Ministry of Planning, Development & Special Initiatives

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LOCAL RESEARCH
LOCAL SOLUTIONS

FOOD & AGRICULTURE

Edited by Nadeem Javaid & Faheem Jehangir Khan

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(Volume XIX)

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TABLE OF CONTENTS

PART I - FOOD & AGRICULTURE: *Research Papers*

PART II - FOOD & AGRICULTURE: *Policy Briefs*

PART I

FOOD & AGRICULTURE

Research Papers

THE IMPACT OF GOVERNMENT POLICIES ON PRODUCTION OF OLIVE IN PAKISTAN

Khair Muhammad Kakar[1]

ABSTRACT

The olive sector in Pakistan holds significant potential to improve living standards and boost the nation's economy, but several obstacles hinder its progress. Key challenges include inadequate supply chain, value chain, and market infrastructure, technical shortcomings in production and processing, and poor coordination among stakeholders. This study reviews these challenges and offers specific policy suggestions aimed at advancing the sector. The findings highlight the urgent need for better access to both international and domestic markets, as well as improved agricultural inputs like fertilisers and insecticides. To enhance competitiveness, the sector requires the development of targeted and diverse olive varieties, strict compliance with international standards, and effective orchard management. The absence of a centralised regulatory body and an over-reliance on subsidies rather than market-driven growth further restrict prospects. By adopting a comprehensive, integrated strategy that addresses all aspects of the value chain—including branding, market access, and ecosystem development—Pakistan could fully unlock the potential of its olive industry. Such an approach would benefit farmers and stimulate the local economy.

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1. INTRODUCTION

Pakistan's agricultural sector, which is increasingly focusing on high-value crops such as olives, significantly contributes to the country's socioeconomic prosperity. Olive cultivation has garnered considerable interest due to its potential to enhance farmers' incomes and bolster the agricultural economy. Its ability to adapt to marginal and uneven terrains further enhances its appeal (Jan et al., 2021; Khaliq et al., 2020; Raza et al., 2023).

Particularly in the provinces of Balochistan, Khyber Pakhtunkhwa, and the Potohar region in Punjab, Pakistan's diverse agroclimatic conditions are ideal for olive cultivation. Since the government recognises the environmental and economic benefits of olive oil, it has implemented various legislation and programmes to promote olive farming. However, the olive industry remains relatively young. It faces several challenges, including a lack of processing and marketing facilities, limited access to high-quality plant material, and a shortage of technological expertise.

This study investigates the impact of government initiatives on olive production in Pakistan. It provides a detailed analysis of the effects that various policy measures have had, both directly and indirectly, on production and productivity. The lack of coordination among many entities involved in the olive sector, along with the importance of government policies in tackling supply chain challenges—especially in the processing and marketing of olives—are key focus areas. This study also examines research on the challenges faced by farmers in adopting olive farming practices, as well as their access to institutional support, financial aid, and incentives.

The study also examines the potential socio-economic and environmental benefits of olive cultivation, including job creation, poverty alleviation, and sustainability. By developing a roadmap for a unified and comprehensive value chain, this research suggests measures to address the numerous challenges hindering the growth of the olive sector and ultimately realise the full potential of Pakistan's olive industry.

2. LITERATURE REVIEW

The production of olives in Pakistan has seen substantial growth in recent years, with numerous regions actively engaged in olive cultivation (Ahmad et al., 2023). Estimates indicate that olive production is spread across 125 districts in Pakistan, with Punjab having the largest cultivated area, followed by Khyber Pakhtunkhwa, Balochistan, and other regions. Furthermore, there are 34 olive oil extraction units operating nationwide, with Khyber Pakhtunkhwa leading, followed by Balochistan and Punjab (Jan et al., 2022).

The government has provided subsidies and other financial incentives to farmers to promote the development of olive orchards (Raza et al., 2023). These incentives cover various aspects, such as purchasing quality planting materials and installing irrigation systems. The literature suggests that these subsidies and incentives have played a vital role in expanding the area under olive cultivation in Pakistan (Riaz & Abdullah, 2022).

The government's investment in research and development activities related to olive cultivation has been significant. This support has led to the development of improved olive varieties and advanced production techniques (Raza et al., 2023; Sarwar et al., 2023). The sharing of technical knowledge with farmers has also been improved through research and development initiatives (Riaz & Abdullah, 2022). The government has initiated infrastructure projects to bolster the olive industry. The establishment of olive nurseries, processing units, and cold storage facilities aims to tackle the challenges faced by farmers in olive processing and marketing (Ahmad et al., 2022).

Studies have emphasised the significance of policy interventions such as subsidies and financial incentives in promoting olive cultivation (Rana et al., 2022). These incentives have been demonstrated to encourage farmers to adopt olive farming and to expand the cultivated area. Additionally, research and development support has been recognised as vital in improving olive production techniques, developing new varieties, and sharing knowledge with farmers.

3. RESEARCH METHODOLOGY

To gather comprehensive primary data on olive cultivation in Pakistan, a multistage stratified sampling technique was employed. This approach enabled the collection of information from diverse olive-growing regions, ensuring representation across various agroclimatic conditions.

Data Collection

Farmers' Questionnaires

Farmers' questionnaires were distributed in the following districts:

Khyber Pakhtunkhwa: Districts Dir, Kohat, Nowshera, Swat, Swabi, Peshawar, Mansehra, and Parachinar.

Punjab: Districts Chakwal, Talagang, Attock, Bahawalpur, and D.G. Khan.

Balochistan: Districts Chagi, Pajgoor, Noshki, Khuzdar, Bela, Mastung, Quetta, Pishin, Chaman, Killa Saifulla, Hernai, Barkan, Kohlu, Musakhail, Loralai, Zhob, and Sherani.

The questionnaires were developed in consultation with subject matter experts and pilot-tested to ensure clarity and effectiveness. They focused on various aspects of olive cultivation, including challenges faced by farmers, availability of quality inputs, access to markets, and awareness of government policies. Data collected through the questionnaires has been analysed using relevant statistical techniques to derive insights into production trends and market dynamics.

Key Informative Interviews (KIIs)

Key Informative Interviews were conducted in the following districts:

Khyber Pakhtunkhwa: Peshawar, Lower Dir, Upper Dir, Nowshera, Kohat, Mansehra, Abbottabad, Swat, and Swabi.

Balochistan: Quetta, Killa Saifulla, Pishin, Khuzdar, Bela, Washuk, Kharaan, Noshki, Chagrin, Musakhail, Loralai, and Zhob.

These interviews aimed to gather in-depth insights from key stakeholders, including farmers, nursery operators, researchers, and representatives from the oil industry. The discussions focused on the challenges and opportunities facing the olive industry, including issues related to processing, marketing, and coordination among various government departments. This qualitative data complements the quantitative findings from the farmers' questionnaires, offering a more comprehensive understanding of the sector.

Data Analysis

The information collected through surveys and KIIs has been analysed using the Policy Analysis Matrix (PAM) methodology. This approach facilitated the assessment of the economic efficiency of olive production and the impact of government policies on the sector. Detailed results from the surveys and qualitative insights from the KIIs are included here.

4. RESULTS

Status of Olive Plantation

The status of olive plantation in Pakistan shows a scattered and diverse landscape across various regions and provinces.

Balochistan:

Districts: 31

Total Olive Plants: 1,676,477

Total Acreage: 13,193

Balochistan demonstrates a significant presence in olive cultivation, with numerous plants and extensive hectares dedicated to olive farming. The widespread distribution across 31 districts reflects a united effort to promote olive cultivation in the province.

Khyber Pakhtunkhwa (KPK):

Districts: 32

Total Olive Plants: 1,494,626

Total Acreage: 13,489

KP also demonstrates a substantial investment in olive plantations, with numerous plants and extensive farmland. Its presence across 32 districts shows a well-organised approach to olive cultivation, reflecting a commitment to strengthening the olive industry in the region.

Punjab:

Districts: 30

Total Olive Plants: 2,115,975

Total Acreage: 16,107

Punjab emerges as a key contributor to olive cultivation, boasting the highest number of plants and the largest area among the provinces. The extensive distribution across 30 districts underscores the province's dedication to the olive sector, potentially establishing Punjab as a major olive-producing region in Pakistan.

Azad Jammu and Kashmir (AJK):

Districts: 10

Total Olive Plants: 126,885

Total Acreage: 957

AJK has a significant presence in olive cultivation, with numerous plants and extensive cultivated land. The emphasis on 10 districts reflects a strategic approach to olive farming, aiming to maximise the region's potential for olive production.

Islamabad Capital Territory (ICT):

District: 1

Total Olive Plants: 96,415

Total Acreage: 816

ICT demonstrates a committed effort in olive planting with a large number of plants and an extensive area. This focused approach can lead to high productivity and efficient management of olive cultivation within the territory.

Gilgit-Baltistan (GB):

Districts: 7

Total Olive Plants: 63,296

Total Acreage: 475

GB has a modest but notable presence in olive cultivation, with a spread of plants and acres across seven districts. This indicates a purposeful effort to incorporate olive farming into the region's agricultural landscape.

Sindh:

Districts: 14

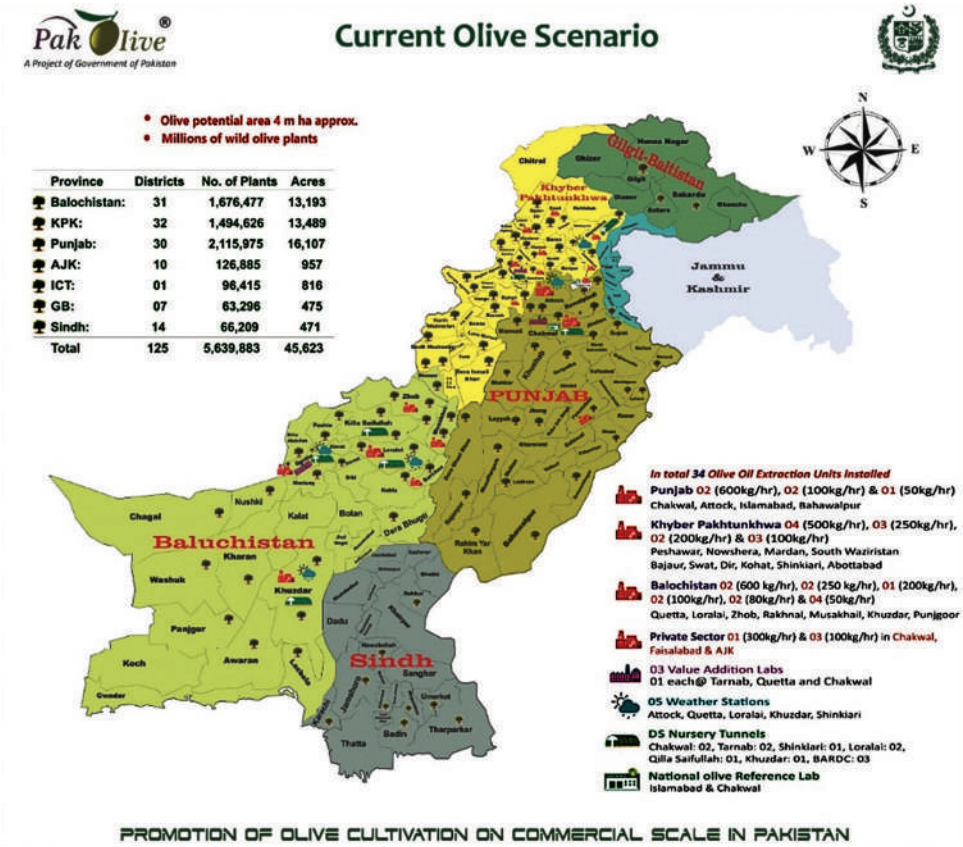
Total Olive Plants: 66,209

Total Acreage: 471

Sindh contributes to the national olive cultivation effort with a considerable number of plants and acres spread across 14 districts. The presence in multiple districts emphasises the province's commitment to diversifying its agricultural pursuits.

In summary, olive plantations are widespread across Pakistan. Olive farming exists in various provinces, reflecting a commitment to capitalising on both the economic and environmental advantages of olive cultivation. The substantial number of plants and large areas in each region demonstrate a strategic effort to position Pakistan as a significant player in the global olive industry.

Figure 1: Current Status of Olive Planting and Extraction Units



Source: Author's compilations.

Status of Olive Oil Extraction Units

The status of olive oil extraction units in Pakistan indicates a widespread effort to develop processing infrastructure across provinces and sectors.

Punjab:

Total Units: 5

Capacities: 2 units (600kg/hr), 2 units (100kg/hr), 1 unit (50kg/hr)

Locations: Chakwal, Attock, Islamabad, Bahawalpur

Punjab has a wide variety of olive oil extraction units, differing in size and location. This reflects a strong effort to establish processing facilities in key areas, showing the province's dedication to the olive oil sector.

Khyber Pakhtunkhwa (KPK):

Total Units: 12

Capacities: 4 units (500kg/hr), 3 units (250kg/hr), 2 units (200kg/hr), 3 units (100kg/hr)

Locations: Peshawar, Nowshera, Mardan, South Waziristan, Bajaur, Swat, Dir, Kohat, Shinkiari, Abbottabad

KP demonstrates a significant investment in olive oil extraction units, spanning various capacities and strategically positioned across different districts. This decentralised approach aims to foster olive oil processing throughout the province.

Balochistan:

Total Units: 13

Capacities: 2 units (600kg/hr), 2 units (250kg/hr), 1 unit (200kg/hr), 2 units (100kg/hr), 2 units (80kg/hr), 4 units (50kg/hr)

Locations: Quetta, Loralai, Zhob, Rakhnai, Musakhail, Khuzdar, Punjgoor

Balochistan has a strong presence in olive oil extraction units, with various capacities across different regions. This extensive network aims to integrate olive oil production into the province's agricultural landscape.

Private Sector:

Total Units: 4

Capacities: 1 unit (300kg/hr), 3 units (100kg/hr)

Locations: Chakwal, Faisalabad, AJK

The private sector contributes to the olive oil extraction infrastructure, focusing on Chakwal, Faisalabad, and AJK. This involvement indicates a growing interest and investment from non-governmental entities in the olive oil processing industry.

Value Addition Labs:

Total Labs: 3

Locations: Tarnab, Quetta, Chakwal

Three value-added labs, strategically situated in Tarnab, Quetta, and Chakwal, highlight a focus on research and development, thereby strengthening the overall value chain of olive oil production.

Weather Stations:

Total Stations: 5

Locations: Attock, Quetta, Loralai, Khuzdar, Shinkiari

The installation of weather stations in key locations emphasises the importance of monitoring climatic conditions for optimal olive cultivation and oil extraction.

DS Nursery Tunnels:

Total Tunnels: 12

Locations: Chakwal (2), Tarnab (2), Shinkiari (1), Loralai (2), Qilla Saifullah (1), Khuzdar (1), BARDC (3)

The presence of nursery tunnels in various locations indicates a focus on propagating olive plants for ongoing growth and future cultivation.

National Olive Reference Lab:

Total Labs: 2

Locations: Islamabad, Chakwal

The establishment of a national olive reference laboratory in Islamabad and Chakwal demonstrates a commitment to upholding quality standards and fostering research in the olive oil sector nationwide.

In conclusion, the status of olive oil extraction units in Pakistan demonstrates a comprehensive and well-coordinated approach involving both the public and private sectors. This infrastructure, together with research facilities and support systems, aims to improve the entire olive oil production ecosystem in the country.

Descriptive Analysis

We have collected data from 160 olive-growing farmers across three provinces of Pakistan: Punjab, Balochistan, and Khyber Pakhtunkhwa.

Table 1: Province/District Wise Data Collection

Punjab		Balochistan			Khyber Pakhtunkhwa		
Chakwal	Kalar Kahar	Loralai	Killa Saifullah	Killa Abdullah	Dir	Peshawar	Kohat
		Khuzdar	Musakhail	Kachi			
Pindi	Bahawal pur	Nushki	Dukki	Mastung			
Attock							

Source: Author's compilations.

The socioeconomic characteristics of the farmers are presented in Table 2 below. The table indicates that the average education level, farming experience, and olive farming experience are 13.26, 8.84, and 7.57 years, respectively, in the study area. The average distances from the farm to the agricultural market and to the city are 4.64 km and 4.5 km, respectively.

Table 2: Socioeconomic Indicators of Olive Producers

Variables	Mean	Median	St. Dev	Min	Max
Education (years)	13.26	14	0.36	5	14
Olive farming (years)	8.84	8	2.48	1	15
Olive cultivating experience (years)	7.57	8	2.75	1	13
Distance to Agri Market (km)	4.64	4	3.38	2	22
Distance to the city	4.5	3	3.38	2	22

Source: Author's compilations.

