prices make it competitive both for cooking and food processing industries in the domestic markets of many developing countries. Pakistan also imports cotton that competes with domestic cotton production. These two factors may explain the declines in both primary agriculture and off-farm component of the AFS GDP in the cotton value chain. There are eight value chains achieving growth rates above the average for the total AFS during the 2006–2023 period; we consider only the four fastest growing value chains, which had growth rates of more than 4%, exceeding the economywide growth rate in this period (these are marked with an asterisk in Table A1.3). Each of the three groups – exportable, importable, and less-traded value chains -- include one of the fast-growing value chains, and two such value chains are in less-traded group. They are maize (exportable), oilseeds (importable), poultry and milk (less traded). The milk value chain is the largest value chain group in Pakistan, accounting for 31.1% of AFS GDP in 2023, while the poultry value chain has the highest growth rate (6.1%). For all four fast-growing value chains, off-farm components grew faster than primary GDP. Some value chain

Table A.3 Agrifood system GDP growth rates by value chain (2006–2023)

	Average annual GDP growth rate (%)			
	Total AFS	Primary Agriculture	Off-farm AFS	Agro-processing
All products	2.8	2.4	3.3	3.1
Exportable	2.9	2.2	4.0	3.6
Rice*	3.2	2.3	3.9	3.5
Fruits and nuts	2.3	1.9	3.9	3.6
Maize*	4.7	4.3	5.3	4.3
Fish	2.4	1.5	3.3	5.4
Importable	-0.4	-0.8	-0.1	-1.2
Pulses	0.8	-2.9	2.4	3.7
Oilseeds*	5.4	3.0	5.9	3.8
Cotton	-1.8	-1.4	-2.1	-4.4
Other crops	3.2	1.5	3.9	3.6
Forestry	1.2	1.1	1.3	3.7
Less traded	3.4	2.9	4.4	4.2
Wheat	2.2	0.9	3.0	2.8
Vegetables	3.0	2.4	4.7	3.7
Sugar	3.1	2.6	3.5	3.6
Poultry*	6.1	5.4	6.5	6.1
Other livestock	2.1	1.1	5.6	6.1
Milk*	4.4	4.3	4.8	3.7

Source: Authors' analysis using the 2006-2023 Social Accounting Matrixes for Pakistan (IFPRI 2024).

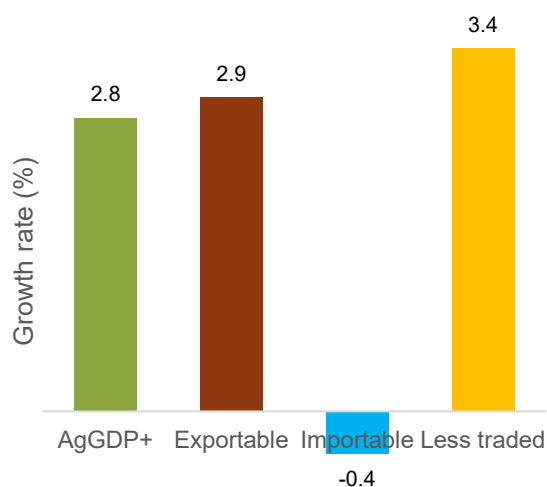
Note: Value chains that experienced above-average AFS GDP growth over the 2006–2023 period (that is, higher than 4.0%) are marked with an asterisk (*).

groups that have relatively large off-farm components could not reach these levels of growth; these include rice, wheat, and other livestock value chain groups. For these three value chains, slow growth within primary agriculture is a main explanation for their slow growth, indicating the importance of growth in primary agriculture in order to generate fast growth for the value chains with large off-farm components.

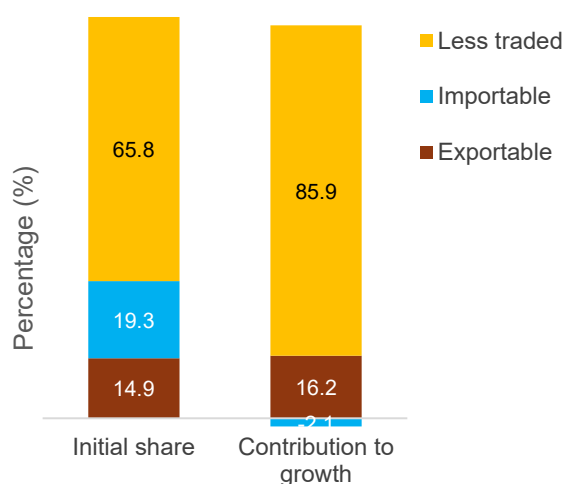
Figure A1.6 summarizes the key growth trends from Table A1.3. On average, the growth rate of exportable value chains (2.9%) is similar to the growth rate of the national AFS GDP (2.8%) growth is negative (-0.4%) for the importable value chains, and less-traded value chains (3.4%) grew much faster than the national AFS GDP (Panel A). As the less-traded group is very large (65.8% of total in 2006), and its growth rate is above average, more than 85% of total AFS growth in 2006–2023 is from the less-traded value chains (Panel B).

Figure A1.6 Drivers of Pakistan’s AFS GDP growth (2006–2023)

A: Average annual AFS GDP growth rates by value chain classification (2006–2023)



B: Initial share (2006) and contribution to growth (2006–2023)



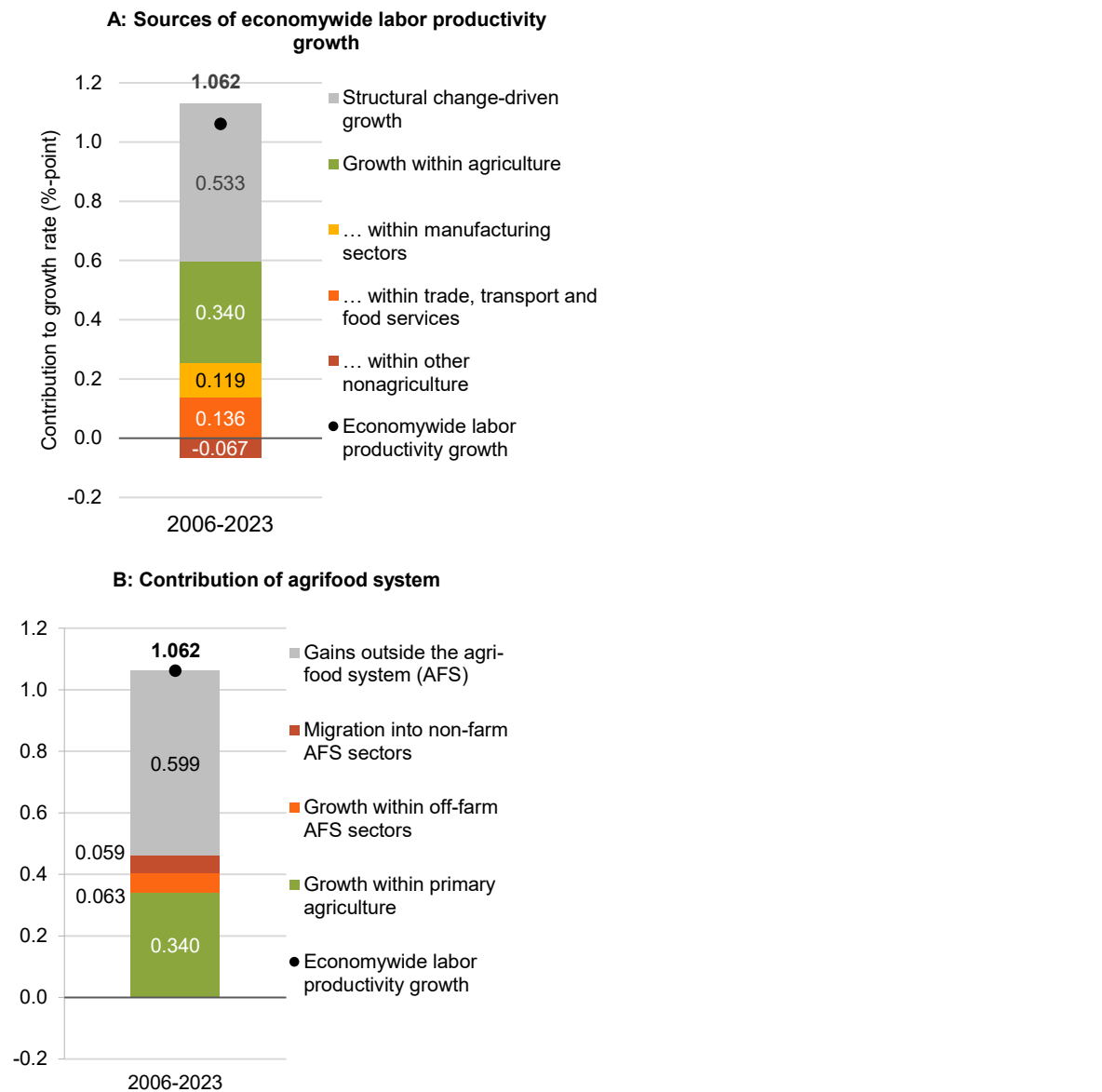
Source: Authors’ analysis using the 2006–2023 Social Accounting Matrixes for Pakistan (IFPRI 2024).