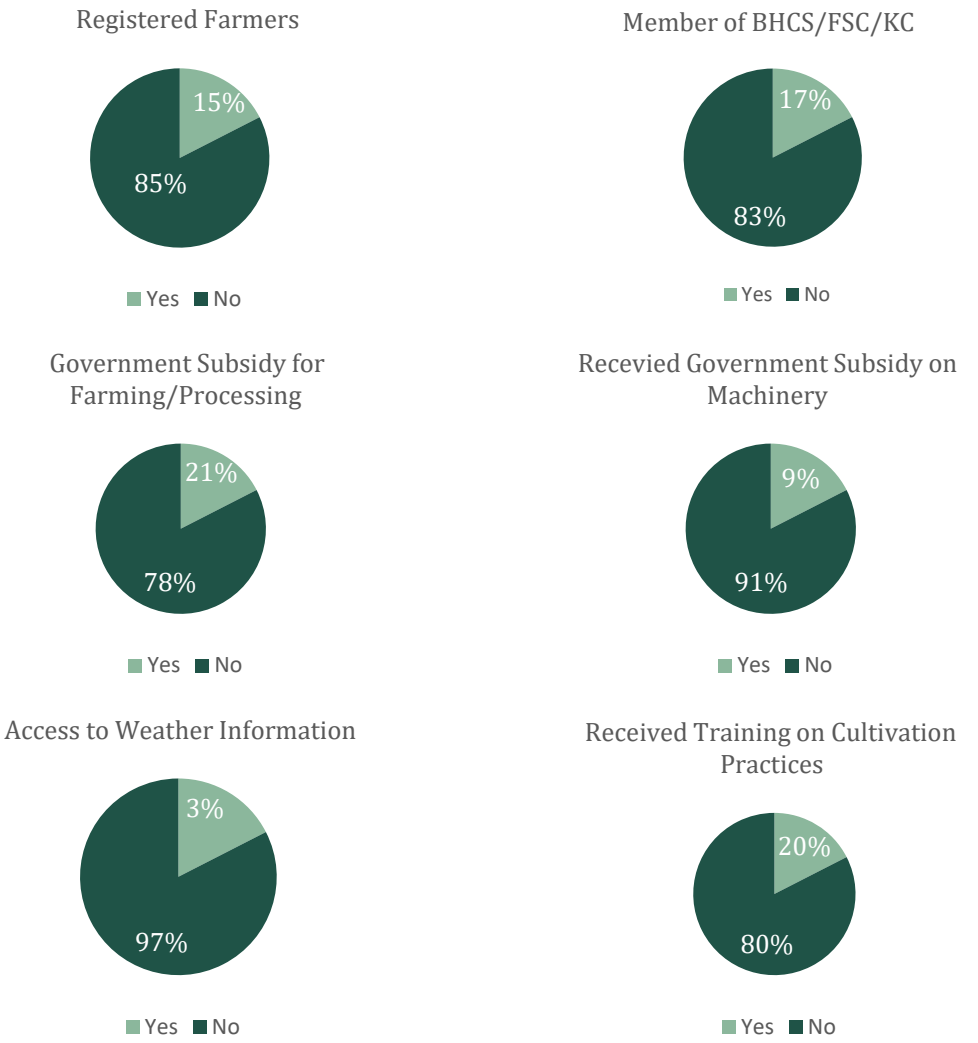
The characteristics related to extension services and access statistics are shown in Table 3 and Figure 2 below. We see that 18% of farmers are registered with the Agriculture Department, and 17% are registered with BHCS/FSC/KC. While 21% of farmers received subsidies for farming or processing, 14% received a subsidy for machinery. Only 5% of farmers have access to weather information. Additionally, 20% received training in cultivation techniques, and 31% received training in olive cultivation practices.

Table 3 : Extension Services/Access Statistics

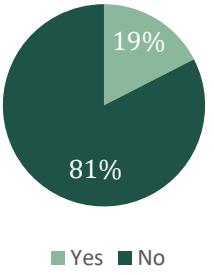
Services / Access	Yes	No
Registered	32 (18%)	152 (85%)
Member of BHCS/FSC/KC	30 (17%)	149 (83%)
Government Subsidy for Farming/Processing	34 (21%)	125 (78%)
Subsidy on Machinery	14 (9%)	146 (91%)
Access to weather information	5 (3%)	155 (97%)
Received training on cultivation practices	32 (20%)	128 (80%)
Received training in Olive cultivation practices	31 (19%)	129 (81%)

Source: Author's compilations.

Figure 2: Summary Statistics



Received Training on Olive Cultivation Practices



Source: Author's compilations.

The agricultural sector in Pakistan has experienced a notable shift towards high-value crops, including olive trees. These adaptable trees flourish in various agro-climatic conditions, especially in provinces such as Balochistan, Khyber Pakhtunkhwa, and the Potohar region of Punjab. Acknowledging the economic and environmental benefits of olive cultivation, the government has introduced several policies and programmes to facilitate its growth. However, challenges persist, such as limited technical expertise among farmers, inadequate access to quality planting materials, and a lack of processing and marketing infrastructure.

One of the main objectives of this study is to evaluate the impact of government policies on olive production. The results strongly support policy interventions: an overwhelming 98% of respondents are willing to invest if the government subsidises 50% of the costs. Similarly, 96% favour investment when processing units (such as oil expellers) receive subsidies. A significant 98% would invest if diesel or electricity costs were subsidised, while 95% recognise the importance of subsidies for pesticides, insecticides, and weedicides. Ninety-eight per cent are open to investing if drought-resistant olive varieties are introduced, and 96% see improved water availability as beneficial. A large majority, 98%, believe that proper training and extension services would encourage investment, and 98% regard crop insurance as a valuable policy intervention (Table 4).

Table 4: Farmers' Responses to Various Policy Intervention in Olive Sector

Policy Intervention	Yes	No
If the government subsidizes 50% of the cost, would you be more likely to invest in olive farming or processing	158 (98 %)	2 (2%)
If the government subsidizes Processing Units (Expeller)would you be more likely to invests in olive farming or processing?	154 (96 %)	6 (4 %)
If the government subsidizes diesel/electricity, would you be more likely to invests in olive farming or processing	158 (98 %)	2 (2%)
If the government subsidizes pesticides/ insecticides/ weedicides, would you be more likely it invests in olive farming or processing	153 (95%)	7 (5%)
If drought resistant varieties are introduced, would you be more likely to invest in olive farming or processing	158 (98 %)	2 (2%)
If water availability is enhanced, would you be more likely to invest in olive farming or processing	154 (96 %)	6 (4 %)
If training and extension services are properly provided, would you be more likely to invests in olive farming or processing	157 (98 %)	3 (2%)
If crop insurance is introduced, would you be more likely to invest in olive farming or processing	158 (98 %)	2 (2%)

Source: Author's compilations.

Two of the main challenges in olive cultivation are access to water and extension services. High costs of fertiliser, seed, and energy also significantly affect olive production. Similarly, herbicides and seed quality are additional barriers hindering olive cultivation.

Farmers' Perceptions

The farmers identified some major and minor issues affecting olive production. The issues, as perceived by the farmers, are reported below: 4.8.1 Access to High-Quality Inputs:

HIGH-QUALITY FERTILIZER:

Major Issue: 154 respondents emphasised the importance of access to high-quality fertiliser. Ensuring that olive trees have nutrient-rich soil is vital for optimal growth and yield.

Minor Issue: Five respondents raised concerns, potentially relating to availability or affordability.

Don't Know: One respondent was uncertain about the impact of fertiliser quality.

HIGH-QUALITY PESTICIDES, INSECTICIDES, AND WEEDICIDES:

Major Issue: 140 respondents highlighted the importance of quality pesticides. Effective pest control is crucial for healthy olive trees.

Minor Concern: 15 respondents expressed worries about pesticide quality.

Don't Know: 5 respondents were uncertain about the significance of these inputs.

Access to Markets:

NATIONAL MARKET:

Major Issue: 149 respondents recognised the importance of a strong national market. Effective distribution channels and local demand are essential for olive sales.

Minor Issue: 10 respondents raised minor concerns regarding market access.

Don't know: one respondent was uncertain about the impact of national market access.

INTERNATIONAL MARKET:

Major Issue: 155 respondents highlighted the importance of international market access. Export opportunities can significantly enhance the olive industry.

Minor issue: three respondents expressed slight reservations.

Don't Know: 2 respondents were unsure about the implications of global market access.

The farmers' perceptions of the challenges faced in olive production are presented in Table 5 below. We note that access to high-quality fertiliser, pesticides, insecticides, and weedicides is a major issue reported in olive production within the study area. Additionally, access to both international and national olive markets is also a significant problem reported.

Table 5: Farmers' Perception about Issues in Olive Production

Factors		Major issue	Minor issue	Don't know
Access to	high quality fertiliser	154	5	1
	High-quality pesticides	140	15	5
	High-quality Insecticides	145	13	2
	High-quality Weedicides	145	13	2
Access to	National Market	149	10	1
	International Market	155	3	2

Source: Author's compilations.

Table 6: Estimates of PAM Indicators of Olive (Based on Export Price Parity)

Economic Efficiency	Region	Olive
NPC	Punjab	1.02
	Khyber-Pakhtunkhwa	1.01
	Balochistan	1.04
EPC	Punjab	0.91
	Khyber-Pakhtunkhwa	0.92
	Balochistan	0.99
DRC	Punjab	0.59
	Khyber-Pakhtunkhwa	0.54
	Balochistan	0.39

Source: Author's compilations.

Results of the Analysis of Agricultural Policies:

The Policy Analysis Matrix (PAM) provides key indicators for assessing the competitiveness and efficiency of economic systems, especially in the agricultural sector. It examines the level of protection or implicit taxation resulting from a country's policies on agriculture, which affects both input and output markets, as well as the overall trade of the industry. This study utilises specific indicators to measure these impacts on olive production.

The PAM has been utilised to assess the impact of recent policies, such as input prices, product prices, resource prices, loan support, subsidies through agricultural projects, and exchange rates, on the efficiency of olive tree production across provinces. Consequently, this study has explored comparative advantages and economic norms of protection, emphasising competitiveness and efficiency within the olive sector. The discussion of the results follows.

The Nominal Protection Coefficient (NPC) measures the ratio of the unit domestic price (DP) to the foreign price (PP), both expressed in national currency. Table 6 displays the NPC values for olives: 1.02 in Punjab, 1.01 in

Khyber Pakhtunkhwa (KP), and 1.04 in Balochistan. These figures indicate that domestic prices are marginally higher than international levels, suggesting a modest level of protection for farmers.

The Effective Protection Coefficient (EPC) measures private value added (PVA) relative to social or economic value added. An EPC value greater than one indicates that producers are generating value added beyond optimal levels due to protective measures, which suggests economic efficiency among farmers. Conversely, an EPC value of less than one points to implicit taxation, indicating areas where producers may face disadvantages. Table 6 shows that the EPC for Balochistan is very close to 1, while for Punjab and KP it stands at 0.91 and 0.92, respectively. These figures imply some implicit taxation in Punjab and KP.

The Domestic Resource Cost (DRC) indicates the opportunity cost of domestic resources in terms of social value added per unit of crop production. A DRC value below one signifies a comparative advantage for the respective product. The findings for olives in Punjab, KP, and Balochistan reveal differing DRC values, highlighting varying resource efficiencies and the potential for competitive production across these regions.

Based on these findings, we suggest customised incentives for farmers that match their specific crop needs and farm sizes. These incentives would promote the cultivation of crops that utilise domestic resources most effectively, while increasing output. Furthermore, it is essential to tackle price volatility in input and output markets, especially regarding olive prices, to establish a more stable environment for olive production.

Balochistan, with its unique advantages in olive cultivation, requires improved market infrastructure to promote the expansion of olive production. Enhancing access to markets and processing facilities will benefit local farmers and help establish Balochistan as a significant player in the national olive industry. By implementing these recommendations, Pakistan can effectively realise the potential of its olive sector, create economic opportunities for farmers, and support rural development.

5. ANALYSING THE OLIVE VALUE CHAIN IN PAKISTAN: OPPORTUNITIES FOR WOMEN'S INCLUSION AND PARTICIPATION

The olive industry in Pakistan faces numerous challenges, including issues related to input quality, market access, and policy stability. To effectively address these challenges, policymakers should focus on improving orchard management, packaging, branding, and establishing reliable regulatory frameworks. Enhancing water availability, selecting appropriate varieties, and using proper pruning techniques are essential for advancing olive farming. Ensuring quality production, appealing packaging, and compliance with international standards will further enhance competitiveness. A comprehensive approach, supported by stable policies, technical expertise, and market development, will foster sustainable growth in Pakistan's olive sector.

Table 7: Key Problems and Policy Recommendations

Elements of the Main Problem	Solutions/Policy Recommendations
1. Major general problems in the industry	Focus on orchard management, packaging, branding, regulation, and policy.
2. Issues in supplying inputs	Strengthen the regulatory framework, establish support prices, ensure adherence to international standards, address labour costs, and improve input quality.
3. Farming challenges	Improve water availability, select climate-appropriate varieties, and refine pruning techniques.
4. Marketing obstacles	Ensure quality products, attractive packaging, and develop local markets.
5. Processing issues	Address lack of technical manpower, establish portable processing units, comply with HACCP standards, and improve storage facilities.
6. Export performance and competitiveness challenges	Increase production volume, ensure that the quality meets standards, and improve packaging.
7. Government policy challenges	Address policy instability and irregularities.
8. Other related issues	Reduce farmers' costs for plant provision and irrigation systems.

Source: Author's compilations.

Production Factors

1. **Impact of Climate Change on Olive Production**

    - Sudden temperature increases during flowering in Balochistan have negatively affected production.
    - Increased humidity and rainfall during the monsoon in Punjab have damaged fruit quality because of anthracnose disease.
    - Rising temperatures in KP have caused olive psyllid attacks, affecting flowering and overall yield.
    - Flooding in several districts of Balochistan, KP, and Punjab last year further worsened the challenges mentioned above.

2. **Adaptation to Climate Change**

    - Farmers in Balochistan have switched to olive cultivation because it needs less water than traditional crops like apples.
    - In Punjab, stakeholders are increasingly engaged in olive production due to the high-income potential from value-added products.
    - Regions in KP, such as Nowshera and Dir, are producing high-quality olives suitable for pickling and oil extraction.

3. **Olive Fruit Production Estimates**

    - Olive trees typically mature in seven years. In Balochistan, the average yield is 25-30 kg per tree; in KP, it is 20-25 kg per tree; and in Punjab, it is around 15 kg per tree.

4. **Farmer Awareness of Olive Benefits and Techniques**

    - The PSDP-funded Olive Project, in partnership with an Italian-funded initiative, has delivered training across the entire olive value chain, including nursery production, orchard management, pest control, and marketing.

5. **Role of Women in Olive Production**

    - Women mainly participate in olive value addition, creating products like pickles, soaps, cosmetics, and olive tea across Punjab, KP, and Balochistan. Women's associations have been formed, and both Italian experts and local technicians have conducted training sessions.

6. **Influence of Women's Participation on Value Chain Success**

    - Women play a vital role in the olive value chain by bringing innovative products to local markets, thus enhancing overall market success.

7. **Pest and Disease Challenges**

    - Olive Psyllid: Managed by timing treatments precisely and using insecticidal soaps.
    - Anthracnose: Minimised by early harvesting and better tree aeration.
    - Olive Fruit Fly: Managed using pheromone traps and targeted insecticides.
    - Olive Scale and Other Diseases: Tackled through monitoring, pruning, and the application of copper-based treatments.

8. **Access to Resources for Women Farmers**

    - In Punjab, some women are involved in establishing orchards and nursery production. However, in other regions, women's roles are mainly limited to value-added and household industries.

Market Issues

1. **Collective Marketing Efforts**

    - As olive is a new crop in Pakistan, establishing collective marketing initiatives will help unite producers and better promote olive products.

2. **Women's Participation in Production and Market Outcomes**

    - Women's participation in value addition remains in its early stages but shows potential for bringing locally produced olive products to the market.

3. **Challenges in Market Access**

    - At present, there is no formal market for olive products, which causes most farmers to depend on personal networks for selling.

4. **Impact of Middlemen on Market Dynamics**

    - Middlemen frequently buy olives at low prices from farmers in Balochistan and KP, impacting profitability.

5. **Supply and Demand Challenges**

    - Although demand for olive oil and related products is increasing, supply is limited by the absence of local markets.

6. **Market Competition and Pricing**

    - Without a standardised pricing mechanism, local producers often sell at low prices, which affects their profitability, with middlemen selling later at higher rates.

7. **Opportunities and Challenges of E-Commerce**

    - E-commerce has yet to be introduced to the olive sector, presenting both a challenge and an opportunity for future growth.