AFS transformation is an important part of economic transformation and structural change. Increases in economywide labor productivity, closely tied to economic development, typically arise through two channels. First, productivity can increase among workers within their respective sectors of employment. Second, economywide productivity rises when workers transition to more productive sectors. These two channels are commonly referred to as the “within-sector” and “between-sector” (or “structural change”) drivers of labor productivity growth. As previously mentioned, GDP per worker in agriculture is lower than in other segments of AFS and the broader economy. Hence, a shift away from agriculture toward other sectors generally enhances economy-wide labor productivity.

The distinct contributions of these structural drivers of growth can be estimated utilizing a decomposition approach outlined by McMillan, Rodrik, and Verduzco-Gallo (2017). Panel A of Figure A1.7 illustrates that economywide labor productivity. With a modest GDP growth rate of 3.5% per year, the economywide labor productivity, as measured by GDP per worker, only grew at an average annual rate of 1.06% between 2006 and 2023. Roughly half of such growth was driven by structural change led growth (0.533 percentage points in Panel A) through labor moving out of agriculture into more productive nonagricultural sectors. The remaining half percent was driven by within-sector labor productivity growth from both agricultural and nonagricultural sectors (in Panel A).

Notably, the within-sector labor productivity growth in agriculture accounts for 0.34 percentage points of the 1.06% annual average economywide labor productivity growth rate, contributing about 32.0% of the total labor productivity growth. This is likely due to mechanization during this period that releases labor from agriculture to the rest of the economy. The agriculture sector accounted for 28.6% of total GDP in 2006. While agricultural productivity did not necessarily grow faster than economywide productivity, agricultural productivity made a significant contribution to economywide productivity growth due to the large size of the sector.

Figure A1.7 Decomposition of average annual labor productivity growth rate, 2006–2023



Source: Authors’ analysis using the 2006–2023 Social Accounting Matrixes for Pakistan (IFPRI 2024).

The manufacturing sector also made some contribution to economywide labor productivity growth between 2006 and 2023, accounting for 0.119 percentage points as did the trade, transport and food service sectors (0.136 percentage points), while the contribution from other nonagricultural services, including the financial and business services, is negative (-0.067%). Labor productivity within real estate and other business-related services declined between 2006 and 2023, possibly due to the creation of many small and informal firms in these service sectors. Labor productivity in such informal service sectors is generally lower than in the formal service sectors (Diao et al. 2024), and improving productivity of such service sectors, therefore, is important for economywide labor productivity growth in the future.

Panel B of Figure A1.7 demonstrates the estimated contribution of AFS to economywide labor productivity growth. The within-sector contribution from agriculture remains consistent

across both panels (0.34 percentage points). The migration of workers from the agriculture sector to a set of nonagricultural sectors—defined as structural change-driven growth in Panel A—is disaggregated into two subcomponents in Panel B. The labor mobility from primary agriculture to AFS’s off-farm components, which are part of the nonagricultural sectors, accounted for 0.059 percentage points in Panel B, equivalent to 11.1% of the structural change-led growth during this period—specifically, 0.059 percentage points out of a total of 0.533 percentage points shown in Panel A. While this structural change-led growth within AFS is modest, labor productivity within the off-farm part of AFS increases, accounting for 0.063 percentage points out of 0.203 percentage points ($0.119 + 0.136 - 0.067$ in Panel A) of within-sector labor productivity growth in the total nonagricultural sectors. Consequently, the three components associated with AFS, as shown in Figure A1.7 (B), contributed 43.6% of total labor productivity growth between 2006 and 2023.

The remaining 56.4% of total labor productivity growth originated in two sources outside AFS, amounting to about 0.55 percentage points in Panel B:

- Within-sector productivity growth in the rest of the nonagricultural economy. That is, $0.119 + 0.136 - 0.067$ in Panel A minus 0.063 for within-sector off-farm part of AFS in Panel B, which equals 0.125, equivalent to roughly 11.8% of the total labor productivity growth of 1.06 percentage points on the top of both panels.
- Migration of farm workers into sectors outside AFS. That is, 0.533 in Panel A minus 0.059 in Panel B, which equals 0.474, equivalent to roughly 44.6% of the total labor productivity growth rate of 1.06 percentage points on the top of both panels.

In summary, between 2006 and 2023, Pakistan’s economy experienced a modest structural transformation that is consistent with the country’s modest economic growth in this period. The combined modest within-sector productivity improvements in both on- and off-farm components of the agrifood system and structural change-driven growth in labor productivity indicate a slow progression in agricultural transformation. As a result, to accelerate growth beyond agricultural activities and bolster transformation remains a challenge for both AFS and the broader economy in Pakistan.

Assessing Value Chain Growth Outcomes Using IFPRI’s RIAPA Model

IFPRI’s Rural Investment and Policy Analysis (RIAPA) model is a tool for conducting forward-looking, economywide country-level analysis (IFPRI 2023). RIAPA has been used in a wide variety of contexts to simulate the impacts of policies, investments, and economic shocks. Here we employ RIAPA to assess the effectiveness of productivity-led growth in Pakistan’s different agricultural value chain groups for promoting multiple development outcomes. The analysis was carried out for 12 value chain groups, which were selected from the original list of 15. Pulses are merged with oilseeds to create the pulse and oilseed value chain, as the original pulse and oilseed value chains are small. We further group cattle, which is part of the original “other livestock” value chain, with milk and redefine them as the cattle and milk value chain, which includes beef and dairy products. Fishery and forestry value chains were excluded. We considered four development outcomes:

- A poverty–growth elasticity that measures the percentage-point change in the poverty headcount rate per unit of agricultural GDP growth generated within the targeted value chain;
- A growth multiplier that measures the change in GDP per unit of increase in agricultural GDP in the targeted value chain;
- An employment multiplier that measures the change in the number of jobs created per unit of increase in agricultural GDP in the targeted value chain; and
- A diet-quality indicator that measures the percentage change in a diet quality index per unit of agricultural GDP growth generated within the targeted value chain.