8. **Product Competitiveness**

    - Farmers following HACCP standards for producing extra virgin olive oil enjoy higher demand and better prices compared to those producing lower-quality oil.

9. **Challenges Faced by Traders**

    - Traders face difficulties due to the unavailability of local markets for olive products.

Processing

1. **Impact of Product Quality on Market Demand**

    - The demand for high-quality products, such as extra-virgin olive oil, is rising as consumers become more health conscious. Effective packaging and labelling are essential for market success.

2. **Facilities Required for Olive Processing**

    - Key facilities include small portable extraction units in remote areas, pre- and post-harvest kits, stainless steel storage tanks, proper bottles, and equipment for table olive processing. The government offers various subsidies to support farmers.

3. **Cost of Processing and Profitability**

    - Starting a business for value-added products demands minimal investment, enabling competition with imported goods.

4. **Available Processing Facilities**

    Oil mills across Punjab, Balochistan, and KP offer extraction facilities, with training sessions organised to ensure quality production. Units for table olive processing are also available in key areas.

    - Women's involvement in processing is limited, reflecting the novelty of the olive crop in Pakistan.

5. **Risk Factors in Olive Processing**

    - Electricity shortages are managed with generators, but the lack of proper stainless-steel storage tanks results in quality issues when oil is kept in plastic containers. Traditional methods of preparing olive pickles also limit the product's shelf life.

6. **Role of Local Manufacturing**

    - Local manufacturers design and produce machinery to support the development of the olive value chain.

External Factors

1. **Impact of Government Policies**

    - The government offers considerable support, including subsidised plants, drip irrigation systems, and training on the olive value chain. The establishment of the Pakistan Olive Oil Council (POOC) aims to enhance the olive oil industry further.

2. **Investment and Return on Investment**

    - Costs and returns vary significantly across different products.

3. **Coordination Challenges Among Stakeh**olders

    - The lack of associations in provinces hampers coordination. Creating provincial associations would improve communication and marketing efforts.

4. **Women's Engagement in Policy Shaping**

    - Two women are part of the POOC, receiving training that empowers them to play a key role in the olive value chain.

5. **Options for Increasing Women's Participation**

    - Women can participate in various activities, including:
    - Cosmetic preparation
    - Producing different types of olive pickles
    - Nursery propagation
    - Making olive tea and jam (murraba)

6. CONCLUSION

In conclusion, Pakistan's olive industry has substantial growth potential, but it encounters a variety of challenges. To promote sustainable development, policymakers should focus on key areas such as efficient orchard management, quality inputs, and simplified regulations. Ensuring water availability, selecting suitable varieties, and employing proper pruning techniques are crucial for enhancing olive farming outcomes. Marketing efforts should emphasise high-quality products, appealing packaging, and better access to local markets. Additionally, it is important to address technical gaps in processing, comply with international standards, and maintain policy consistency to enhance the industry's competitiveness. Supporting women's participation in the olive value chain, particularly in value addition and processing, through training and access to resources, can inspire innovation and drive market growth. By adopting a comprehensive approach and maintaining sustained government backing, Pakistan can realise the full potential of its olive sector, which will ultimately benefit farmers and positively contribute to the national economy.

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THE POLITICAL ECONOMY OF WHEAT SUBSIDY AND FOOD SECURITY IN GILGIT-BALTISTAN

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ABSTRACT

Wheat subsidy has played a pivotal role in ensuring food security in the mountainous region of Gilgit-Baltistan (GB), Pakistan. However, despite receiving 1.6 million subsidised wheat bags annually from the federal government, GB continues to grapple with alarming rates of food insecurity and malnutrition. This raises critical questions about the efficiency and impact of the decades-old universal wheat subsidy program. Through a mixed-methods approach involving a household survey, focus group discussions, and key informant interviews, this study analyses the wheat subsidy program's structure, implementation, and impact on the food security status of smallholding farmer households in GB. Preliminary analysis suggests that the uniform subsidy policy is insufficient in addressing vulnerabilities. The qualitative insights provide on-ground challenges around the timely acquisition, quality, and quantity of the subsidised wheat allocations. The opaque public distribution system is conducive to pilferage, rent-seeking, and elite capture, resulting in inequities that undermine the achievement of policy objectives. Considering the changing socioeconomic dynamics, a strong case emerges for re-examining the traditional models of food security provisioning in remote mountainous regions, such as GB. Policy recommendations include exploring alternative local production strategies and implementing more inclusive and transparent targeting mechanisms for subsidized food delivery, focusing on nutritional outcomes. This has far-reaching implications for sustainable food system transitions and resilience-building of isolated mountain-communities in the face of growing climate risks.

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1. INTRODUCTION

Background

Food security is a global imperative, a fundamental human right (Azwardi et al.,2016), and a key indicator of a nation's socio-economic development. Providing sufficient, economical, healthy, and safe food for the expanding global population presents a formidable challenge for human society (Manikas et al., 2023). This challenge is compounded when governments are tasked with guaranteeing food security without contributing to climate change, impairing water and land resources, or diminishing biodiversity (Abu & Oldewage-Theron, 2019). Achieving food security and ending hunger has remained the core objective of the Sustainable Development Goals (SDGs) agenda and is also crucial for achieving other goals such as no poverty, good health and well-being, responsible consumption and production, clean water and sanitation, and climate action (Saccone & Vallino, 2022). In regions marked by geographical isolation and environmental challenges, such as mountainous communities, achieving food security is a complex puzzle. The dynamics of food security in these areas differ significantly from those in the plains (Rasul & Hussain, 2015), as these areas are unsuitable for conventional green revolution agricultural practices. Mountainous environments face unique agricultural challenges stemming from factors like extreme slopes, soil erosion risks, water scarcity threats, increasing weather extremes, seasonal production variability, and frequent natural disasters like landslides and floods (Uprety et al., 2019; Karpouzoglou et al., 2020). Therefore, food self-sufficiency has been a significant problem in mountain regions, and they rely on plain areas to meet their food requirement.

The food security status in Gilgit-Baltistan is similar to that of other mountainous regions in the developing world. Specifically, the region's high altitude, temperature extremes, frequent natural disasters such as floods and landslides, poor road connectivity, and limited arable land complicate farming and food transportation (Tuladhar et al., 2023). This results in low agricultural productivity, food scarcity during winter, and malnutrition. Owing to these marginal socioeconomic conditions and food vulnerability, the Federal Government of Pakistan administers a highly subsidised wheat rationing program. The objective is to ensure the per capita availability of wheat at a lower price. To ensure food security, rationing wheat is an effective way of distributing the scarce commodity in areas where the income distribution is relatively uniform. The federal government subsidises 1.6 million bags of wheat for Rs. 7–8 billion annually, making wheat available at

6-7 times less than the national average price per kg. Although the primary objective of the wheat subsidy is to secure vulnerable people regarding food and livelihood, the subsidy has also remained a source of legitimacy for the federal government, considering the constitutional limbo of the region. The political sensitivity of the wheat subsidy in Gilgit-Baltistan remains undeniable. The region has experienced large protests and sit-ins in response to federal government subsidy cuts (Rasul & Hussain, 2015), escalating the situation to a discussion on the country's political legitimacy in administering Gilgit-Baltistan.

The Dynamics of Wheat Subsidy in Gilgit Baltistan and Food Security

Despite the highly subsidised wheat program, the statistical evidence paints a gloomy picture of the food challenges (Hussain et al., 2022). More than half of the population in Gilgit Baltistan is food insecure (SDPI & WPF, 2009), compared to 37% of the national average (GOP, 2018b). According to the National Nutrition Survey (NNS) 2018, the region grapples with alarming rates of malnutrition and stunting, with 46.6% of children affected by stunting, well above the national average of 40.2% (GOP, 2018b). Wasting affects 9.4% of children in Gilgit-Baltistan, compared to the national average of 17.7%, and 21.3% of children under five are underweight, further highlighting the urgency of addressing food security. Such statistics of Gilgit-Baltistan question the nature, design, and implementation strategies associated with the food policy in general and the wheat subsidy program in particular. As there is no comprehensive food policy beyond subsidized wheat, we will discuss the issues surrounding wheat subsidy program as a food security policy. First, the problem lies in the implementation strategy and effectiveness of the wheat subsidy program as a social safety net. The universal wheat subsidy, irrespective of the socioeconomic profile of the households, is rendering the objective of the subsidy inefficient as a social safety net program in terms of the accessibility and affordability dimensions of food security. The program is not targeted at needy households, as most households do not earn even a minimum wage, and they receive the same subsidised amount as the rich do. The poor cannot afford the unsubsidized flour like the rich, and the fixed ration of wheat is insufficient to meet their dietary needs.

Moreover, the subsidy is also creating a threat to the country's escalating budget deficit. This raises questions about the sustainability of the subsidy program in protecting the vulnerable and poor segments of the community without risking the country's long-term macroeconomic stability. Secondly,

land-use issues in the plains of Pakistan exhibit an alarming degradation trend, characterised by soil and wind erosion, loss of soil fertility, deforestation, waterlogging & salinity, and water shortages. The costs associated with these challenges are substantial. "The cost associated with loss of soil fertility alone is estimated to be Rs.70 billion per year in Pakistan" (GOP, 2015). Wheat-growing belts in the plains are transitioning to sugarcane belts due to large subsidy schemes attached to sugar production, processing, and export. Sugar is referred to as a parliamentary crop in Pakistan, as many parliamentarians are involved in sugarcane harvesting and production. These factors contribute to declining wheat production in the country, making the availability of subsidised wheat to GB a threat and increasing the visibility of food insecurity in the future. Thirdly, wheat subsidies have changed people's dietary habits and raised concerns about food security. The import-driven nature of wheat production hinders local production, despite having sufficient land for wheat cultivation. Subsidies, as we know, hurt local production. The subsidy has led to a decline in the local production and consumption of a variety of seeds and grains, including buckwheat, barley, and maize, which have historically been part of the local people's diet in the Hindu Kush Himalayan region. Moreover, reliance on external wheat supplies can worsen food insecurity during price fluctuations or supply disruptions (Rasul & Hussain, 2015). Irrespective of their nutritional content and quality, wheat and rice are often referred to as food for the poor and have become a routine part of the diet. Though total calorie intake has increased due to changes in dietary habits, the nutritional status has deteriorated due to a deficiency of micronutrients. Vitamin-related deficiencies of the population of Gilgit-Baltistan make this apparent (Deficiencies of micronutrients in women of reproductive age: 96% deficiency of Vitamin D, 71% deficiency of Calcium. Deficiencies in children below 5; 82% deficiency of Vitamin A and 70% deficiency of Iodine (SDPI & WFP, 2009). The loss of self-sufficiency in food has created several risks for the local community, including market dependency and heightened political and environmental concerns.

Distribution, Quality, and Price Control of Subsidised Wheat in Gilgit-Baltistan

The area of Gilgit-Baltistan has a special status and has no job opportunities, industry, infrastructure, fund allocations, and other facilities that the rest of the country enjoys. Therefore, the Government of Pakistan allocated a 1.5 million metric tons of wheat quota on subsidised rates for the people of Gilgit-Baltistan to extend the benefit to them (Dawn, 2022). The wheat is transported via M/S Northern Areas Transport Corporation (NATCO) carriage

from Base Godown, Islamabad, to Gilgit-Baltistan, and thereafter, it is supplied to the owners of flour mills for grinding and production of flour. These flour mills are responsible for supplying flour to consumers at various distribution points through the dealership system. “The fixation of the price of flour and the minute examination reveals that the rate of 40 Kg bag of flour is fixed at the rate of Rs. 620/ per 40 Kg Bag for the consumer, whereas the same is lifted by the food department from the flour mills at the rate of Rs. 548/¬ per bag. Thus, Rs. 18 per 40 Kg bag are added in the shape of transport charges, and Rs. 23 per 40 Kg bag is further added on account of expenses incurred on salaries of employees, including salesmen and supervisors. Then an amount of Rs.11/ is further added per 40 Kg bag on account of rent of shops taken on rent at the rate of Rs. 350/per shop per month” (SAC, 2013).

Initially, municipal committees/union councils/ members or other public representatives distribute the subsidised wheat among the end users. After this, to meet the general public's demand for flour, the concept of wheat dealers for distributing subsidised wheat was introduced by the GB Food Department in their respective localities. This dealership system has facilitated black marketing of subsidised wheat, as it has supplied it to tandoor owners, hotel Owners, etc., at higher prices. This process has continued to date and is considered a major cause of the wheat shortage in the region. Along similar lines, most of the Flour Mill owners were also reportedly involved in black marketing by making fine Danedar flour, Maida and Sooji, etc., by using the subsidised wheat and by selling it to Tandoor owners and bakers at a higher price to make lucrative profits (SAC, 2013). Furthermore, these mill owners also produced choker from the subsidised wheat, and later on, it was smuggled to the countryside to make profits. This Dealer-Mill Owner nexus not only involved black marketing, but also produced low-quality flour for the general public's use.

The wisdom of the Government of Pakistan in providing subsidised wheat is to support the poor and marginalised mountainous people of Gilgit-Baltistan. It is not provided to benefit an individual or a group of individuals (Flour Dealers, Mill owners, Tandoor owners, etc.). However, the current distribution mechanism of subsidised wheat has several flaws, which prevent this advantage from reaching the end users in its true spirit, allowing blackmailers or mafias in the area to benefit from it (SAC, 2013). Therefore, the core objective of this research is to identify the current pitfalls in the distribution policy of subsidised wheat and to devise a policy in consultation with the Government of Gilgit-Baltistan and other stakeholders to ensure the fair distribution of this privilege granted by the Federal Government of Pakistan, keeping in the larger interest of the general public.

Scope and Significance of the Research

The scope of this research lies in the need for a more comprehensive economic analysis of the wheat subsidy program in terms of food security in Gilgit-Baltistan, which focuses on consumers rather than producers. Given the changing economic landscape of the region, a re-evaluation of the subsidy program's efficiency in achieving food security goals becomes imperative. The economic profile of Gilgit-Baltistan in the 1970s was relatively uniform. Hence, the universal wheat subsidy program, a rationed and untargeted subsidy, had a strong foundation for its implementation. However, over the years, the economic profile and income distribution of the population have undergone substantial changes. Redesigning the policy and intervention can be formalised to achieve the aims and objectives and be economically implementable. This can be achieved by reallocating the wheat subsidy through targeted subsidy programs, such as rationed, targeted subsidies based on the price and income level of the household, making the policy more efficient in targeting the poor and vulnerable to achieve their food security. A targeted subsidy can raise the welfare of the vulnerable and lower the budget deficit (Swaminathan, 1998). Given a fixed budget, a larger unit transfer is possible if fewer people are included. It will increase the availability of wheat and its accessibility to vulnerable households. Secondly, there are expected challenges to the sustainability of the wheat subsidy program, including its import-driven nature, opportunity costs, and production challenges in the plain areas. In agriculture, subsidy programs are provided to wheat producers, generally raising their productivity. Wheat imported into Gilgit Baltistan at a highly subsidised rate is harming the local subsistence production, despite having land suitable for growing wheat, and compromising the availability and sustainability dimensions of food security. The loss of self-sufficiency in food has created several risks for the local community, including market dependency, political concerns, and environmental concerns. The recent interventions of IFAD in expanding arable land have increased the potential of agriculture and agricultural income in the region. GB has the potential for import substitution by incentivising horticulture, dairy production, and food processing. This could enhance self-sufficiency and resilience (Rasul & Hussain, 2015). Moreover, if the amount of subsidised wheat is produced in GB, it can maintain the availability, accessibility, and sustainability dimensions of food security, as there is sufficient land for production compared to the population size. This can be achieved by redirecting subsidies towards research and development, providing sustainable agricultural solutions that benefit small farmers, and promoting a more sustainable food supply in the future. As subsidies are

rigorously used for environmental protection measures (Erickson et al., 2020), such initiatives can also help in fighting climate change along with food insecurity, with consideration of the quality of food production along with quantity enhancement (Chen et al., 2023) while designing food policies.

Moreover, the opacity of the public distribution system is eroding the purpose of the subsidy, as it fosters pilferage and rent-seeking due to the lack of clearly delineated quotas. Furthermore, inadequate compliance mechanisms in place for intermediaries allow a potential black market to prevail, undermining the policy objectives of the wheat subsidy. This is first study of its kind to investigate and scale the black market associated with wheat subsidies, which will help policymakers analyse it from a broader perspective.

Objectives

Building on the above discussion, this research aims to achieve the following objectives.

- To comprehensively understand the wheat subsidy program's structure and implementation, including the magnitude of the subsidy, distribution mechanisms, and target beneficiaries.
- The impact of the wheat subsidy on the food security of the households in Gilgit-Baltistan
- To explore the potential of black marketing associated with the wheat subsidy and its scale.
- Propose policy alternatives to redesign an efficient policy for the reallocation of the subsidy program economically for effective implementation.

Wheat procurement and Distribution

The food department of Gilgit Baltistan largely relies upon Pakistan Agricultural Storage & Services Ltd (PASSCO) for wheat procurement alongside the Punjab Food Department. These procurements account for 150,173 MT of wheat, on average, from 2017 to 2021. However, the actual allocation of wheat to Gilgit-Baltistan is 16000 MT. The difference between the actual allocation and procurement shows a considerable shortage.

The table below shows the difference between actual allocations and procurement data. During these years, the Food Department GB has observed an average shortage of 36000 MT.

Table 1: Procurement of Wheat by PASSCO and Food Department, GB(MT)

Year	Total	PASSCO	Punjab Food Department
2017	142,110	142,110	0
2018	145,960	145,960	0
2019	146,971	146,971	0
2020	159,992	159,992	0
2021	155,832	140,832	15,000
2022 up to 30th September, 2022	21,499	21,499	0

Source: Food Department GB.

Table 2: Annual Allocation and Releases of Wheat (in MT)

Particulars	Wheat (in MT)
Annual Allocation	160,000
Monthly Consumption	13,333
Daily Consumption	444
Actual Releases Per Month	10,333
Monthly Short Fall/Less Releases	3,000
Annual Short Fall/Less Releases	36,000

Source: Food Department GB.

The Food Department Gilgit Baltistan is responsible for distributing these bags to all the districts based on population. The table below shows the detailed distribution of wheat among different districts from 2017 to 2022. The detailed exploration shows that Shigar is the largest recipient of subsidised wheat, while Nagar's share is the lowest among all the districts.

Table 3: District Wise and Year Wise Wheat Distribution 2017-18 to 2021-22

District	100 kg Bags				
	2017-18	2018-19	2019-20	2020-21	2021-22
Gilgit	279,616	280,942	314,568	316,059	289,555
Hunza	167,979	168,775	188,977	189,872	153,281
Nagar	58,545	58,823	65,863	66,175	56,884
Ghizer	79,907	80,286	89,895	90,321	62,720
Skardu	102,286	102,771	115,072	115,617	134,373
Shiger	289,196	290,566	325,345	326,886	254,871
Kharmang	185,130	186,008	208,271	209,259	230,281
Ghanche	305,773	307,222	343,995	345,625	439,310
Diamer	55,071	55,332	61,955	62,248	82,443
Astore	76,912	77,276	86,526	86,936	105,302
Total	1,600,415	1,608,001	1,800,467	1,808,998	1,809,000

Source: Food Department GB.

2. LITERATURE REVIEW

Wheat Subsidy and Food Security

The issue of food security worldwide has remained a key concern among policy circles in recent decades. It encompasses the dimensions of food availability, access, and utilisation (Rao & Casimir, 2003; Shetty, 2009). The World Food Summit on food security in 1996 defined food security as: "It exists when all people, at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life".

Mountains cover approximately 27% of the Earth's surface and are home to around 12% of the global population, with about half residing in the Asia Pacific region (FAO, 2015; Ullah et al., 2020). "Almost 245 million mountainous population living in the developing world is estimated to be vulnerable to food insecurity as a result of difficult conditions for agricultural production, social and political marginalization, low productivity, subsistence economies, the constraints of terrain and climate, poor infrastructure, limited access to markets, physical isolation, vulnerability to natural risks, and high cost of food production and transportation" (Rasul & Hussain, 2015; Spies, 2018). The incidence of food insecurity and vulnerability in mountain communities is a

pressing issue due to erratic weather patterns, rugged terrain, low agricultural productivity, poverty, and environmental challenges. Pandey (2016) offers insights into some of the prominent factors contributing to the deterioration of food security in mountainous communities in the Trans-Himalayan belt of Nepal. These include short growing seasons, small land sizes, decreasing livestock holdings, and high transport costs for imported foods. The findings document that 50% of households are food insecure, with occasional (42%) or moderate (8%) deficiencies. This represents an improvement from the higher levels of deficiency 10 years ago, and such improvements were attributed to increased access to purchasing food from markets. Such findings demonstrate the severe challenges to attaining food security in remote, marginalised, mountainous regions, where geophysical and climatic constraints hinder local agriculture. While Pandey (2016) focuses on geophysical and climatic limitations, Rasul & Hussain (2015) delve deeper into socio-economic factors like poverty, environmental degradation, climate change, and inadequate policy support. Both studies emphasise the unique vulnerability of mountain agriculture and food systems. Over 30% of the population suffers from food insecurity, and 50% have some form of malnutrition (Rasul & Hussain, 2015). Such results call for firm strategies to address food security and require integrated approaches encompassing production, income enhancement for purchased food access, resilient local food systems, environmental management, and infrastructure improvements tailored to distinct mountain zones based on agricultural potential and market access.

In recent years, the increasing frequency of climate hazards, such as floods, water scarcity, and droughts, has further exacerbated the issue and is projected to raise more concerns. The subsistence farming historically practiced by these communities has been severely challenged by environmental degradation and climate change, rendering the resilience of these communities a global concern. Recent assessments indicate that mountain communities in the Hindu Kush Himalaya have experienced a 40% decline in their agricultural yields due to environmental and climatic hazards (ICIMOD). Poverty is evident from the nutritional statistics as 31% of the mountain communities in HKH live below the poverty line. The rate of malnutrition and stunting in remote mountain areas is highly prevalent despite declining global trends. This limits their capacity for production and food acquisition.

The nature of Food and livelihood security in mountainous regions is quite different than what is in the plains (Ullah et al., 2020) because socioeconomic and environmental conditions in mountainous areas are changing rapidly

which in turn has triggered the issue of food security in the Hindu Kush-Himalayan (HKH) region (Tiwari, 2000). The problem of food insecurity in the mountains of Pakistan is considerably more complex than the plains (Spies, 2018), as these areas are not suitable for the conventional green revolution's agricultural practices. Mostly, in the Hindu Kush-Himalayan (HKH) region of Pakistan, the potential of niche products like" fruit, nuts, and livestock" along with the opportunities produced by globalisation has not been explored yet (Rasul et al., 2014; Hussain et al., 2022). Mountainous areas are renowned for their suitability for producing nutritionally rich crops, including buckwheat, barley, beans, and millet. The production and consumption of these neglected and underutilised food crops (NUFCs) in mountainous areas are attributed to factors such as agricultural intensification, changing food habits, and lack of policy support. This decline in NUFCs is contributing to the prevalence of malnutrition in these regions, as the balance of the food consumption basket is altered due to negligence in the production and subsequent consumption of these nutrition-rich crops. This is evident, as half of the dietary energy supply in the mountains is met through wheat, maize, and rice, which are not produced in these regions and are imported from the plains (Adhikari et al., 2019). Due to negligence and a lack of mainstreaming in food policymaking, these crops have undergone consistent down-gradation and have disappeared from the local food basket.

In recent times, due to some socioeconomic factors and climate change, the natural resource base has been declining in mountainous areas particularly in the "Hindu-Kush Himalayan (HKH)" region (Ahmad et al., 2022) due to which an unbearable loss of natural resources, ecosystem services, in terms of "soil nutrients, water, and biomass" which in turn has badly affected crop productivity and triggered food security issue and increased vulnerability of mountainous community (Tiwari & Joshi, 2012). Currently, people in this region heavily rely on external sources to meet their food requirements (Ahmad et al., 2022). The deterioration of the local food system has also contributed substantially to the food and nutritional security of mountain communities in northern Pakistan (Adhikari et al., 2017). The decline in subsistence agriculture and NUFCs also has profound implications for climate change adaptation and mitigation strategies.

In Pakistan, approximately 61% of the country's geographical area is covered by mountains (GOP, 2018a), which accommodates about 50 million people, accounting for nearly 24% of the country's total population (GOP, 2017). "Rangeland, conifer forest cover, and area under ice and snow-wasteland are the main features of the landscape of the Gilgit-Baltistan and Chitral (GBC) region and collectively cover 6.687 million hectares, 8.4% of the total

geographical area of the country" (Hussain et al., 2022). Livelihoods and food security in mountainous regions depend heavily on local resources, including subsistence agriculture and livestock. In some areas, few people are also engaged in horticultural activities. (Spies, 2018). The livelihood activities in Pakistan's mountains heavily depend on "subsistence agriculture, livestock, common pasture and rangeland, forest, and some non-farm activities". They are pretty similar to other mountainous regions of the world (Hussain et al., 2022). Average land holdings, the size of cultivable land, and per-acre yield from crop production are limited and insufficient to meet the food requirements of poor mountain communities (Ullah et al., 2020). Livestock, the most significant source of household income, is the primary means of livelihood and food security in the mountainous areas of northern Pakistan. However, in most parts of GB, the products of livestock are mainly used to meet subsistence requirements. However, a few households in some localities also sell them into the market to earn as a source of livelihood (Ahmad et al., 2012). Along with agricultural and livestock sources, income generated from non-agricultural sources like "small businesses, services, remittances, non-farm wages, forests, and social safety nets" also plays a vital role in achieving mountain food security (Israr & Khan, 2010).

Historically, wheat subsidies have played a pivotal role in ensuring food security in Gilgit-Baltistan, aligning with the vulnerable socio-economic conditions of the region. Wheat has remained the major cereal of the local diet. Owing to its mountainous terrain, the area has limited arable land, low crop productivity, food deficits, and high reliance on wheat imports. Due to local cereal and pulse deficits, the government of Pakistan subsidises wheat in GB regions, which is procured from the plains of the country (Hussain et al., 2022).

Subsidy cuts also trigger political unrest in regions with limited constitutional rights and civil liberties. The withdrawal of the wheat subsidy in GB in 2014 and the resulting protests and sit-ins demanding constitutional status highlight the population's dependence on subsidised wheat from Pakistan's plains to meet food needs. This dependence also leaves them vulnerable to disruptions in external food supplies, especially given the frequency of natural disasters and climate-induced hazards (Rasul & Hussain, 2015). While political unrest amid the subsidy cuts highlights the significance of the wheat subsidy program in the region, the article does not assess whether the decades-long monthly ration program has effectively improved food security in GB. Key questions remain, including the proportion of households that qualify for rations, whether the allotted wheat meets per capita caloric needs, how market fluctuations affect reliance on rations, and whether alternative

nutrition programs may better serve remote, mountainous villages. The socioeconomic dynamics of the region in the 21st century have undergone significant transformation. The uniformity of income distribution at the time of the introduction of the wheat subsidy in the early seventies has significantly altered. The exposure of the region to other areas of Pakistan and the global world, such as China, has significantly contributed to the emergence of new development opportunities and diverse livelihood options (Dame & Nusser, 2011) in the region contributing to significant variations in the income distribution and local food system (Spies, 2018.). According to Spies (2018), traditional rural communities with high agroecological potential have enhanced their productivity regarding diverse farming options. However, low-agroecological potential communities have shifted from subsistence agriculture to off-farm opportunities, such as tourism and handicrafts (Tuladhar et al., 2023). Similarly, Remittances from abroad or within the country, small and micro enterprises, wage labour, mountain tourism, and the collection of medicinal plants, along with other herbs, are other sources of livelihoods and food security in such regions (Rasul & Hussain, 2015). Although the potential of off-farm opportunities has not been fully explored, there is a need for national policies to be established to harness this potential and increase the community's purchasing power to access food and develop a resilient local food system (Tiwari & Joshi, 2012). Thus, a significant portion of off-farm income is allocated to addressing food security issues in the region (Spies, 2018). The withdrawal of subsidies at any point might only cause a food crisis among the vulnerable income groups with no other non-farm income sources. Although these findings present a pessimistic view of the sustainability of the local food system in ensuring food security, the study area and sampling are limited to one district in Gilgit-Baltistan. The region has ten districts with a diversified landscape and land use patterns, so building a general argument on one locality might be misleading. Consequently, further exploration and investigation, including expanding the sampling and methodology, are required. The dynamics of human development have also changed due to improved infrastructure, education, and healthcare facilities (Hussain et al., 2022). Gilgit Baltistan has a recorded literacy rate in Pakistan, superseding all four provinces and AJK.

Although pivotal to food security, food subsidies, especially those focused on staple grains like wheat, can pose threats to traditional subsistence agriculture in mountainous areas. Subsidies that provide cheap, imported grains can create a dependence on these foods rather than local crops. This leads to a decline in the subsistence production of nutritious, native grains and crops adapted to mountain conditions. The too much emphasis on subsidised

food supply from plain areas in food and nutrition policies and programs has resulted in the distortion of the local subsistence agriculture system, despite its high value, rich nutrient composition, and pivotal role in achieving food security for mountain communities (Adhikari et al., 2017). The influx of cheap subsidised grains can distort local cereal markets, depressing prices and incentivising mountain farmers to grow subsistence crops. This exacerbates abandonment of marginal, terraced mountain fields. Moreover, the inexpensive uniform grains lack the micronutrients found in traditional mountain crops, such as millets, buckwheat, and barley. Focusing subsidies exclusively on wheat/rice leads to a loss of crop diversity, which undermines nutritional security. The study documented a high prevalence of malnutrition in the mountain communities of Pakistan and Nepal, resulting from the decline in the production and utilisation of Neglected and Underutilised Food Crops (NUFCs), such as millets, buckwheat, barley, and beans, which are prominent in these communities.

Food Security and its specifics in the remote mountainous areas have always been given limited importance in national and international development agendas (Dame & Nusser, 2011). “At the same time, local food systems have undergone significant transitions over the past two decades (Spies, 2018). Whereas subsistence agriculture still forms the economic mainstay in these regions, current dynamics are generally characterised by livelihood diversification with increased off-farm income opportunities and an expansion of external development interventions” (Dame & Nusser, 2011).

Drawing on these insights, it is crucial to examine the specific role of the wheat subsidy in Gilgit-Baltistan. Moreover, it is essential to investigate whether the wheat subsidy to consumers mitigates food insecurity by making wheat affordable or if it potentially contributes to the decline of subsistence agriculture observed by Rasul & Hussain (2015), further jeopardising food security in the long run.

Opportunity Cost of Wheat Subsidy

The Government of Pakistan aims to ensure food security in Gilgit-Baltistan through a high subsidy on imported wheat from the countryside. The federal government subsidises 1.6 million bags of wheat for 7–8 billion PKR per year, making wheat available at 6-7 times the national average price per kilogram. Despite the abundance of literature available on this subject, the absence of an analysis concerning the developmental and distributional aspects of wheat subsidies in GB is notable.

The primary objective of food subsidy programs is to ensure food security and alleviate poverty, given the greater proportion of income spent on food by economically marginalised groups. These safety net programs are short-term policy instruments with long-term consequences for fiscal conditions and the economy's development. Despite their extensive use, policy analysts lack agreement regarding the efficacy of food subsidy programs. The primary criticism outlined in the literature centres on economic inefficiency, a high fiscal burden, and welfare loss.

Endre et al. (1992) presented one of the earliest studies concerning Pakistan in this area of study. A time series analysis of household income and expenditure surveys (HIES) shows that despite a decrease in the actual price of wheat resulting from subsidies and other factors, there was no notable increase in per capita wheat consumption across all income levels. Thus, the cost of such intervention was deemed to be excessively high. Ashfaq et al. (2001) present concrete evidence of this societal cost. Simulation experiments using econometric models indicate that the welfare loss incurred due to extensive government involvement in wheat pricing policy amounts to 14 billion rupees per annum from 1973 to 1996. Moreover, producers lose an average of $25 billion annually, the government incurs a cost of $6 billion, and consumers benefit by $17 billion annually.

The cost-ineffectiveness and inefficiency of consumer subsidies are also being questioned in other developing countries. In one of IFPRI's studies, Calegar et al. (1988) express reservations regarding the wheat subsidy in Brazil and argue that it significantly burdens society. In addition to welfare considerations, Calegar et al. (1988) underscore the impact of wheat subsidies on income distribution. The total estimated social cost of consumer subsidies during the entire period, using standard partial equilibrium and comparative static analysis, was Cr84 billion, of which only 19% is utilised by the impoverished population. This situation mirrors the case in Egypt, where poor households receive merely a third of the total value of food subsidies, as 75% of the households in the subsidy system are not poor (Breisinger et al., 2021).

Hence, the regressive nature of food subsidy programs makes them extremely costly, incurring high opportunity costs. López et al. (2011) provide empirical evidence suggesting that underinvestment in public goods, due to prioritising subsidies on private goods, has significant implications for economic development. Instead, directing resources from these subsidies (private goods) to the provision of public goods results in an increment in the per

capita income of the rural population and contributes significantly to poverty reduction. This paper presents empirical evidence based on GMM estimation, utilising data from the rural sector in fifteen Latin American countries from 1985 to 2001.