The simulations entail increasing on-farm productivity separately in each targeted value chain and comparing development outcomes across the value chains. While this exogenous productivity shock is imposed only in the primary agriculture component of each value chain, there are spillover effects into that value chain’s off-farm components as well into other agricultural value chains or sectors outside the AFS. These spillovers are captured by the economywide model and provide an indication of the transformation effect that agricultural productivity growth in the value chain has within the AFS and in the broader economy. There are also structural differences across value chains. Value chains, for example, have unique links to other sectors as suppliers or users of intermediate inputs, or they have unique links to rural or urban households in different income groups because of the types of workers they employ or the consumption preferences of households for the agrifood products produced by those value chains.

As such, each value chain growth scenario is expected to have a unique impact on the development outcomes; moreover, not all value chains will be equally effective at improving outcomes. In some cases, there may even be trade-offs due to competition for resources across value chains. With the aid of the RIAPA model, these complex effects can be unpacked, thus providing information to governments or development partners that can be used to prioritize across different value chains, subject of course to the development outcomes they value most highly.

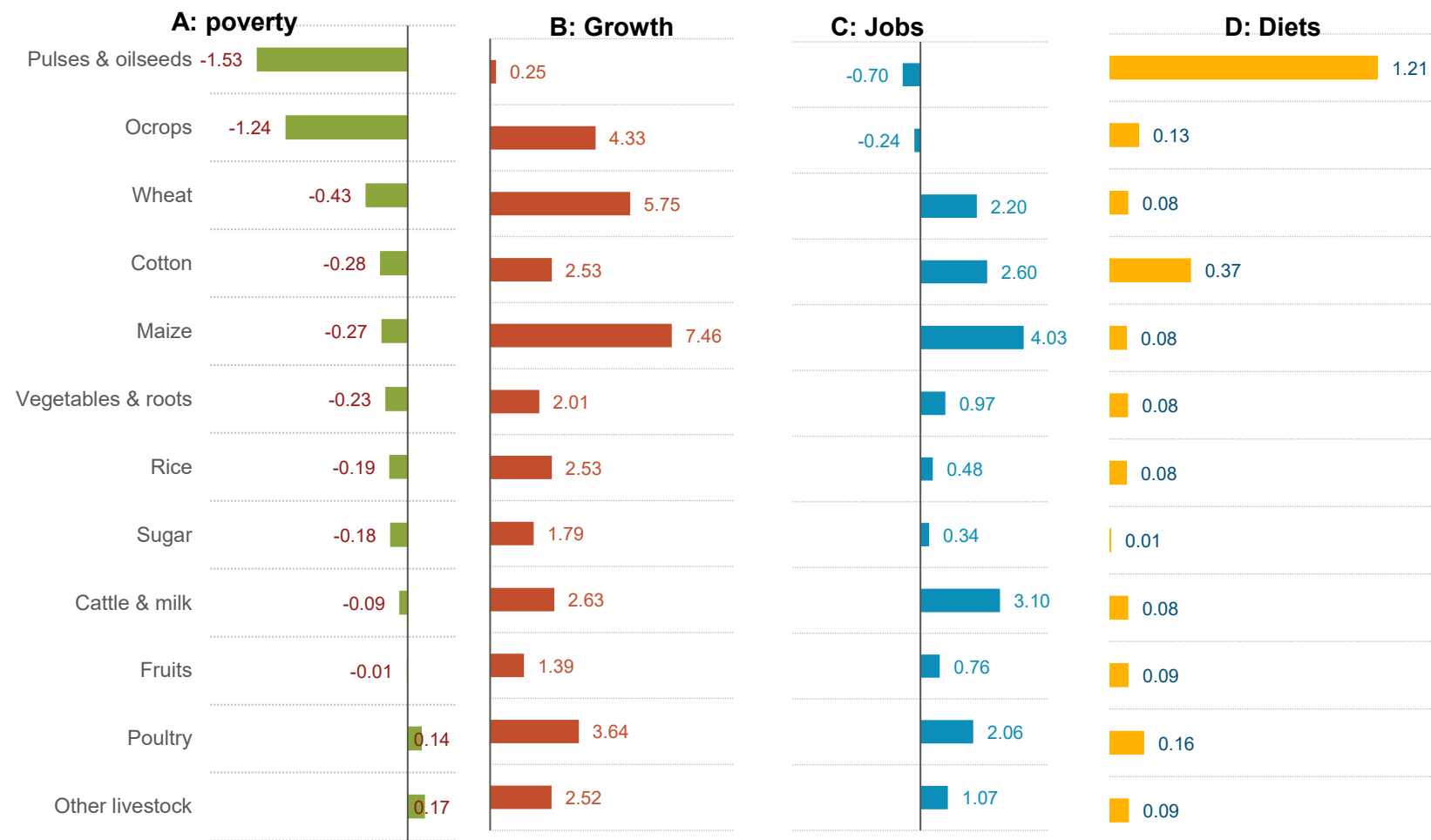
Figure A1.8 shows the scores each value chain achieves across the four development outcome indicators. We arbitrarily rank the value chains by their poverty score. Value chains clearly differ significantly in terms of their effectiveness in improving different development outcomes. The pulse and oilseed value chain, for example, has the strongest poverty effects and is also most effective at improving diet quality, but it is not effective in increasing jobs. The maize value chain, in contrast, is most effective at generating economywide jobs, but ranks low in improving diet quality. These results highlight the possible trade-offs that may emerge when prioritizing individual value chains, as no single value chain is the most effective at achieving every development objective. Promoting a few value chains jointly will not only diversify agricultural growth; it can also help to simultaneously achieve multiple development objectives.

A composite score across different outcome indicators is created in order to narrow down the number of value chains that might be prioritized. Since the different outcome indicators have different underlying units, the individual outcomes are normalized so that they are comparable while still retaining their ranking within the outcome category. Normalization entails assigning a score of 1 to the value chain that is most effective within an outcome category and a score of 0 to the least effective value chain. All value chains receive a score between

1 and 0 that is proportionate to their original score relative to the highest-ranked value chain. The individual normalized scores for the outcomes are then combined into a composite score for each value chain. The default approach assumes that each of the four outcome indicators is equally important, so an equal weight is assigned to each score; however, if policymakers consider a particular development outcome to be more or less important than the other outcomes, the weights assigned to each particular outcome score can be adjusted accordingly.

Figure A1.9 presents the composite scores using equal weights across the four development outcome indicators. Each component in the bars shows the relative contribution of a particular outcome indicator in the final score. The maize value chain is ranked highest followed by the pulse and oilseed value chain and then by the wheat value chain, with their composite scores much higher than the remaining nine value chains. For the highest-ranked maize value chain, two of the four outcome components—growth and jobs—make much more important contributions as well as having some poverty reduction effect. For the second highest-ranked pulse and oilseed value chain, poverty and diet quality make the important contributions. For the maize value chain, there is no effect on diet quality, and for pulse and oilseed value chain, there is no effect on growth and job creation. Maize is a high-yield crop, and about two-thirds is grown in Pakistan’s irrigated areas. This explains why maize is an exportable crop and has grown most rapidly in the past, as shown in Table A1.3. In the domestic market, maize is a multipurpose crop that is used as both food and forage as well as an intermediate input in the feed industry, which creates downstream linkage effects when maize production increases with a higher productivity. This explains its strong growth and job creation effects shown in Figure A1.8. While most maize is grown in Punjab by less poor farmers, it is also often grown by some poor farmers on marginal land.