The above result aligns with the findings of Fan et al. (2008), who applied a multi-equation system to estimate the impact of government investments and subsidies on agricultural growth and poverty reduction. The evidence suggests that resource allocation towards agricultural R&D, education, and infrastructure has a significantly greater impact on long-term growth and poverty reduction than investments in private subsidies. However, proponents contend that exiting these programs is not easy due to their complex political economy, as witnessed in many developing countries (Gutner, 1999). Instead of eliminating subsidies, enhancing their effectiveness by reforming the system and targeting the beneficiaries directly would be advantageous. Breisinger et al (2021) explore the growth and distributional impact of food policy reforms in Egypt, using a computable general equilibrium (CGE) model. Three scenarios are being examined regarding the food subsidy called Tamweem: even reforms, targeted reforms, and, finally, comprehensive reforms. The result displays that better targeting of food subsidies improves outcomes for poor households; however, eliminating subsidies without any compensation transfers would exacerbate poverty and inequality in Egypt. Tunisia also provides an impressive example of subsidy reforms, wherein universal food subsidies are replaced by targeted subsidies, resulting in a halving of the program's cost (Tuck & Lindert, 1996).

Hence, the success and efficacy of food subsidies can be strengthened through reforms wherein the needy beneficiaries are targeted directly. With improvement in targeting, the fundamental objective of food subsidy programs can be achieved with little budgetary exposure. However, to design future reforms, it is imperative to understand the distributional aspect of the subsidy program and the probable consequences that changes in the existing policies will have.

Black Marketing and Wheat Subsidy

The subsidies across various countries are distributed through either public distribution systems or private entities. Ascertaining these practices, the Government of Gilgit-Baltistan has been distributing subsidised wheat to its consumers since 1970. These distribution systems establish linkages between the subsidised commodity and beneficiaries; however, intermediaries and

characteristics of these distribution systems have long been a point of concern for researchers and consumers. For example, researchers have always been sceptical about the opacity of the system (Reinikka & Svensson, 2004; Mehta & Jha, 2010).

The study conducted by Mehta & Jha (2012) reveals that programs in which quotas were clearly identified and regularly met, and in which consumers were given a due voice, had lower pilferage rates. Thus, it can be argued that the opacity of the system hinders the beneficiaries from benefiting from stipulated subsidies. The issue is similarly encountered within the Food Department of the Government of Gilgit-Baltistan, wherein the absence of publicly accessible data and the lack of clearly delineated quotas present a noteworthy challenge. These findings are ascertained by Jha & Ramaswami (2012), where they have shown that in India the food department increased the amount of subsidy from 1.61 kg/(person-month) to 2.27 kg/(person-month) during 1999/2000 and 2004/2005 survey years, the consumption only increased from 1.01 to 1.03 Kg/(person-month). Similarly, Khera (2011b) establishes that the pilferage of subsidised wheat and rice increased manifold during these times. Likewise, Reinikka & Svensson (2004) have shown that the association between the inputs and outputs will be weak in an opaque system, thus fostering irregularities. These findings are further augmented by Drèze & Khera (2010) and Himanshu & Sen (2011), who have attributed transparency and institutional design to the success of these programs.

In addition, system leakages coupled with poor targeting led to most of the benefits accruing to the non-needy. Ahmed et al. (2001) studied the Egyptian food system and found that the subsidy program affects the rich and poor unequally, i.e., wealthy households benefit more than the poor. These distribution systems emerge through political processes, resulting in errors of inclusion, errors of exclusion, and uneven targeting. How wheat subsidies are applied in Gilgit-Baltistan unfairly affects both the rich and the poor. Wealthier individuals do not get their fair share of the wheat quota, and there are reports that authorities are selling these unallocated portions on the black market.

Similarly, Gulati & Saini (2015) attempted to study public distribution systems in India, revealing that these systems deliver better services in better-off states, while their performance has been questionable in relatively poorer states, raising equity issues. Moreover, they have identified the leakages associated with food delivery, where large amounts of food are diverted to open markets instead of being delivered to the poor. Similarly, Fernandez (2010) has argued, based on his study to understand the poor practices

associated with identifying the poor in India, that identifying those below the poverty line is highly contested across political and bureaucratic circles, seriously affecting program efficiency. These findings align with those of Drèze & Khera (2015), who studied the leakages associated with the Above Poverty Line (APL) and the Below Poverty Line (BPL). The findings suggest that cardholders above the poverty line frequently pilfer large amounts of food.

The poor beneficiaries have hardly been covered through these programs; their share of food is either pilfered or diverted to other areas. For example, the study investigated by Dhanaraj & Gade (2012) in Tamil Nadu shows that for every 5 kg of rice, only 1 kilogram reached the poor. Similarly, in the case of sugar, the poor receive 1 kilograms for every 8.52 kg. Thus, validating that the poor's share of subsidised goods is more prone to pilferage and black marketing. These claims are further confirmed by Kumar & Ayyappan (2014), who, in an attempt to understand the distribution mechanism of 12 states of India, revealed that in some states up to 100% of subsidised wheat is diverted to other states. Similarly, Khera., (2011a) shows that poor households cannot access their full entitlement to goods, and as a result, are forced to purchase them from the open market at higher rates.

3. METHODOLOGY

Study Area

The study is conducted in the mountain communities of Gilgit-Baltistan, located in northern Pakistan. Gilgit Baltistan covers an area of over 72,971 square kilometres and is home to approximately 1.8 million inhabitants. The terrain is characterised by high peaks and valleys, with elevations ranging from 1,500 to 8,000 meters. The specific communities targeted for this study are small, remote villages in the Gilgit, Skardu, Ghizer, and Nagar districts, which are highly dependent on subsistence agriculture and wheat for their food supply. These communities were selected due to their reliance on wheat cultivation on terraced mountain fields as well as their receipt of government wheat subsidies aimed at enhancing food security. Additionally, their isolation and marginalisation make them appropriate case studies for examining the impacts of wheat policy decisions on vulnerable populations.

Primary data collection involved surveys, interviews, and focus groups conducted with village residents, farmers, and local leaders. Questions were posed on topics like wheat yields, access to subsidised wheat, food security, scarcity experiences, the effectiveness of subsidy programs, and challenges to wheat cultivation and access in these terrain-challenged mountain settings. Secondary district-level data on wheat production, government food aid allotments, and population demographics were also incorporated into the analysis, where available. Results shed light on how consumer-based wheat subsidies succeed or fail in reaching and improving food security among remote mountain villages in this region.

Sampling Strategy

In the first stage, a purposive sampling technique was employed to identify the sample districts in Gilgit-Baltistan where wheat cultivation constitutes a significant component of subsistence agriculture and the local diet. Primarily, 4 out of 10 districts were selected. The criteria for district selection included altitude, terrain, accessibility, level of marginalisation, and receipt of government wheat subsidies. Additionally, sampled districts were required to have a majority of their population dependent on their own wheat production rather than purchasing it from markets. Input from local leaders, agricultural experts, and secondary census data informed the final site selection, which chose information-rich cases that reflected the research questions. Secondly, one village from each district was selected for the study based on our earlier specification for district selection.

The third stage involved random household sampling within the selected villages to survey 90-100 households in each community. Households farming wheat on owned or rented land formed the primary sample population. Upon visiting each village, a predetermined number of subjects was randomly selected from the list. This eliminates the risk of bias resulting from intentionally excluding specific households over others.

Data sources at the household level included surveys on landholding, crop yields and income, costs, food consumption and expenditures, and the efficacy of subsidies; semi-structured interviews on food security perspectives and experiences; and focus group discussions to capture community-level dynamics surrounding wheat cultivation, distribution, and sufficiency.

Data Collection Process

A team of university graduates was hired and trained in data collection techniques, research ethics, and data quality. Before the final survey began, a pilot survey was conducted to ensure the tools were practical and that reliable data could be gathered.

For the collection of qualitative data, three FGDs (one in each district) and 20 Key Informant Interviews (KIIs) were conducted. In group discussions, the representation of various Wheat stakeholders will be ensured.

Wheat Subsidy and Food Security

A mixed-methods research approach is employed in this study, given the exploratory nature of the research and the lack of consistent baseline data on socio-economic indicators in Gilgit-Baltistan. This approach enables the gathering of various data and perspectives on the wheat subsidy and its linkages with food security, as well as the perspectives of different stakeholders on the wheat subsidy. The use of a questionnaire-based household survey provides quantitative data on the socio-economic status of the local population, their access to and consumption of food, and the impact of the wheat subsidy on food security. Group discussions and in-depth interviews with agricultural experts, the government's food and agriculture department, subsidised wheat dealers, and the local community are conducted to provide qualitative insights into the research problem. This data provides a deeper understanding of the impact of the wheat subsidy on the local community and identifies the challenges in the current subsidised wheat mechanism in the study area. Comparing the data obtained from these various methods will validate the findings and gain a more comprehensive understanding of the dynamics of wheat subsidies in the region.

Impact of Wheat Subsidy on Food Security

In this study, the definition of food security used is based on the definition provided by the Food and Agriculture Organisation (FAO), which states that food security is achieved when all individuals have consistent access to sufficient, safe, and nutritious food to meet their dietary needs and preferences for a healthy life. Food security has four standard dimensions: (i) availability- having enough food available regularly (ii) access to resources or income to acquire suitable and healthy food; (iii) utilisation- having a reasonable food use based on knowledge of essential nutrition and care; and

(iv) stability of availability, access, and utilisation of food. The production of staple crops measures availability, accessibility is measured by income, utilisation is measured by food and nutrition knowledge, and stability of access and utilisation is measured by a stable supply of staple crops, disaster risk reduction, and environmental sustainability. The first two dimensions are crucial in the context of wheat subsidies' impact on food security because wheat subsidies have reduced the production of staple crops in the study area. Second, a lack of jobs, an absence of industry, and a large amount of non-agricultural land available for producing cash crops result in the area's per capita income being lower compared to the rest of the country. Therefore, the study primarily focuses on the first two dimensions of food security to analyse the impact of the wheat subsidy on it. As food security is a dichotomous variable, the conventional method used to measure it involves a binary response, indicating whether a household is considered food secure (value of 1) or not (value of 0). To model the relationship between food security and other variables, a linear probability model (LPM) can be used. However, LPMs can be problematic due to the heteroscedasticity of the error term and the possibility that the dependent variable may not be restricted to the range of 0 to 1. To overcome these issues, a more suitable method is to model the relationship so that the dependent variable is unobservable. This approach can yield results with more policy implications, as the relationship between the independent and dependent variables can be better understood, and the impact of different policies can be more accurately assessed.

The logistic regression technique is used to model the relationship between a dichotomous dependent variable, such as food security, and a set of independent variables that are believed to influence the outcome. The following model is proposed for estimation using the logistic regression technique.

$$〖FS〗_i = \beta_0 + \beta_1 〖WS〗_i + \beta_i \sum_{(i=0)}^{n} 〖Control〗 + \varepsilon_i$$

Where:

FSi is the household's food security (1= food secured, 0=otherwise)

WSi is the frequency of household utilisation of subsidised wheat. This variable will be measured using a scale of 1-3 (1 being no use of subsidised wheat in the household and 3 being the utilisation of only subsidised wheat).

Black Marketing

To explore the prevalence of black marketing associated with wheat subsidy, we will employ an exploratory approach. The study uses the definitions of 'leakage' or 'pilferage' as defined by Gulati & Saini (2015), which refers to the difference between the amount of wheat supplied by the central government and the actual amount delivered to consumers. Due to data limitations, our study will focus on Gilgit city only, where we will procure data from the food department for the last three years. The subsequent supply to 6 mills and distribution to individual beneficiaries has been studied. Thus, we can exploit the amount supplied by the central government and the amount delivered.

Moreover, a qualitative section has been incorporated into this study, which includes key informant interviews, focused group discussions, and consumer perceptions to investigate the pitfalls of the distribution infrastructure alongside compliance mechanisms. Thus, we have also explored the institution of public distribution and policy analysis.

Questionnaire Development

For the household survey, a detailed questionnaire was developed in collaboration with experts and through literature reviews. The questionnaire has three sections. The first section contains questions on the demographic profile of the households. This includes household demographic and socioeconomic characteristics, livelihoods and income sources, land holdings, and other relevant factors. Specifically, the questionnaire includes modules on household roster, occupation, income, and crop cultivation, including wheat and livestock rearing. The second section includes constructs related to food consumption and wheat subsidies, as well as their implications for dietary requirements. The final section addresses food security.

Food security is a multifaceted and complex concept. Measuring food insecurity has presented an enduring challenge for researchers and practitioners due to its intricate and multifaceted nature (Coates, 2007). There exists no single tool that measures every dimension of food security. Various food and health-oriented institutions and organizations have developed several instruments for capturing the food security indicators including; the Food Consumption Score (FCS) of the World Food Program (WFP); Food Insecurity Experience Scale (FIES) of the Food and Agriculture Organization (FAO); Household Food Security Survey Module (HFSSM) by the United States Department of Agriculture (USDA) and Household Food Insecurity Access Scale (HFIAS) designed by United States Agency for International Development (USAID).

The Household Food Insecurity Access Scale (HFIAS), developed by USAID's Food and Nutrition Technical Assistance (FANTA), has been used to collect data on food insecurity and assess the household's food security status over the past four weeks. The HFIAS scale involves an investigation into the occurrence and frequency of food insecurity in the household over the last four weeks. Nine questions are attributed to the occurrence, followed by nine questions about the frequency of occurrence of food security at an increasing level of severity, to determine the degree of seriousness. The scale is preferred in this study due to its subjective nature and applicability in various cultural settings (Pandey, 2016), as well as in the context of developing countries. The scale is more sensitive to changes in household conditions over time, making it a valid tool for monitoring and evaluating subsidy programs. Moreover, Experience-based measurements are more convenient in dealing with primary data collection and rapid food security assessments (Manikas et al., 2023). The scale is simple but methodologically more convenient in evaluating and monitoring food programs (Coates, 2007).

Focused Group Discussions (FGDs)

For the collection of qualitative data, one FGD in each of the sample districts is conducted, and a total of four FGDs are conducted cumulatively. In each FGD, 10-15 local community members were invited to participate. For discussion, structured questions and pre-planned probes were administered in line with Krueger (2014). The two-way focus group discussion method was used. One group actively discussed the issues while the other observed and raised questions. The typical parts of the FGD included an introduction by the moderator, a welcome to the participants, and a request for them to introduce themselves. This was followed by the opening questions, which were typically straightforward, allowing the participants to feel at ease. The participants were allowed to add topics for discussion if they wanted to.

Key Informant Interviews (KIIs)

This study proposed a total of 20 KIIs- 5 in each district. The key informants were village activists, tribal/traditional leaders or elders, office bearers of government departments, and authorized wheat dealers. For this purpose, open-ended questions were designed for the participants in the following way:

- The importance of wheat subsidies in ensuring food availability in their households.

- The challenges of subsidising wheat distribution mechanisms in their valley.
- The frequency of subsidised wheat distribution and criteria of distribution (including who is getting more subsidised wheat, etc.).
- Challenges to the local agriculture system and its inefficiency in the provision of food to the local people.

Data Analysis and Reporting

This study employed a mixed-methods approach to comprehensively investigate the impacts of the wheat subsidy program on food security in Gilgit-Baltistan. Both quantitative and qualitative data were collected and analysed using appropriate techniques.

Quantitative Analysis

Quantitative data were obtained through a household questionnaire survey administered to a representative sample of households across the study area. The questionnaire captured information on socio-economic characteristics, agricultural practices, food consumption patterns, and perceptions regarding the wheat subsidy program.

The quantitative data analysis was performed using SPSS (Statistical Package for the Social Sciences) software. Descriptive statistics, including frequencies, percentages, means, and standard deviations, were calculated to summarise the sample characteristics and key variables of interest. Furthermore, inferential statistical analyses were conducted to explore relationships and identify significant factors associated with food security outcomes. Specifically, logistic regression models were employed to examine the influence of various socio-economic, demographic, and agricultural factors on household food security status.

Qualitative Analysis

Qualitative data have been collected through focus group discussions (FGDs) and key informant interviews (KIIs) with diverse stakeholders, including community members, local farmers, agriculture officials, and civil society representatives. These methods enabled an in-depth exploration of perceptions, experiences, and challenges associated with the wheat subsidy program and its impact on food security.