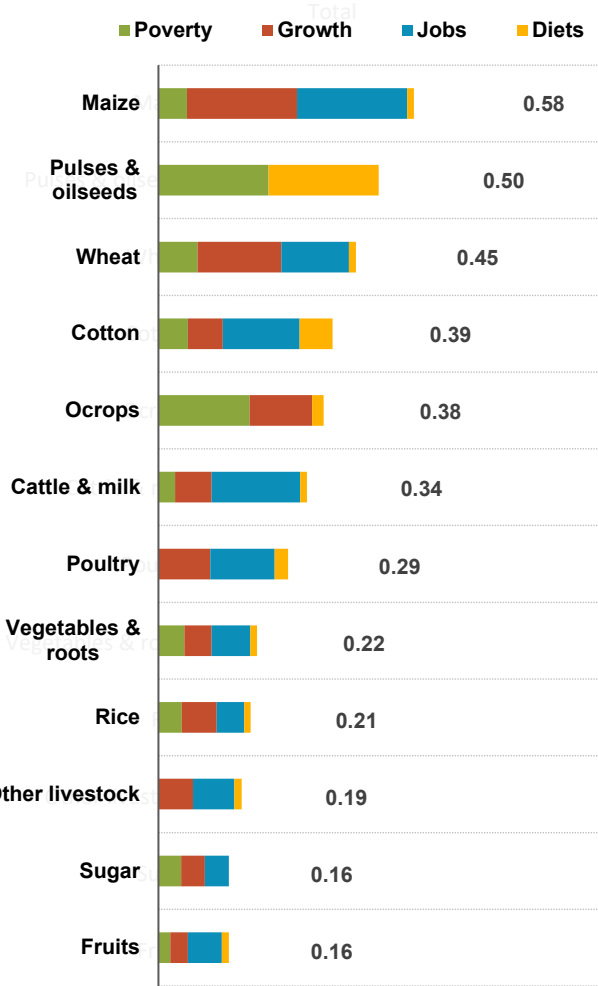
Figure A1.8 Impact of value chain growth on development outcomes



Source: RIAPA model results.

Note: Panel A shows the percentage point changes in poverty rate that are associated with a 1% increase in agricultural GDP; Panel B shows the changes in total GDP (in US\$ millions) that are associated with a US\$1.0 million increase in agricultural GDP from the targeted value chain; Panel C is the change in total economywide employment that is associated with a US\$1.0 million increase in agricultural GDP from the targeted value chain; and Panel D is the percentage improvement in diet quality that is associated with a 1% increase in agricultural GDP. The figure is ordered by the poverty rate outcome.

Figure A1.9 Composite score of development outcomes: Equal weights



Source: RIAPA model results.

Note: The composite score is a simple average (equally weighted) of the scores for each of the four outcome categories; the figure is ordered according to the highest composite score.

This explains why maize-led growth also generates some poverty effects. The strong positive diet quality impact from pulse and oilseed led growth comes from its contribution to two groups of foods in a balanced diet structure—animal fat and vegetable oil, and animal and vegetable protein. The current consumption levels of both groups of food products are below the required level for a balanced diet among many of Pakistan’s households. More than 30% of pulses and oilseeds consumed in Pakistan are imported. Productivity growth lowers domestic prices, creating not only import substitution but also allowing consumers to enjoy lowered prices and hence increase consumption. The same is true for some oilseeds (e.g., soybeans) and vegetable oil products, which also rely on imports. Lowered prices for oilseeds benefit oil processing as oilseeds are intermediate inputs of vegetable oil production. Together with increased demand for pulses, the pulse and oilseed value chains directly contribute to improving diet quality significantly. In Pakistan, pulses and oilseeds are widely grown by many poor rural farmers. Productivity growth increases these farm households’ incomes, thus allowing them to increase consumption of many food and nonfood products, which explains why pulse and oilseed led growth also has a strong poverty reduction effect. However, part of increased labor demand in pulse and oilseed production comes from other agricultural sectors, which explains why economywide labor supply

increases little with their growth. This means pulse and oilseed led growth would contribute little to job creation, even though it could have important impacts on the poverty and diet outcomes. For the wheat value chain, the third-ranked value chain, there is little contribution to improving diet quality, while the value chain has the second-strongest growth outcome and third-strongest job creation outcome. The strong growth and job outcomes result from the upstream linkages to the flour and bakery sectors, as wheat requires milling into flour for household food preparation, and wheat flour is also the major input in the bakery industry. The other off-farm components of the AFS system such as transport and trade services also benefit from such linkage effects. This explains why growth led by wheat has stronger multiplier and employment creation effects than many other value chains studied. Moreover, wheat is widely grown by Pakistani farmers, and many such farmers hire farm laborers, creating incomes for the poor rural landless households when wheat production expands with a higher productivity, and hence, generating a poverty reduction effect. However, wheat-based flatbread is already the major staple food for both poor and nonpoor households in the country, and further increasing consumption of such food would not contribute much to improving diet quality directly.

Except for the highest-ranked value chain (maize), the other two top-ranking value chains (pulse and oilseed and wheat) grew slowly in production in the 2006-2023 period, as shown in Table A1.3. While the pulse and oilseed and wheat value chains have potential to make significant contribution to some of the development outcome indicators, achieving their growth remains a challenge. Rice is an important food crop and a large value chain in Pakistan, and it is also an important exportable value chain with the export-output ratio much higher than most other value chains (Table A1.3). However, the RIAPA modeling analysis shows that rice-led growth makes a modest contribution to poverty, growth, jobs, and diet (Figure A1.8), ranking at ninth based on the composite scores (Figure A1.9).

The above discussion emphasizes that, while a ranking of impacts on multiple development outcomes on the basis of composite scores allows us to identify and prioritize value chains, trade-offs clearly exist as to which outcomes are most significantly affected by productivity-led growth in each value chain. There is no single value chain identified with strong impact on all four development outcomes, and for most value chains, it is often the case that strong impacts on two or three outcomes are accompanied by minimum or little impact on the other outcomes. Thus, it is unlikely to achieve all desired development outcomes by prioritizing just one or two value chains.

Summary

Pakistan's economy grew modestly at 3.5% per year between 2006 and 2023. Modest economic growth implies a slow structural change in the broad economy. The agrifood system (AFS) also grew modestly at less than 3.0% in this period, and the transformation process was also slow. While the growth rate for the off-farm component of the AFS was faster than the growth rate on the farm, because of slow growth in primary agriculture, the entire AFS cannot benefit from such relatively fast growth in off-farm components, whose share of total AFS GDP increased only 5 percentage points in 18 years.

The RIAPA model-based comparison of future sources of growth shows that there is no single value chain group that is the most effective in achieving all desired development outcomes, that is, declining poverty, economic growth, job growth, and improved diets. The maize value chain, pulse and oilseed value chain, and wheat value chain rank highly in their composite outcome scores. For maize (the highest-ranked value chain), however, there is little contribution to improving diet quality, while for pulses and oilseeds (the second-ranked value chain), there is no contribution to growth and job creation. While the maize value chain had a high growth rate in the 2006-2023 period, the primary agricultural GDP

growth rate is slow for wheat and negative for pulses in this period. Achieving growth in the agri-food value chains with greater impacts on development outcomes remains a challenge, and such growth is further constrained by the lack of growth in the broader economy. Promoting growth among multiple value chains that can offer an effective and broad-based way to achieve multiple development outcomes requires more rapid growth in the broad economy.

About the Authors Xinshen Diao is a Senior Research Fellow, and James Thurlow is the Director of IFPRI's Foresight and Policy Modeling Unit, based in Washington, DC.

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Annex

Table A1. Value chain groups and their corresponding agricultural subsectors

Value chain groups and their share of AFS GDP	Individual value chains (or agricultural subsectors) in the group and their share of the group's agricultural GDP
Rice (6.8%)	Rice 100%
Wheat (10.3%)	Wheat 100%
Maize (1.8%)	Maize 100%
Pulses (0.8%)	Pulses 100%
Oilseeds (0.7%)	Groundnuts 46.6% Sesame 23.6% Soybeans 0.001% Other oilseeds 29.8%
Vegetables and roots (10.1%)	Vegetables 86.0% Irish potatoes 13.7% Sweet potatoes 0.001% Other roots 0.2%
Fruits and nuts (5.2%)	Nuts 3.3% Bananas 1.8% Other fruits 94.9%
Sugar (4.1%)	Sugar (100%)
Cotton (6.2%)	Cotton (100%)
Other crops (1.5%)	Tobacco 57.1% Other crops 42.9%
Poultry (4.8%)	Poultry meat 67.3% Eggs 32.7%
Other livestock (12.9%)	Cattle meat 83.5% small ruminants 16.2% Other livestock 0.3
Milk (31.1%)	Raw milk 100%
Fish (1.6%)	Aquaculture 25.5% capture fisheries 74.5%
Forestry (2.1%)	Forestry 100%

Source: Authors' calculation based on the 2023 Social Accounting Matrix for Pakistan (IFPRI).

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Appendix 2: Field Mission Report

IFPRI-ADB Rural Transformation Project Pakistan Field Mission Report

Prepared by: Stephen Davies, Non-Resident Fellow, IFPRI;
Amna Ejaz, Consultant, IFPRI.
Location: Islamabad & Lahore, Pakistan.
Dates: June 15 to July 5, 2025.

Executive Summary

This field mission was carried out to engage with key stakeholders from government departments, development partners, and the private sector, to understand the ongoing shifts in Pakistan's wheat value chain and its potential to contribution to the broader rural transformation. The mission included a series of meetings in Islamabad and Lahore, followed by a consultative workshop conducted by IFPRI. Discussions during the various meetings as well as the workshop highlighted major themes, including institutional realignment under the Punjab Price Control and Commodities Management (PCCM) Department, efforts by the Punjab Agricultural Marketing and Regulatory Authority (PAMRA) to modernize markets, the evolving role of storage and electronic warehouse receipts (EWRs), challenges related to market infrastructure and credit, and the complex socio-economic factors influencing rural transformation. Findings from the field mission will inform the Pakistan Country report being prepared under the ADB funded Rural Transformation Project.

Mission Objectives

- Conduct stakeholder meetings with key public and private sector stakeholders;
- Prepare content and logistics for the consultative workshop;
- Conduct the workshop on rural transformation of the agri-food system in Pakistan and the potential contributions of wheat value chain, under the broader ADB Rural Transformation Project.

Key Findings / Takeaways

Meetings with institutions such as PAMRA, IFC, and the Planning Commission, Government of Pakistan, revealed strong momentum toward decentralization, digitization, and opportunities for private sector participation in agricultural marketing and storage.

The IFPRI workshop itself served as a platform to synthesize perspectives across government, development partners, and private actors. Participants emphasized the need to align wheat policy reforms with broader rural transformation goals, such as encouraging high-value crop transitions, supporting smallholder access to storage and finance, and improving off-farm opportunities in processing and logistics. Participant feedback was collected using the Mentimeter, which highlighted widespread concerns about high transport and post-harvest costs, limited near-farm processing, and weak rural infrastructure. There was cautious optimism about the role of futures markets and electronic warehouse

receipts, but a shared recognition that their success depends on strong institutions, credible pricing mechanisms, and gradual farmer inclusion.

The mission highlighted the need to view wheat reforms as part of a larger, rural transformation effort.

Summary of Meetings

1. Meeting with Punjab Agriculture Department, June 17, 2025

The meeting with Mr. Saqib Shehzad Saleem, representative Punjab Agriculture Department, focused on recent institutional shifts under the PCCM framework in Punjab. PAMRA has emerged as a lead agency, now functioning independently and working to digitize Market Committees and expand market infrastructure beyond urban centers. Key reforms include narrowing Market Committee jurisdictions and increasing the monitoring of millers' stock holding.

2. Meeting with International Finance Corporation, June 17, 2025

Dr Davies met with IFC representatives Muddassir Shafique and Charles Schneider, who highlighted key constraints and opportunities in private sector-led storage development were explored. They informed that millers are seen as likely primary users of storage and EWRs, with smaller farmers facing entry barriers due to transaction sizes and consolidation needs. The conversation highlighted that profitability in storage hinges on utilization, and that effective EWR implementation requires infrastructure flexibility and credible financial linkages.

3. PAMRA Meeting, June 25, 2025

Dr. Davies met with Director Wasim Iqbal to review PAMRA's progress in modernizing Punjab's agricultural markets. Discussions centered on financial challenges facing public markets, PAMRA's initiatives in outsourcing fee collection, and efforts to introduce grading, sanitation, and warehouse accreditation systems. A key shift involves removing geographic market monopolies and supporting private market development. PAMRA is also pushing legislation to enable digital transactions and electronic warehouse receipts, signaling a broader move toward competitive, tech-enabled market systems. There was also discussion of the effects on the competitive position of the commission agents (or *arhtis*).

4. World Bank Wheat Workshop, June 26, 2025

The World Bank organized a multi-stakeholder consultation on wheat productivity, market reforms, and subsidy rationalization. Presentations highlighted Pakistan's wheat production gap, the potential for redirection of subsidies toward R&D, and storage system modernization. Topics such as the role of government stocks, the feasibility of silo adoption, and the importance of legal reforms were discussed.

5. Pakistan Mercantile Exchange (PMEX), June 26, 2025

Dr. Davies and Dr. Tahir Ali (IWMI) met with the assistant director of PMEX Mr. Asad Raza. The primary purpose of this meeting was to understand their perspective on the development of electronic warehouse receipts and its use in the current wheat program initiated by the Punjab government, which is an alternative to the earlier wheat procurement program. PMEX has set up a spot market to trade electronic warehouse receipts associated with the Punjab government's program to ensure liquidity for these notes. PMEX is also a participant in the development of futures markets and linkages to the physical storage and marketing of key agricultural commodities.

Other meetings were held with the Pakistan Institute of Development Economics, members of the Planning Commission and water sector specialists, but these will be incorporated into the report at a later date as they pertain to topics to be added to the report in the next phase.

Detailed meeting minutes are given in Annex-II

Summary of IFPRI-ADB Workshop

The workshop was held on July 3rd 2025 in Islamabad, and involved a detailed presentation by Dr Stephen Davies, with active discussion and participation by the attendees through structured Mentimeter feedback and general discussions. About one third of the presentation was on aspects of rural transformation and two-thirds on changes to the wheat procurement program. In this section, we discuss some of the findings that seem to have broad effects on rural transformation and then look more specifically at the wheat market.

First, it is useful to review the approach used in this analysis. As Diao and Thurlow (2024) note in their paper (that will be attached to our main report), “When economies transform, agrifood systems are expected to evolve with countries’ development.” Importantly, as agricultural productivity rises, farmers, generally above five acres in Pakistan, generate surplus production that can be sold to markets and help drive growth in the nonfarm economy in and out of the growth of agrifood sectors (Haggblade, Hazell, and Dorosh 2007; Mellor and Malick (2017)).