The qualitative data, consisting of transcripts from FGDs and KIIs, were analysed using NVivo software, a powerful tool for qualitative data analysis. A thematic analysis approach was adopted, involving the following steps:

- **Data Familiarisation:** Researchers immersed themselves in the data by reading and re-reading the transcripts.
- **Coding:** Relevant segments of the data were assigned codes based on their meaning and content.
- **Theme Development:** Codes were organised into broader themes that captured the overarching patterns and insights emerging from the data.
- **Theme Review and Refinement:** The themes were reviewed, refined, and organised into a coherent thematic structure.
- **Interpretation and Reporting:** The finalised themes were interpreted and synthesised into a narrative that addressed the research objectives.

The qualitative analysis provided rich insights into the lived experiences, perceptions, and challenges faced by various stakeholders regarding the wheat subsidy program and its impacts on food security.

4. FINDINGS

Descriptive Analysis

This section provides a brief discussion of the respondents', household heads', and household profiles in the study area. Details are given as follows.

Respondent Profile

Table 4 presents the demographic characteristics of the respondents, including the total population, male and female population, household size, gender, age, literacy level, marital status, relationship with the household head, and occupation.

Table 4: Respondents' Profile

Respondents Profile	Sample Respondents
No. of households	85
Total population	578
Male population	250
Female population	328
Household size	6.80
Gender (%)	
Male	100
Female	-
Age	
Average age	33.5
Age Group (%)	
18-30	34.0
31-55	66.0
Above 55	-
Literacy Level (%)	
Not literate	5.0
Primary	19.5
Middle	12.5
Secondary	27.5
Higher secondary	17.5
Graduation	9.5
Masters	3.5
Others	-
Material Status (%)	
Never married	8.5
Married	91.5
Divorced/separated	-
Widowed	-
Relationship with HH Head (%)	
Self	76.5
Son	21.0
Brothers	2.5
Occupation	
Own-farming	32.3
Off-farm skilled labor	33.5
Off-farm unskilled labor	15.6
Govt. job	-
Private job	4.2
Business	14.4
Other work	-
Unemployed	-
Old/disable	-
N = 424	
Treatment = 212	
Control = 212	

Source: Author's illustrations from survey data.

The total number of respondents is 85, with a 100 per cent response rate. The survey results indicate a relatively middle-aged population of respondents in both the control and treatment groups. In our study, all the respondents are male. The average age for the sample respondents is 33.5. For the overall sample, 34 per cent of the respondents were in the 18-30 age range, and 66 per cent of the respondents were aged between 31 and 55 years. The maximum age of any respondent in the sample is 55 years. The marital status of the respondents showed that 8.5 per cent were never married, while 91.5 per cent are married. No respondents are divorced or widowed. The literacy data presented in Table 4 show that 5.0 per cent of respondents are illiterate. Among the literate respondents, 19.5 per cent have completed the primary of education (up to grade 5), 12.5 per cent of the respondents attended the middle level (up to 8th grade), 27.5 percent of the respondents completed matric level (10th grade) 17.5 percent completed higher secondary (12th grade), 9.5 percent completed graduation (14 years of education). The rest of them, i.e., 3.5 per cent of the respondents, have completed a master's level of education (16 years of education). The demographic structure of 85 households revealed 578 household members, comprising 250 males and 328 females. The mean household size for the sample is 6.80 members. Off-farm skilled labour is the major profession for the treatment respondents, as 33.5 per cent were associated with this profession, followed by off-farm unskilled labour, 15.6 per cent, and business, 14.4 per cent, respectively.

Profile of Household Head

Information regarding the household profile is presented in Table 5 below:

Table 5: Profile of Household Head

Profile of the household Head	Sample Households
Male	100.0
Female	-
Age (%)	
Average age	34.43
Percentage age group:	
18-30	33.0
31-55	67.0
Above 55	-
Literacy Level (%)	
Not literate	11.3
Primary	25
Middle	17.9
Secondary	16

Profile of the household Head	Sample Households
Literacy Level (%)	
Higher secondary	22.2
Graduation	4.7
Masters	2.8
Others	-
Material Status (%)	
Never married	-
Married	99.1
Divorced/separated	-
Widowed	0.9

Source: Author's illustrations from survey data.

The average age of household heads in the overall sample was 34.43 years. Almost all household heads are in the working-age bracket. Most of the household heads are literate and have some level of education; only 11.4 per cent are illiterate. The highest percentage of literate household heads (25 per cent) for the overall sample have attained a primary level of education, followed by 22.2 percent with a higher secondary, 17.9 per cent have middle level (up to 8th grade), 16 percent have secondary level education (up to 10th grade), 4.7 percent are graduates (14 years of schooling) and 2.8 percent have attained an education level up to master's. Almost all household heads (99.1 per cent were married. Few household heads, 0.9 per cent in the treatment group, are in the widowed category of marital status.

5. DEMOGRAPHIC COMPOSITION OF HOUSEHOLDS IN THE STUDY AREA

In this sub-section of the household profile, the distribution of household population segregated by gender and age status for the overall sample households has been presented. Details are given in Table 6 as follows.

Table 6: Demographic Composition of Households

Households Demography (%)	Sample Households
Total households (no.)	85
Total population (no.)	578
Male population (no.)	250
Female population (no.)	328
Up to 1 years (F) (%)	2.43
Up to 1 years (M)	1.88

Households Demography (%)	Sample Households
Over 1-5 years (F)	5.00
Over 1- 5 years (M)	5.56
Over 5-10 years (F)	6.46
Over 5-10 years (M)	6.04
Over 10-18 years (F)	12.15
Over 10-18 years (M)	12.64
Over 18-24 years (F)	4.51
Over 18-24 years (M)	4.31
Over 24-55 years (F)	15.90
Over 24-55 years (M)	16.88
Over 55-65 years (F)	1.88
Over 55-65 years (M)	2.36
Over 65 years (F)	1.11
Over 65 years (M)	0.90
Adult population	47.85
Adult male population	24.45
Adult female population	23.4
Total working age population (over 10 years)	72.64
Working age population (over 10-18 years)	24.79
Working age population (over 18-55 years)	41.6
Working age population (over 55 years)	6.25
Dependency ratio (up to 10 & over 55 years)	0.46
Dependency ratio (up to 10 years)	0.37
Dependency ratio (over 55 years)	0.08
Gender ratio	1.02
Female to male ratio	0.98

Source: Author's illustrations from survey data.

The survey consisted of 85 households in the study area. According to the survey results reported in Table 6, the total population consisted of 578 persons, comprising 250 males and 328 females. The segregation of the population, based on gender and age status, showed that the average female child population (up to one year of age) consisted of 2.43 per cent of the female child population. Similarly, the average male child population in this age category was 1.88 per cent. The average female children population (over 1-5 years) for the sample was 5.00 per cent, while the average male children population under this age bracket was 5.56 per cent. The average female population of children (over 5-10 years) was 6.46 per cent. Likewise, the average male child population in this age group was 6.04 per cent.

Table 6 also showed an adult population of the sample households disaggregated by gender. In this survey, the total adult population (over 18 years of age) was 47.85 per cent. It has been observed that the percentage of the male adult population in the sample households was 24.45 percent. In comparison, 23.4 per cent of the adult population in this group of households consisted of females. The working-age population (over 10 years) has been divided into three sub-age categories: 10-18 years, 18-55 years, and 55 years and above. Typically, the age interval of 15-64 years has been used as the standard age range for the working-age population; however, in rural areas of Gilgit-Baltistan, Pakistan, people between 10 and 15 years and those above 64 years of age are also actively engaged in agriculture and other income-generating activities: agriculture and other income-generating activities. Therefore, to analyse household socioeconomic status in the study area of Gilgit-Baltistan, Pakistan, this study used a population of over 10 years as a threshold to represent the working-age population. Various impact evaluation studies in Pakistan (e.g., Khan and Saddi, 2008; Leary et al., 2011) have also used the same threshold to represent the working-age population. An overwhelming majority, i.e., 72.64 per cent of the overall sample population, fell into the working age population in the study area. Out of this working-age population, 24.79 per cent belong to the 10-18 age group, 41.6 per cent fall within the 18-55 age bracket, and 6.25 per cent belong to the 55+ age group. The data for the active working-age population, presented in Table 6, revealed that an overwhelming majority (41.6%) of the population fell within the active working-age population bracket in the study area.

The average dependency ratio (for populations aged 10 and over 55 years) for the overall sample was 0.46. Similarly, dependency ratios in both sub-age categories were as follows: the dependency ratio (up to 10 years) was 0.37, and the dependency ratio (over 55 years) was 0.08 for the sample households in the study area. The female-to-male ratio was 0.98, while the gender ratio was 1.02 in the study area.

Household Income

Income can generally be defined as earnings from productive activities and current transfers. Income permits people to obtain goods and services. Table 7 presents the survey results on household income, distribution, and sources.

Table 7: Household Income

Household Income	Sample Households
Average Annual household income	4,991,696
Average Monthly household income	415,975
Annual per-capita income	8,636
Monthly per-capita income	720
Contribution by different sectors (%)	
Crops	21.67
Livestock	12.11
Business	21.94
Labor	34.19
Services	2
Pension	1.61
Rental income	0.49
Remittances	1.94
Cash/gifts	0.44
Others	3.6

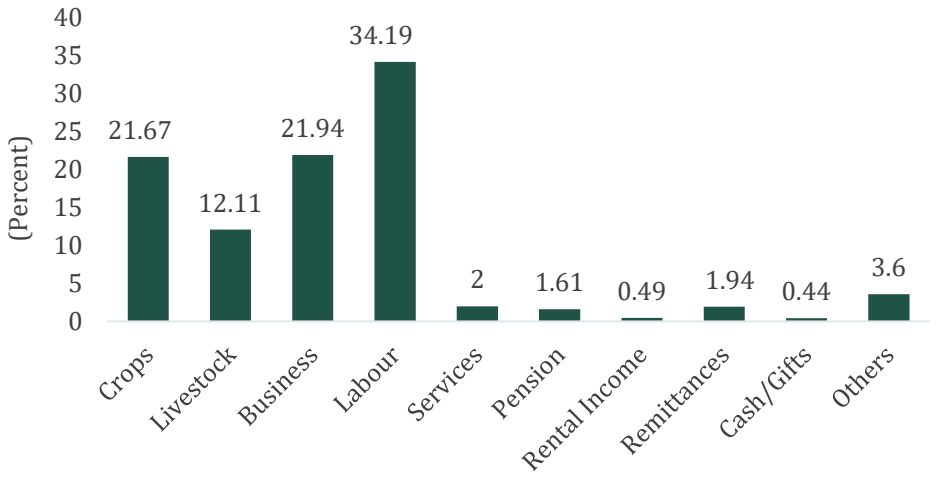
Source: Author's illustrations from survey data.

The average annual and monthly household incomes of the 85 sample households were PKR 4991695.84 and PKR 415974.58, respectively. Similarly, annual and monthly per-capita incomes were PKR 8636.15 and PKR 719.67.

Major Sources of Household Income in the Study Area

The results in Figure 1, presented below, indicate that labour is the primary source of household income (34.19%), followed by business (21.94%) and crops (21.67%), respectively. Other sources of household income included livestock (12.11 per cent), services (2.00 per cent), pensions (1.61 per cent), rental income (0.49 per cent), remittances (1.94 per cent), cash gifts (0.44 per cent), and others.

Figure. 1: Major Sources of Household Income in the Study Area



Source: Graphic derived from survey data by the author.

Household Expenditures

Household expenditures refer to the total amount spent by households to meet their everyday needs, including food, clothing, housing (rent), energy, transportation, health costs, leisure activities, and miscellaneous services.

Table 8: Household Expenditures

Household Expenditures	Sample Household Expenditures
Average annual household expenditures	4,754,701
Average monthly household expenditures	396,225
Annual per-capita expenditures	8,226
Monthly per-capita expenditures	686
Expenditures on Different Sectors (%)	
Food	39.19
Clothing	11.81
Housing	14.51
Health Care	7.95
Education	14.39
Social Functions	1.54
Transport	2.53
Remittances	1.57
Cash/Gifts	0.6
Fuel	4.47
Others	1.43

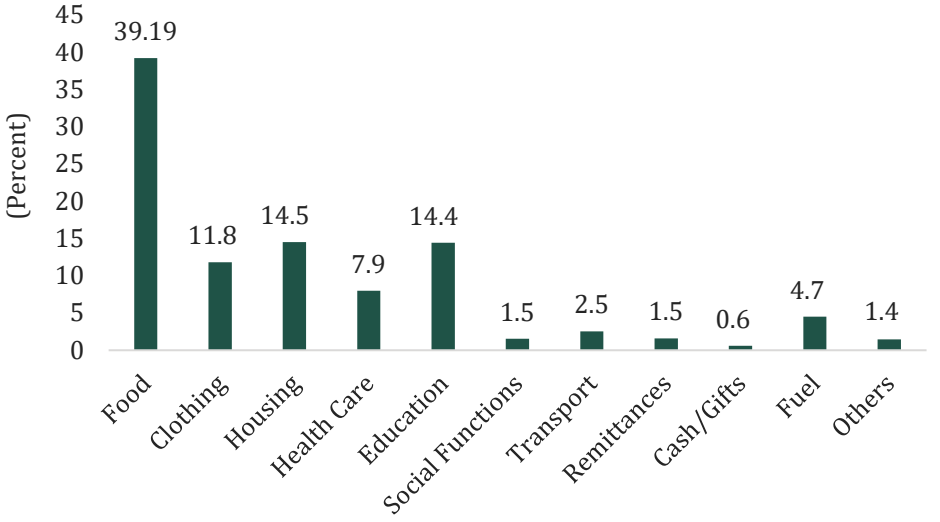
Source: Author's illustrations from survey data.

Results reported in Table 8 show that the average annual household expenditures, average monthly household expenditures, annual per-capita expenditures, and monthly per-capita expenditures for the sample households in the study area were PKR 475,470.55, PKR 396,225.00, PKR 8,226.12, and PKR 685.51, respectively.

Expenditure Patterns of Households

Figure 2 depicts the expenditure pattern of treatment and control group households in the study area. The expenditures pattern of households in the study area shows that (39.19 percent) of expenditures are on food consumption, (14.51 per cent) on housing, (14.39 per cent) on education, (11.88 per cent) on clothing, (7.95 per cent) on health care, (4.47 per cent) on fuel, (2.53 per cent) on transport and remaining on other purposes.

Figure 2: Expenditure Pattern of Households in the Study Area



Source: Derived from survey data by author.

6. DESCRIPTIVE STATISTICS FOR THE ENTIRE SAMPLE

Table 9: Summary of Key Variables

Variable	Summary
Age	Average respondent age: 33.5 years. Majority (66%) are 31–55 years old.
Region (District)	Sampled from 4 districts: Ghizer (54%), Gilgit (10%), Nagar (13%), Shigar (22%).
Household Type	Mostly extended/joint households. Household sizes: 4–9 members (dominant).
Marital Status	91.5% of respondents are married; 8.5% never married.
Education	5% illiterate; rest distributed from primary (19.5%) to masters (3.5%). Largest group: secondary education (27.5%).
Family Size	Average household size: 6.8 members.
Income	Average monthly household income: PKR 415,975. Majority earn from labor (34%) and business (22%). 35.9% have no personal income.
Dependency Ratio	Overall dependency ratio: 0.46.
Expenditures	Average monthly expenditures: PKR 396,225. Food accounts for ~39% of expenses.
Land Size	(Specific numbers not extracted. Wheat farming noted on terraced land.)
Agriculture Production	Main crops: wheat cultivation (subsistence level). Agriculture + livestock contribute ~34% to household income.
Wheat Subsidy	Wheat subsidies are heavily utilized but poorly targeted. Universal approach criticized.
Food Security	Despite subsidies, over 50% of households continue to face food insecurity. Dependency on external wheat and nutrient deficiencies were observed.

Source: Authors' compilations.

7. SOCIO-ECONOMIC PROFILE OF SURVEYED HOUSEHOLDS

This section analyses the gender-wise distribution of key socio-economic variables, namely district affiliation, household size, household income, and employment status.