Rising rural incomes generate demand for more diverse products, leading to more processing, packaging, transporting, trading, and other non-farm activities. As Pakistan has evolved to a lower middle-income country by GDP measures, “urbanization, the non-farm economy, and non-agricultural incomes play more dominant roles in propelling agrifood system development” , so both urban and rural nonfarm consumers drive demand for agricultural outputs and the system of markets and value chains connect rural areas to towns and cities (Dorosh and Thurlow 2013). This development varies across countries.

In the review provided during our ADB stakeholder meeting, we started with the broader rural transformation process in Pakistan, based on the Diao and Thurlow (2024) work, and from which two important dimensions were highlighted and debated. First, overall labor productivity by categories within and outside the agrifood system was presented. The overall rate was 1.062%, a very low number when compared to similar analyses for other countries. One third of this growth was in primary agriculture and an added 6% was in off-farm labor productivity growth, so the agrifood system accounted for 40% of the admittedly low labor productivity growth. Also, the shares of GDP in agriculture and off farm components of the AFS were reported and compared to other groups of countries. Pakistan showed a broad similarity to the lowest income countries in terms of the contribution of the AFS to overall GDP growth, but the off-farm portion was dominated by trade and transport.

During the stakeholder meeting at least three topics were discussed that informed significant dimensions of the rural transformation. There was a general concern for landless laborers in rural areas, and on forces of inequality found in both rural and urban areas. The rise in peri urban areas, which has been difficult to see given the fixed administrative boundaries between rural and urban areas, was noted to have added both opportunities and constraints to the transformation itself.

Thirdly, recent changes in the regulation of central markets, which have handled most cereals and fruit and vegetable marketing, have occurred; with proper monitoring and support, this transformation can lead to major changes. These include a reduction of the notified area associated with each market and

have led to a potential evolution of the marketing areas that creates better locations of rural markets, and more competition among commission agents and other traders, so that farmers should see better returns. This may also lead to a greater shift to modern marketing and storage, with reduced losses in fruits and vegetables, and with lower prices and better returns to those who farm them. If, in combination with better location of rural markets, these combined outcomes can expedite the growth of rural fruit and vegetable markets and could help improve nutritional outcomes with lower prices of these nutritionally valuable agricultural products.

Furthermore, this evolution of rural markets also is opening up the potential for more electronic marketing that bypasses the central markets to send more direct sales to processors and retailers. There has been some development along these lines in chilis and potatoes, but these have been specialty crops with much local production concentration and thus a relative ease of improving storage and marketing.

A further conclusion is that the evolution of the futures markets and a tie to markets such as the Chicago Mercantile Exchange will ultimately bring international prices and local prices to be more synchronized than they have been recently. This of course is part of the effects of the decline in the wheat procurement program.

Summary of insights on changes on the Wheat marketing system. Much of the discussion above was drawn from our review of wheat marketing and the institutions associated with it, but the insights had wider implications for rural transformation. Using the presentation and the participant comments summarized below, we were able to pull together a view of value chains in the wheat marketing system that vary somewhat systematically. The following figures show two slides from the presentation that capture the substance of our arguments.

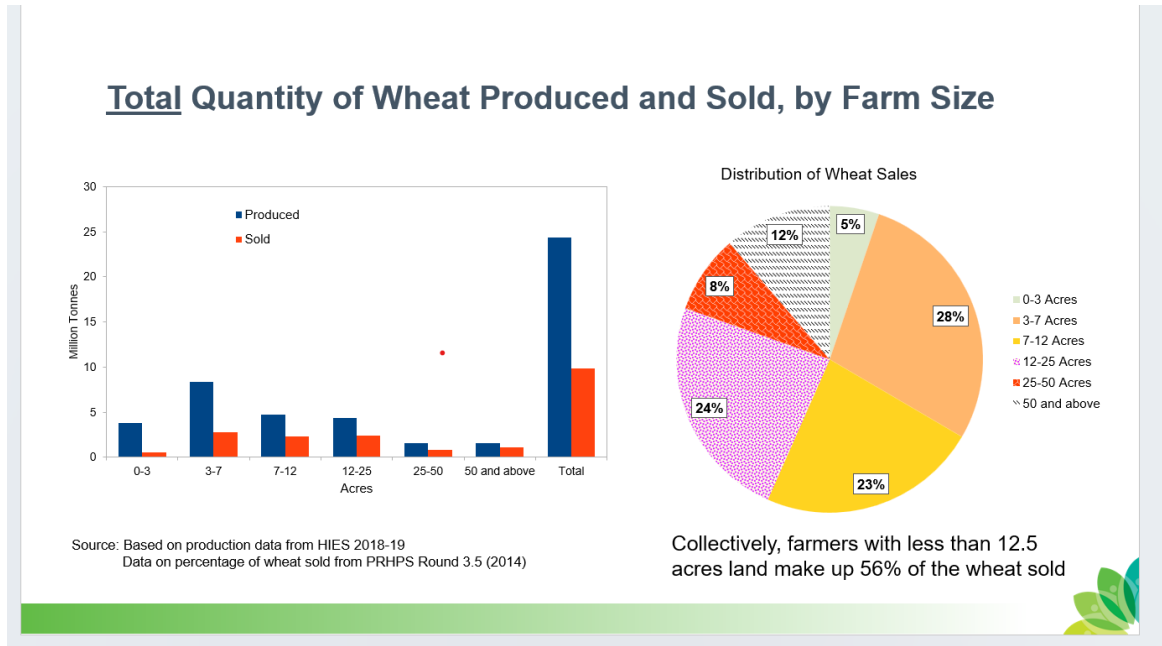
The first figure shows the wheat produced and sold by different farm sizes, which give a different picture from the common perception that large farms account for most sales (even though they may have had a disproportionately large part of purchases by government programs.) The total production of 24.4 mmt resulted in only 41% sold or 9.9 mmt. Moreover 56% of these sales were made by farms with less than 12.5 acres of production. Most of these sales go through Commission agents, rather than to processors or government buyers. In previous years about one quarter of production had been purchased by the government, which would have been 6.1 mmt using the numbers in the figure. The government may continue to purchase about 4.0 mmt during for strategic reserve purposes so about 2.0 mmt needs to find a different outlet. This seems to be a manageable number that could get shifted to Commission agents and overtime to the modern system storage and warehouses.

We represent our view of the different value chains used in the second figure. The modern system is generally the smallest at this point and is mostly used in the current Punjab government program encouraging storage in accredited warehouses with associated warehouse receipts. (See discussions of PAMRA and IFC for details on this program. In contrast, the largest value chain is the traditional system with a heavy dependence on commission agents but also often withholds production from the market other than to eventually be used in barter trade for various services within a locality. Our sense is that resistance to change in large segments of the traditional sector is likely to slow the transition to a modern system. Wheat is a form of currency that has extended use in local economies as sources of payments and a store of wealth particularly by those. This may slow the movement of wheat into other crops, and the uptake of modern storage and marketing approaches.

The middle value chain shows medium and larger farmers who are in the transitional position and may be those most likely to shift into the modern system relatively quickly. With the decline in the wheat

support price, there is likely to be forces at work to increase product differentiation that can help address the rising consumer incomes and urban consumption patterns and these would often be pursued by these farms.

Selected slides from the ADB-IFPRI presentation on July 3, 2025



Schematic of Rural Transformation through the Wheat Value Chain

Marginal & Small Farmers

- Produce mainly for home consumption. Sell surplus.
- Little Individual contribution, major collective contribution of wheat in the market.
- poorly integrated into the market
- Normally sell to middlemen / commission agents.
- Unlikely users of EWRs → May face high transaction costs (transport etc)
- Rely mostly on Informal credit
- Likely to continue to function within the traditional system.