Table 10: Socio-Economic Profile of Surveyed Households

Variable	Male - Gender Frequency	Male - Gender Percentage	Female - Gender Frequency	Female - Gender Percentage
District				
Ghizer	249	54.01	26	49.06
Gilgit	48	10.41	12	22.64
Nagar	61	13.23	7	13.21
Shigar	103	22.34	8	15.09
Total	**461**	**100.00**	**53**	**100.00**
HH Size				
1–3 members	17	3.67	2	3.77
4–6 members	174	37.58	23	43.40
7–9 members	151	32.61	18	33.96
10–12 members	62	13.39	6	11.32
13+ members	59	12.74	4	7.55
Total	**463**	**100.00**	**53**	**100.00**
Income				
No income	166	35.85	13	24.53
PKR 1–25,000	47	10.15	6	11.32
PKR 25,001–50,000	74	15.98	11	20.75
PKR 50,001–75,000	38	8.21	6	11.32
PKR 75,001–100,000	30	6.48	6	11.32
PKR 100,001–150,000	35	7.56	4	7.55
PKR 150,001–200,000	29	6.26	3	5.66
PKR 200,001+	44	9.50	4	7.55
Total	**463**	**100.0**	**53**	**100.0**
Work Status of HH Member				
Business	45	9.78	3	5.66
Farming	223	48.48	19	35.85
Government Service	96	20.87	9	16.98
Labor Work	22	4.78	6	11.32
Pension	17	3.70	2	3.77
Private job	38	8.26	12	22.64
Student (Not Working)	11	2.39	2	3.77
Unemployed	4	0.87	0	0.00
Others	4	0.87	0	0.00
Total	**460**	**100.00**	**53**	**100.00**

Source: Authors' compilations.

Gender Distribution by District: Table 10 presents the distribution of male and female respondents across districts. Most male respondents are from Ghizer (54.01%). The smallest number is from Gilgit (10.41%). Similarly, female respondents also primarily originated from Ghizer (49.06%), with smallest number from Nagar (13.21%). This indicates that Ghizer district had the largest overall representation in the sample for both genders, reflecting its agricultural prominence and larger rural household structures in the region.

Gender Distribution by Household Size: Table 10 shows the household size distribution, categorized separately for male- and female-headed households: Among male-headed households, the majority (37.58%) lived in households with 4 –6 members, followed by 32.61% in 7–9 member households. A similar trend was observed for female-headed households: This distribution suggests that medium to large household sizes are typical for male- and female-headed households, consistent with traditional family structures in Gilgit-Baltistan.

Gender Distribution by Household Income: A significant proportion of male-headed households (35.85%) have no income, while 24.53% of female-headed households fell into the same category. In both groups, households with an income below PKR 50,000 per month are predominant. Higher-income brackets (PKR 100,001+) represented a smaller fraction of both male and female households, indicating a generally low-income environment across the surveyed population. This income distribution highlights economic vulnerability across both genders, though female-headed households had slightly better representation in some middle-income categories.

Gender Distribution by Work Status: Farming dominates the employment landscape for both male (48.48%) and female (35.85%) households, reaffirming the agrarian nature of the regional economy. Government service was the second-largest occupation among male respondents (20.87%), while among females, private jobs (22.64%) were slightly more prevalent than government jobs (16.98%). Very few respondents are unemployed, indicating that most households have at least one working member, though the type of job and income levels vary. These results suggest a heavy reliance on traditional agricultural livelihoods and public sector employment, with relatively limited participation in private sector or entrepreneurial activities.

Ghizer district is the core hub of the survey population, with significant representation from both genders. Medium-to-large household sizes dominate, underscoring extended family living arrangements common to the region. Economic conditions are fragile for both genders, with a substantial

number reporting no income or very low income. Employment remains primarily agriculture-based, underscoring the importance of agriculture-driven development policies in improving household welfare.

Land Allocation Across Crops Among Surveyed Households

Table 11 presents the percentage of agricultural land allocated to different crops by the surveyed households. The distribution reflects the dietary needs and the agro-climatic realities of the Gilgit-Baltistan region.

Table 11: Land Allocation across Crops among Surveyed Households

	% share
Wheat	19.9
Maize	15.0
Barley	6.1
Potatoes	9.8
Buck Wheat	9.9
Millet	8.0
Pulses	3.6
Vegetables	4.4
Fodder	12.2
Others	11.1
Total	100

Source: Authors' compilations.

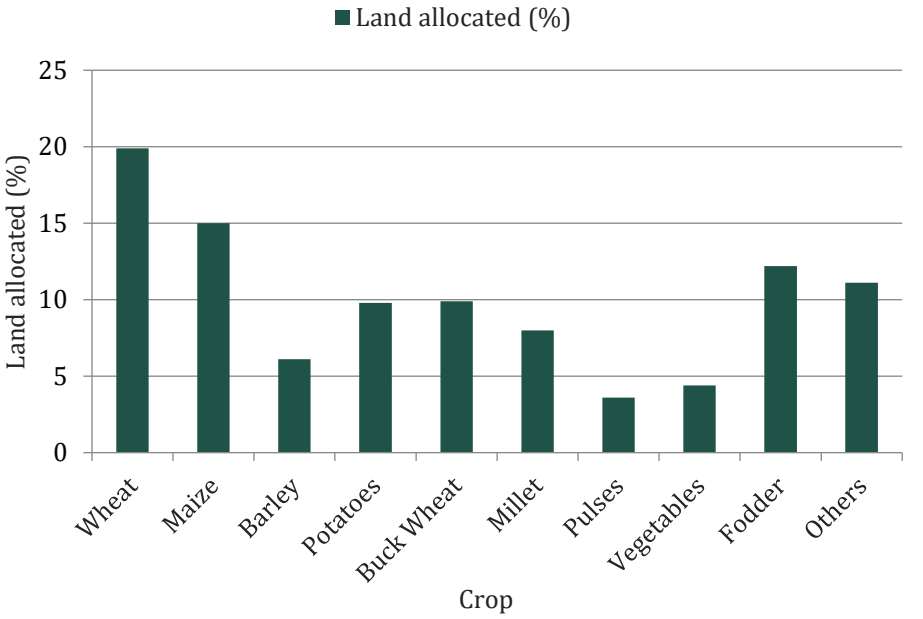
Key Observations on Land Allocation:

Wheat occupies almost one-fifth (19.9%) of the cultivated land. This is expected, as wheat remains the primary staple food for most households in Gilgit-Baltistan. Maize is the second-most cultivated crop, covering 15% of the land. It serves as both a food crop and fodder, reflecting its dual role in household sustenance and livestock support. These high-altitude crops occupy a significant share of land. Potatoes are a key cash crop in the region, while buckwheat is adapted to marginal soils and shorter growing seasons. A substantial portion of land (12.2%) is allocated to fodder crops, highlighting the importance of livestock as a livelihood source. Fodder cultivation ensures food security for animals during harsh winters. The traditional cereals like Barley (6.1%) and Millet (8.0%) are also important, particularly for communities residing at higher altitudes where wheat and maize cultivation may be less feasible. Only a tiny fraction of land is dedicated to vegetables (4.4%) and pulses (3.6%), indicating limited dietary diversity from homegrown produce. This suggests a potential area for agricultural development and nutritional improvement initiatives. A significant share of

land is classified under "others (11.1%)" possibly including orchard crops (apples, apricots) and small-scale horticulture, which are common in the region but not individually detailed in this table.

The land allocation pattern suggests that farming households prioritise staple food security (wheat and maize) and livestock sustenance (fodder), with limited diversification into vegetables and pulses. This cropping pattern reflects the risk-averse behaviour of rural households operating in harsh climatic conditions. In summary, while prioritising staple security agricultural interventions, in future, could focus on improving nutritional outcomes and household income through targeted crop diversification strategies.

Figure 3: Land Allocation across Crops among Surveyed Households



Source: Authors' compilations.

Reasons for Not Growing Wheat Among Surveyed Households

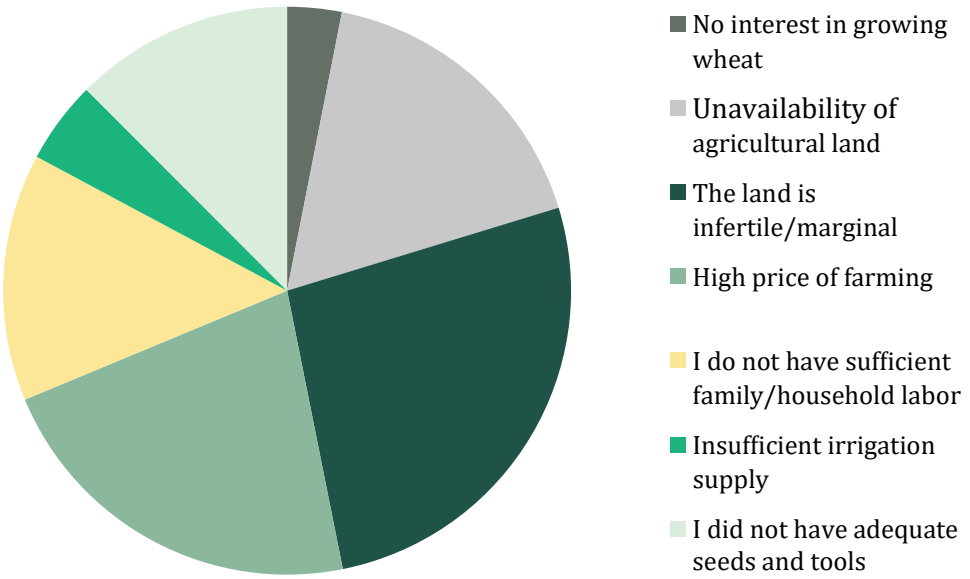
Figure 3 presents a pie chart illustrating the various constraints reported by households for not engaging in wheat cultivation. The figure offers valuable insights into structural and economic barriers affecting wheat production in Gilgit-Baltistan.

Land Infertility/Marginality (26.6%): The most common reason cited by respondents is the poor quality of available land. Over one-quarter of households (26.6%) reported that their land was infertile or marginal, making

it unsuitable for wheat cultivation. This highlights the environmental challenges faced by many rural farmers in the region. The second major constraint (21.9%) is the high cost associated with farming. Inputs such as fertilisers, seeds, and labour have become increasingly expensive, making wheat cultivation financially unviable.

A significant proportion of respondents (17.2%) indicated that they lack access to cultivable land. This underscores a significant structural barrier to agricultural participation, particularly for landless or marginal households. About 14.1% of households report insufficient family members or household labour to manage wheat cultivation effectively. Given the labour-intensive nature of wheat farming, this is a critical constraint, especially in areas where youth out-migration is common. Approximately 12.5% of respondents mentioned the unavailability of necessary agricultural inputs, particularly seeds and farming tools, as a significant hindrance to wheat production. A smaller but significant group (4.7%) reported that insufficient water supply restricted their ability to cultivate wheat. Only a tiny proportion (3.1%) of households cited lack of interest as a reason for not growing wheat, suggesting that the barriers to production are predominantly structural or economic rather than preference based.

Figure 4: Reasons for Not Growing Wheat among Surveyed Households



Source: Authors' compilations.

Average Household Income by District and Employment Category

This section analyses the average household income by primary employment category across the four surveyed districts: Ghizer, Gilgit, Nagar, and Shigar.

Table 12: Average Income by District by Employment Category

Name of District	Business	Farming	Government	Labor Worker	Other	Pension	Private Job	Student	Unemployed	Total
Ghizer	132,706	87,989	124,147	24,889	50,000	36,105	92,964	29,167	0	91,444
Gilgit	135,000	61,389	127,400	20,000	...	8,000	137,625	0	...	81,813
Nagar	86,000	130,210	364,167	...	40,000	.	80,000	...	...	147,400
Shigar	0	0	0	...	0	...	0	0	0	0
Total	115,064	73,934	107,276	24,714	22,500	34,700	77,280	13,462	0	78,127

Source: Authors' compilations.

Table 12 shows significant variations in average household incomes across different districts and employment categories, which reflect underlying disparities in economic opportunities, occupational structures, and local resource endowments. In Ghizer, households exhibit a diverse income profile, with those engaged in business activities reporting an average monthly income of PKR 132,705.88, surpassing that of farmers and public sector employees. Government employees earned an average of PKR 124,147.06, indicating that public sector employment remains a strong source of stable income. Farming households reported an average income of PKR 87,989.01, indicating challenges related to agricultural profitability in Ghizer. Incomes derived from labour work were notably lower, at PKR 24,888.89, highlighting the vulnerability of households dependent on manual labour. The overall average household income for Ghizer was PKR 91,443.64.

In Gilgit, slightly different income dynamics are observed: households relying on private employment reported the highest average income, at PKR 137,625 marginally outpacing those of government employees and business proprietors. The incomes from business and government employment were also substantial, averaging PKR 135,000 and PKR 127,400, respectively. Once again, farming yielded lower incomes (PKR 61,389), reinforcing that non-agricultural employment is financially more rewarding in Gilgit. The overall average household income in Gilgit was PKR 81,813.

The Nagar District presents an exceptional trend: government employees achieved remarkably high incomes of PKR 364,167, significantly exceeding those in other districts. This suggests that some households may have access to high-paying government roles or senior civil service positions. Similarly, farming in Nagar provided relatively higher incomes (PKR 130,210) than in Ghizer and Gilgit. Incomes from business and private sector employment were moderate, with business-related households averaging PKR 86,000 and private sector jobs yielding PKR 80,000. The average total household income for Nagar was PKR 147,400, making it the highest among all surveyed districts.

Shigar recorded no reported income across any employment category. Government employment is the most stable and financially rewarding option across most districts, particularly in Nagar. Private employment and business activities also yield relatively high incomes, particularly in Gilgit and Ghizer. Farming and labour work consistently report lower average incomes across all districts, underscoring the precarious nature of agricultural livelihoods, which may not be sustainable without substantial modernization or improved market access. The average household income across all surveyed regions was PKR 78,127, reflecting modest living standards and a potential vulnerability to income shocks.

Farmland Characteristics in the Surveyed Households

Table 13: Land Size Category by District

District	Large (>15 Kanal)	Medium (6-15 Kanal)	No Land	Small (1-5 Kanal)
Ghizer	33	52	55	136
Gilgit	6	16	9	29
Nagar	4	22	7	36
Shigar	14	19	18	61

Source: Authors' compilations.

The cross-tabulation of land size categories by district reveals notable differences in land ownership patterns across the sampled regions. In Ghizer, most households fall into the 'Small' (1–5 Kanal) category, with 136 households, followed by 55 households with no land. Ghizer also has the highest number of households with large landholdings (>15 Kanals), reflecting a more diverse distribution of farm sizes. In contrast, Gilgit, Nagar, and Shigar have fewer large landowners and a concentration of households with either small or medium-sized farms. For instance, in Nagar, 22 households possess medium-sized farms (6–15 Kanals), and 36 have small farms, suggesting a more evenly distributed medium-sized holdings.

Across all districts, the 'Small' landholding category is the most common, underscoring the region's dominance of small-scale subsistence farming. The relatively high number of landless households, especially in Ghizer and Shigar, signals potential vulnerability, as land ownership is often a key determinant of food security and economic resilience. The presence of large landowners is mainly limited to Ghizer and Shigar, indicating localised advantages in agricultural potential. This uneven land distribution points to broader structural issues that likely influence household food security outcomes across the region.

8. CALCULATING FOOD CONSUMPTION SCORE (FCS) FOR GILGIT-BALTISTAN

The Food Consumption Score (FCS) is a composite indicator developed by the World Food Programme (WFP) to measure household food security. It combines three essential elements of food access: dietary diversity (the number of food groups consumed), food frequency (the number of days each food group is consumed in a week), and the relative nutritional importance of each food group. Households are assessed based on their consumption over the previous seven days across eight standard food groups: main staples, pulses, vegetables, fruits, meat and fish, milk and dairy, sugar, and oils and fats. Each group is assigned a weight reflecting its nutritional value, and the weighted consumption frequencies are summed to produce the household's final FCS. Higher FCS values generally indicate better food security and nutritional intake.

Households are classified based on their FCS into three standard categories: "Poor" (0–21), "Borderline" (21.5–35), and "Acceptable" (>35). This classification helps identify the severity of food insecurity in a population. The FCS offers a rapid, reliable, and internationally comparable method to assess food security, making it a vital tool for humanitarian programming, monitoring, and targeting food assistance interventions. Additionally, visual tools such as histograms, bar charts, and pie charts are often used to present FCS distributions. At the same time, spatial maps can reveal geographic disparities in food security across regions or districts.

What is the Food Consumption Score (FCS)?

The FCS is a composite score based on:

1. Dietary diversity
2. Food Frequency
3. Nutritional importance of different food groups

It is developed by the WFP to assess food security at the household level.

Step-by-Step Calculation of FCS

1. Group food items into eight standard food groups:

Table 14: FCS by Food Group

Food Group	Example Items	Weight
1. Main staples	Cereals, tubers	2
2. Pulses	Beans, lentils, peas	3
3. Vegetables	Spinach, tomatoes, carrots	1
4. Fruits	Mangoes, bananas	1
5. Meat and fish	Beef, poultry, fish, eggs	4
6. Milk and dairy	Milk, yogurt, cheese	4
7. Sugar	Sugar, honey, sweets	0.5
8. Oils and fats	Oil, butter, ghee	0.5

Source: Authors' compilations.