What can be done for small farms? (Competition for Arhtis)

Traditional

Medium Sized Farmers

- Market oriented.
- Better market access than smaller farmers.
- Have the capacity to modernize, but with credit limitations.
- Formal + informal credit
- Better situated to benefit from EWRs
- Generate rural non-farm demand

Have the most potential to be drivers of rural transformation. What assistance can be provided in the short-run?

Transitional

Larger Farmers

- Produce for commercial markets.
- Better market access. Historically better positioned to benefit from government procurement.
- Capacity to be early adopters of technology and will determine success of modern marketing system
- Capacity to diversify without much credit limitations
- Capacity to develop adequate storage.
- Spending habits similar to that of urban consumers (Mellor and Malik, 2017)

Modern

The full presentation given at the Stakeholder Field mission meeting is provided with this paper.

Participant Feedback

Participants raised questions about the decline in agricultural employment, asking whether this reflected a true drop in numbers or merely a shift in percentages due to population growth. This linked to broader concerns around how rural and urban areas are officially defined, especially as rural economies evolve and blur into peri-urban zones. A key challenge discussed was ensuring that landless rural populations are not excluded from this transformation. Participants pointed out that social and economic factors are closely intertwined in rural areas, as agriculture is not just an economic activity but a social one, and migration is often driven by social inequality and not purely by economic incentives. Thus, rural transformation must go beyond farm productivity to address structural inequities and integrate social dimensions like poverty and access to services.

There was a consensus that the rural transformation requires a holistic approach, encompassing both agricultural and broader structural shifts. This included moving from low-value to high-value crops and recognizing the spillover effects that the transformation can have across rural regions. Questions were raised about how off-farm GDP is measured, particularly whether storage and post-harvest activities are adequately captured in these figures. Trade and transport inefficiencies were highlighted as major constraints, which include fuel costs, poor infrastructure, lack of near-farm processing and cold storage, and government incentives that favor urban-based processing over rural set-ups. Weak implementation of policies and high post-harvest losses in fruits and vegetables were also highlighted. The important role of the commission agents in the traditional system and how that might change with a rural transformation such as that described here was also reviewed.

In terms of wheat, participants pointed out that government storage has reached 4 million tonnes, indicating that a shortage is unlikely in the coming fall. It was revealed that the Punjab Price Control and Commodity Management Department is currently trying to engage the commodity exchange (PMEX) to sell excess stock through spot contracts. Participants also noted that the market has done well in aligning domestic wheat prices with international levels.

It was discussed that EWRs are most likely to be accessed by larger farmers and processors, in particular flour millers. As such, modern storage was seen as a partial solution to seasonal price swings, though its effectiveness depends on who owns and operates the infrastructure. Participants were of the view that the most viable model was processor-led storage, which supports direct marketing and bypasses traditional mandis.

Additionally, we collected results to questions *using a Mentimeter app*, where participants used their cell phones to enter answers to a series of questions spread out through the workshop. These questions and answers are attached as a separate document. We will weave them into our write of the full report.

Next Steps

With limited funding, a collaborative discussion on climate change is planned to be held in collaboration with the International Water Management Institute (IWMI) in early August. We will outline the full report by the end of the first week in August 6th.

Findings from the workshop and individual meeting will inform the Pakistan Country report being prepared under the ADB funded Rural Transformation Project.

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ANNEX-1: Workshop Agenda

Consultative Workshop on the Rural Transformation of Pakistan’s Agrifood System and Potential Contributions of the Wheat Value Chain

3rd July, 2025

Faisalabad Boardroom, Serena Hotel Islamabad

Pakistan is undergoing a significant rural transformation, marked by rising urbanization, the growth of the non-farm economy, and increasing non-agricultural incomes. These trends are reshaping the country’s agrifood system, as consumer demand drives more complex value chains that connect rural producers to urban markets.

In particular, the wheat value chain, spanning from production to marketing, is experiencing considerable change due to the withdrawal of government procurement and support prices. These developments present both opportunities and challenges for inclusive rural development.

In this context, the International Food Policy Research Institute (IFPRI), with funding support from the Asian Development Bank (ADB), under ADB’s Green and Resilient Rural Recovery through Agri-Food System Transformation in the Asia and Pacific Region Project, is conducting a study to explore the implications of these shifts.

AGENDA FOR TODAY

Time	Activity	Lead Discussants
9:00 – 9:20	Registration	All
9:20 – 9:30	Welcome and Opening Remarks	ADB and IFPRI
9:30 – 10:00	Overview of Pakistan’s Agrifood Structure and Ongoing Rural Transformation	Stephen Davies and Amna Ejaz
10:00 – 10:30	Discussion	All Participants
10:30 – 10:45	Tea / Coffee Break	
10:45 – 11:15	Elements of Recent Changes in the Wheat Market	Stephen Davies, Amna Ejaz, Tahir Ali and Iqra Akram
11:15 – 12:45	Focused discussion and feedback collection	All Participants
12:45 – 13:00	Conclusion and Closing Remarks	ADB and IFPRI
13:00	Lunch	

ANNEX-II: Meeting Minutes

1. Punjab Agriculture Department

Date: 17 June 2025

Participants: Mr. Saqib Shehzad Saleem, Punjab Agriculture Department
Ms. Amna Ejaz, Consultant, IFPRI

Agenda:

To gather insights on recent changes under the Price Control and Commodities Management (PCCM) structure.

Key Points Discussed:

- Newly formed PCCM department consists of PAMRA, Food Authority, Food Department, E&M, PERA, Consumer Protection.
- PAMRA is no longer operating through E&M; it now functions independently under a District Officer.
- PAMRA is leading efforts to digitize Market Committees and to set up larger (public) markets outside city centers, under the Public Market Sanction Act.
- The jurisdiction of Market Committees has been limited to within market boundaries. Any activities beyond this must be carried out on behalf of E&M.
- Millers are required to purchase a specific portion of their production capacity. Their stocks are being tracked and monitored by the Government.

Summary:

- The realignment under PCCM reflects a broader move toward centralized oversight and defined institutional roles.
- PAMRA appears to be taking on a more autonomous and digitized role in market governance.

2. International Finance Corporation, June 17, 2025

Date: 17 June 2025

Participants: Dr. Stephen Davies, IFPRI
Clemens Breisinger, IFPRI
Mr. Muddassir Shafique, IFC
Mr. Charles Schneider, Creating Markets Advisory, IFC

Agenda:

To discuss storage infrastructure, EWR implementation, and investment potential in wheat markets.

Key Points Discussed:

- Muddassir Shafique spelled out the EWRs program that the PCCM department is implementing.
 - The program is open to farmers with less than 50 acres of production. As noted in other interviews as well, if a farmer deposited wheat in an approved storage facility, he could receive a negotiable receipt and the Bank of Punjab would loan up to for 70% of the value determined when the wheat went into storage.
 - The government would buy wheat from the farmer when they wanted to sell later in the season, at least until the government's stocks filled the 1.0 mmt of storage to be used for strategic reserves.
- There is 1.0 mmt of storage in Sindh and Punjab each, and about 2.0 mmt with PASSCO so public sector storage could be 4 mmt which amounted to about 20% of the needed storage of the smaller harvest in 2024-25.
- IFC noted that flour millers wanted to expand but historically they had little experience storing for longer time periods and strategically using wheat stocks.
 - Millers rent storage similar to what is done for fertilizer, so an issue exists regarding who actually will build infrastructure if it is needed.
 - The Punjab Price Control and Commodity Management Dept is interested in providing rental space to the private sector as they rent rather than build storage.
 - some interest to rent space has been shown.
- To get small farmers involved will require farmer consolidation so that their demand reaches minimum sizes of warehouse receipts and transactions costs.
- Dr Davies asked whether it was likely that private sector storage operations could be profitable. Mr. Shafique noted that profitability was a function of turnover and capacity utilization for a storage facility.
 - He felt that storage did not have to be silo storage, but open pit storage could be effective, so presumably electronic warehouse receipts could be used with less expensive storage structures.

- Charles Schneider in the Creating Markets Advisory worked with futures markets and warehouse receipts. He was interested in the development of various platforms for futures markets and was hoping to find ways to unlock private investments.
 - He noted that it was unlikely that farmers would directly purchase EWRs that were tied to futures markets, but processors such as flour millers would be the largest users, despite pressure to have farmers participate.
- Both IFC representatives felt that there had not been much decline in production due to lower prices, because the previous year had been a particularly high production year (due to the very high procurement prices in Fall 2024) so the decline was a return to an average number rather than a really big drop.

Summary:

IFC discussions highlighted gaps and opportunities in wheat storage and finance systems. The EWR program is gaining traction, though infrastructure and profitability remain key challenges. The private sector's role, especially processors, is pivotal in future market stabilization

3. PAMRA, June 25, 2025

Date: 25 June, 2025

**Participants: Dr. Stephen Davies, IFPRI
Dr. Tahir Ali, IWMI
Mr. Wasim Iqbal, Director, PAMRA**

Agenda:

To get an update on PAMRA's progress in managing market expansion, finances, and changes to geographical jurisdiction.

Key Points Discussed:

- PAMRA was established to modernize Punjab's central agricultural markets, initially governed under the 1939 Act and updated in 2018 and 2020.
- Digital transaction tracking, pricing systems, electronic trading platforms, grading, and credit facilitation are core innovations being pursued.
- Over 200 private markets have been launched, raising quality and transparency concerns.
- A third of public markets are running at a loss or in debt. PAMRA outsourced fee collection, tripling income in one case from PKR 50M to PKR 150M.
- Legislative efforts underway to introduce cleaning/sanitation fees and warehouse accreditation linked to food safety.
- Central markets are no longer defined by geographic notification—licenses and market boundaries are now strictly tied to market premises.

- Electronic warehouse receipts and online sales legislation aim to enhance competition and reduce post-harvest losses.

Summary:

PAMRA is working to modernize Punjab's market systems with digital tools and private sector involvement. Structural changes are reshaping how market jurisdictions function, with a strong push toward efficiency and transparency.

4. Summary - World Bank Workshop on Wheat Productivity and Market Issues

Date: June 26, 2025

Participants: Federal Government Departments and Development Partners.

Agenda:

To discuss key challenges and opportunities in raising wheat productivity, market stabilization, subsidy reforms, storage solutions, and policy considerations affecting Pakistan's wheat sector.

Key Points Discussed:

- **Presentation by Christine Heumesser, Senior Agriculture Economist, World Bank Pakistan**
 - Focused on raising productivity and challenges around input use (seed, fertilizer, water) and the gap between actual yield and potential yield.
 - Pakistan's wheat production is below domestic demand by about 700,000 tonnes.
 - Achieving self-sufficiency involves high direct and indirect costs, including government agricultural expenditure compared to procurement spending.
 - Issues such as over-consumption of wheat and stunting were highlighted.
 - Low crop diversification noted, especially a decline in oilseeds, pulses, and legumes. However, a participant later challenged this by arguing that farmers lack comparative advantage in cultivating these crops, irrespective of policy bias towards wheat.
- **Presentation by Tehseen Qureshi, Agriculture Economist, World Bank Pakistan**
 - Covered CGE (Computable General Equilibrium) and SAM (Social Accounting Matrix) analysis for Punjab.
 - Proposed redirecting freed-up funds (potentially \$100 billion annually) from subsidy removal towards R&D and agricultural research grants.
 - Removing subsidies currently provided to farmers (costing 59 billion) could lead to net gains of 116 billion from improved wheat productivity alone.

- Recommendations included: increasing wheat productivity through research funding, stabilizing wheat markets (mentioning the EWR system as a partial solution), and managing residual risks with buffer and strategic stocks via competitive provincial auctions.
- Christine questioned the need for stock maintenance given the relatively small production deficit.
- **Storage Presentation (By IFC) and Discussion:**
 - Participant discussion on two approaches to wheat storage: wheat stored by either producers or processors, or held with a third-party.
 - Consensus that Pakistan’s storage costs are currently low but may increase with modern silo adoption.
 - Social norms and trust in aggregators was highlighted.
 - Legal reforms and amendments to storage-related acts are necessary to enable modern storage solutions.
- **World Bank Next Steps:**
 - The Bank plans to conduct a series of workshops engaging different stakeholders on various aspects of the wheat market, indicating a sizeable ongoing project.

Summary:

The workshop highlighted the key challenges facing Pakistan’s wheat sector, emphasizing that improvements in productivity, market stability, subsidy reforms, and storage infrastructure, all need to be addressed. The World Bank intends to continue hosting similar workshops to engage different groups and support the development of effective solutions.

5. Meeting Minutes - Pakistan Mercantile Exchange (PMEX)

Date: June 26, 2025

Participants: Dr. Stephen Davies, IFPRI
 Dr. Tahir Ali, IWMI
 Mr. Asad Raza, Assistant Director PMEX

Agenda: To understand PMEX’s perspective on the development of electronic warehouse receipts (EWRs) and their use in the current wheat program initiated by the Punjab government as an alternative to the long running wheat procurement program.

Key points discussed:

- PMEX set up a spot market to trade electronic warehouse receipts associated with the Punjab government’s new wheat program to ensure liquidity for these new EWR notes.

- The storage capacity to manage EWR's is only about 5 to 7% of what's needed, and thus the major portion of the wheat harvest goes through commission agents (arthies) who have some storage but of low quality.
- Mr Asad further elaborated on this system noting that it did not favor contracting and was built around the traditional and physical central markets (mandis). It led to high post harvest losses, and poor price formation, and therefore alternatives are needed.
- The current program of the government, coordinated by PMEX with associated institutions, allows farmers with less than 50 acres to deliver wheat and other commodities to one of 27 warehouses that have been deemed sufficient by the nywa collection management company.
 - When deposited in these warehouses, farmers or their representatives are entitled to receive a negotiable EWR which they can take to either the Bank of Punjab or JBL and receive a 70% loan against the wheat value of the weed put into storage.
 - The farmers are furthermore entitled to four months without interest charges by the warehouse. We did not discuss the charges on loans from the banks.
- Mr. Raza also discussed the PMEX experience with farmers after their initial use of an EWR. At first, farmers were happy with the traditional system because it was known and there was finance through the arthies.
 - However, according to PMEX, after introduction to the new system, farmers recognize that losses were reduced, wastage was cut, and there were potentially returns to seasonal price changes, which they had not received when making a sale at harvest to the arthies.

Summary: PMEX was a participant in a clearly experimental effort by the Punjab government at deriving a modern storage, financing and pricing system, incorporating after a time futures markets and electronic marketing platforms. This is a small effort at present but is an attempt to move the system away from the traditional arthis based system. There will be significant challenges in moving in these directions, but initial evidence according to PMEX suggested that farmers, having experienced the new institutions, were quite positive about its potential.