2. For each group, calculate the number of days (0–7) the HH consumed an item from that group in the past 7 days (not 4 weeks for this method).
    - Cap any value at 7 days (i.e., no food group should exceed 7 even if multiple items were eaten).
3. Multiply the frequency by the food group's weight.
4. Sum all weighted values to get the FCS.

Classification of FCS (WFP Standard)

Table 15: FCS Classification

FCS Range	Food Security Classification
0 – 21	Poor
21.5 – 35	Borderline
>35	Acceptable

Source: Authors' compilations.

District-Level Food Consumption Score (FCS) Analysis

The Food Consumption Scores (FCS) analysis across the districts of Gilgit-Baltistan reveals a concerning pattern of widespread food insecurity. Based on the standardised WFP classification, all central districts exhibit FCS values well below the acceptable threshold (>35), signalling significant gaps in dietary diversity, food frequency, and nutritional intake.

Among the districts, Shiger presents the most alarming situation, with an average FCS of only 3.96, indicating impoverished food access and a reliance on a highly monotonous diet. Ghizer and Gilgit follow closely, each with average FCS scores of 5.79 and 5.62, respectively, reinforcing the severity of the food security crisis even in relatively more populous centres.

While FCS of Nagar (9.70) and Yasin (10.60) demonstrate a slightly better situation, their scores still firmly place them in the 'Poor' food security classification, suggesting persistent vulnerability. These results highlight that even within districts with relatively higher agricultural potential or external support, structural challenges such as limited landholding, geographic isolation, and market inaccessibility continue to constrain household food consumption patterns.

The findings underscore the urgent need for targeted food security interventions to improve dietary diversity through agricultural diversification, enhance market access, and strengthen social safety nets, particularly in the most severely affected districts like Shiger, Ghizer, and Gilgit.

Average Food Consumption Score (FCS) by District

Table 16: FCS Score

District	FCS
Ghizer	5.79
Gilgit	5.62
Nagar	9.7
Shiger	3.96
Yasin	10.6

Source: Authors' compilations.

- Shiger shows the lowest FCS (~3.96) → extreme food insecurity.
- Ghizer and Gilgit are also highly food insecure.
- Yasin is relatively better (~10.6) but still below "Acceptable level"
- Nagar is slightly higher (~9.7) but still concerning.

9. CONSTRUCTION AND RESULTS OF THE FOOD INSECURITY INDEX (FII)

Using variables different from the FCS, a Food Insecurity Index (FII) was constructed to assess household food security more comprehensively, based on key variables reflecting dietary access, economic capability, and agricultural resource ownership. The variables included wheat flour consumption (in kilograms), household income, land ownership (in owned kanals), food expenditure, and access to subsidised flour, both in terms of sufficiency and affordability. All continuous variables were normalised to a 0–1 scale using min-max normalisation, and binary Yes/No responses for subsidised flour access were converted to 1/0, respectively. The FII was then computed as a simple unweighted additive index by summing the normalised scores across all dimensions, ensuring each factor contributed equally to the final score.

Households were subsequently classified into three categories based on tertile distribution of the FII scores: "Severely Food Insecure," "Moderately Food Insecure," and "Food Secure." Lower index scores indicated higher vulnerability, while higher scores reflected better food security conditions. The results show that a significant portion of the surveyed population falls into the severe and moderately food-insecure categories, highlighting persistent vulnerabilities in dietary access, agricultural capacity, and economic means. These findings emphasise the need for integrated food security interventions that address food availability, income generation, and land access among rural households.

Methodology for Food Insecurity Index (FII) Construction

The Food Insecurity Index (FII) used six key variables that capture household food consumption, access to subsidised food support, economic status, and agricultural resource ownership. The selected variables were:

- Wheat flour consumption (in Kilograms) is a proxy for food availability.
- Sufficiency of Subsidized Flour — whether subsidized flour meets household dietary needs (Yes/No).
- Affordability of Subsidized Flour — whether subsidized flour is affordable (Yes/No).

- Total Household Income (PKR) — economic capacity for food access.
- Land Ownership (Kanal) — agricultural capability for food production.
- Food Expenditure (PKR) — economic pressure towards food expenses.

The selected variables have been normalised using min-max scaling to bring all values within a 0–1 range. For binary variables (Yes/No), responses were recoded as 1 for 'Yes' and 0 for 'No'. Missing or invalid entries were treated as 0, assuming a higher food insecurity for non-responses. The Food Insecurity Index was calculated as the simple unweighted sum of the normalised variables for each household. Higher FII scores represent greater food security, while lower scores indicate increased vulnerability. Households were categorised into three food security categories based on tertile cutoffs of the Food Insecurity Index distribution:

- Severely Food Insecure (lowest third),
- Moderately Food Insecure (middle third),
- Food Secure (highest third)

Categorisation of FII

Table 17: FII Categories

Category	Definition
Secure	Score = 0
Moderate Insecure	Score 1–2
Severe Insecure	Score ≥ 3

Source: Authors' compilations.

The categorisation of the Food Insecurity Index (FII) provides the essential framework for understanding household food security status in this study. Households are classified into three distinct categories based on their FII scores: Secure (Score = 0), Moderate Insecure (Score 1–2), and Severe Insecure (Score ≥3). This categorisation reflects the varying degrees of vulnerability experienced by households. Those in the Secure category experience no food insecurity events, while families in the Secure category face occasional limitations in accessing sufficient food. In contrast, severely insecure households experience frequent and severe disruptions in food access. The sharp boundaries between these categories enable a more nuanced analysis of the spread and depth across the surveyed regions.

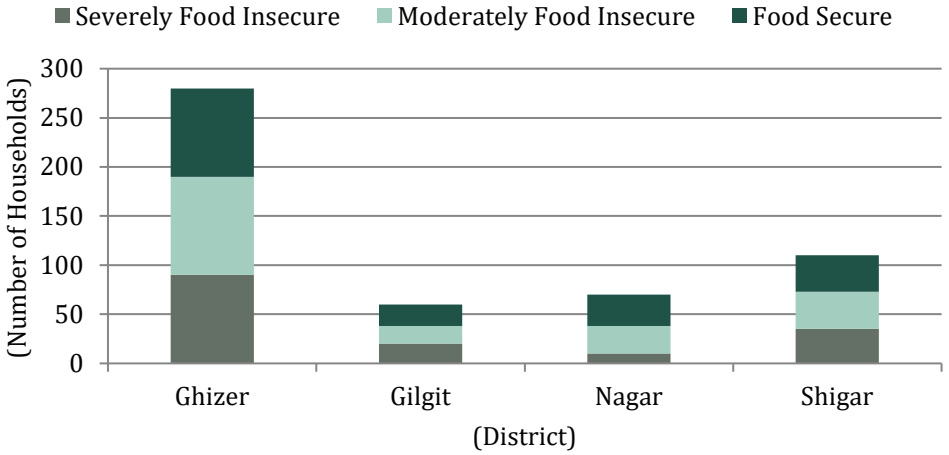
Table 18: FII for Households

District	Severely Food Insecure	Moderately Food Insecure	Food Secure
Ghizer	88	99	89
Gilgit	24	16	20
Nagar	9	29	31
Shigar	34	37	41

Source: Authors' compilations.

When analysing the district-level distribution of food insecurity, it becomes evident that significant geographic disparities exist. Table 18 shows that Ghizer has the highest number of severely food-insecure households (88), alongside a considerable number of moderately food-insecure households (99) and food-secure households (89). This suggests that Ghizer, despite some resilience, faces a broad and severe food insecurity challenge. Gilgit presents a troubling balance: while there are 20 food-secure households, there are also 24 severely insecure ones, indicating persistent vulnerabilities. In contrast, Nagar displays a more favourable distribution, with 31 food-secure households compared to only 9 severely insecure ones. This highlights Nagar as relatively better positioned in terms of food security among the four districts. Shigar, with 34 severely insecure households and 41 food secure ones, occupies an intermediate position, showing both significant vulnerability and partial resilience. The district comparison reveals that location-specific factors, such as agricultural productivity, market access, and livelihood diversity, likely play a crucial role in determining food security outcomes.

Figure 5: Food Security across Districts



Source: Authors' compilations.

Table 19: Wheat Subsidy Vs FII

Wheat Subsidy	Moderate Insecure	Secure	Severe Insecure
No	18.07	44.57	37.34
Yes	18.16	40.91	40.91

Source: Authors' compilations.

Turning to the analysis of wheat subsidy access and its relationship to food insecurity (Table 19), the findings challenge the assumption that receiving a subsidy necessarily improves household food security. Among households that do not receive wheat subsidies, 44.57% are food-secure, compared to 40.91% among those receiving subsidies. Moreover, severe food insecurity affects a higher proportion of subsidy recipients (40.91%) than non-recipients (37.34%). The proportion of moderately insecure households remains virtually identical in both groups (around 18%). These figures suggest that the mere provision of subsidised wheat does not guarantee improvements in food security. The slightly higher severe food insecurity among subsidy recipients raises concerns about the targeting and effectiveness of the subsidy program. It may be that subsidies are directed toward already vulnerable households, thus reflecting rather than reversing their precarious status. Alternatively, it suggests that wheat subsidies alone are insufficient to address the complex, multidimensional causes of food insecurity, which likely include low incomes, inadequate market access, and declining agricultural productivity.

A comparative overview of the district-level distribution and wheat subsidy outcomes leads to an important conclusion. Food insecurity appears to be more strongly influenced by regional and structural factors than by access to wheat subsidies alone. Despite similar subsidy environments, districts such as Nagar demonstrate better food security outcomes, suggesting that local economic and social conditions play a significant role. Moreover, the limited impact of the subsidy program underscores the need for complementary interventions. Food security cannot be achieved solely through subsidising a single commodity; instead, a holistic approach encompassing income generation opportunities, diversification of food production, social protection measures, and nutritional education is crucial. Without addressing these broader determinants, wheat subsidies may act only as a temporary and partial buffer, rather than a sustainable solution to chronic food insecurity.

Household Type, Wheat Subsidy, and Food Insecurity

The following analysis examines the relationship between household structure, receipt of wheat subsidies, and food insecurity outcomes among surveyed households. Data are categorized by Household Type (Joint Family or Nuclear Family), Wheat Subsidy receipt (Yes or No), and Food Insecurity Category (Secure, Moderate Insecure, Severe Insecure).

Table 20: Cross-Tabulation: Household Type × Wheat Subsidy × FII Category

Household Type	Wheat Subsidy	FII Category	Percentage (%)
Joint Family	No	Moderate Insecure	25.00
Joint Family	No	Secure	53.57
Joint Family	No	Severe Insecure	21.43
Joint Family	Yes	Moderate Insecure	17.47
Joint Family	Yes	Secure	42.17
Joint Family	Yes	Severe Insecure	40.36
Nuclear Family	No	Moderate Insecure	14.55
Nuclear Family	No	Secure	40.00
Nuclear Family	No	Severe Insecure	45.45
Nuclear Family	Yes	Moderate Insecure	18.73
Nuclear Family	Yes	Secure	40.07
Nuclear Family	Yes	Severe Insecure	41.20

Source: Authors' compilations.

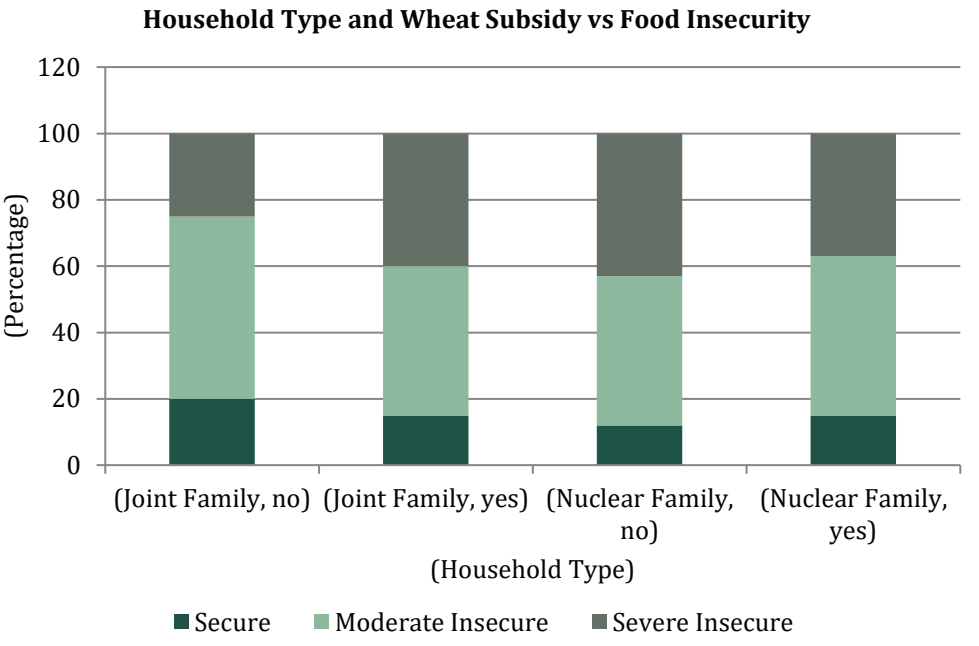
Chi-Square Test Results

A chi-squared test was conducted to evaluate whether the differences in food insecurity categories based on household type and wheat subsidy status are statistically significant.

- Chi-Square Statistic: 5.26
- Degrees of Freedom: 6
- P-Value: 0.512

Since the p-value is more significant than 0.05, we conclude that there is no statistically significant association between household type, wheat subsidy receipt, and food insecurity status. The stacked bar chart and cross-tabulation results indicate that access to wheat subsidies alone does not consistently shift households from food insecurity to food security. Joint Families not receiving subsidies show a relatively higher proportion of food-secure households than those receiving subsidies. Nuclear Families, regardless of subsidy status, consistently exhibit higher rates of severe food insecurity.

Figure 6: WS and FII across Household Types



Source: Authors' compilations.

The findings suggest that addressing food insecurity requires a more comprehensive approach, one that extends beyond food subsidy programs, incorporating income enhancement strategies, agricultural productivity improvements, and community support mechanisms.

10. FOOD CONSUMPTION SCORE (FCS) AND FOOD INSECURITY INDEX (FII)

The Food Consumption Score (FCS) and the Food Insecurity Index (FII) represent two distinct yet complementary approaches to measuring food security at the household level. Conceptually, the FCS, developed by the World Food Programme (WFP), is a direct measure of household dietary intake based on food diversity, consumption frequency, and the nutritional importance of food groups over a seven-day recall period. It quantifies the quality of the diet by assigning weighted values to different food groups and summing the weighted consumption frequencies. A higher FCS suggests a more diversified and nutritionally adequate diet, while lower scores indicate limited dietary diversity and food access.

By contrast, the FII constructed in this study provides a broader and more structural assessment of food security. It incorporates variables reflecting not just food consumption, but also economic capacity (household income, food expenditure), agricultural resources (land ownership), and access to subsidised wheat flour (both sufficiency and affordability). The FII captures the multidimensional nature of food insecurity by integrating food access indicators and the underlying means to sustain food consumption over time. Unlike the FCS, which focuses narrowly on recent dietary intake, the FII considers household resilience and vulnerability across multiple domains.

The methodology underlying each index further accentuates its differences. The FCS involves directly recalling food consumption, applying fixed weights to eight food groups to generate a cumulative score. A household's score is then classified into Poor, Borderline, or Acceptable food consumption categories based on WFP standards. In the present study, district-level analysis of FCS revealed uniformly alarming results. All surveyed districts in Gilgit-Baltistan, including Shigar (FCS 3.96), Ghizer (5.79), Gilgit (5.62), Nagar (9.7), and Yasin (10.6), fell well below the "Acceptable" threshold (>35). These extremely low FCS values reflect a lack of dietary diversity and a profound crisis in food access and nutritional adequacy across the region.

The FII, on the other hand, was constructed through the normalisation and aggregation of six different variables. The final scores were divided into tertiles to classify households as Severely Food Insecure, Moderately Food Insecure, or Food Secure. The results of the FII analysis similarly painted a troubling picture, with a significant share of households falling into severe and moderate food insecurity categories. However, the FII's advantage lies in its ability to differentiate food security conditions not merely by consumption but by households' structural vulnerabilities, such as low income, limited land access, and inadequate affordability of subsidised food.

Empirically, the FCS and FII highlight pervasive food insecurity across the surveyed regions, yet they emphasise different facets of the problem. The FCS reveals that even basic dietary needs are unmet for most households, suggesting immediate nutritional deficits. Meanwhile, the FII offers a deeper insight into why such deficits persist, highlighting systemic constraints in household economic capacities, agricultural resources, and access to affordable food. For instance, the FCS score tells us that Shigar is the most food-insecure district based on current diet quality. The FII, however, reveals that even households receiving wheat subsidies (intended to enhance food access) remain severely insecure, suggesting that subsidies alone are inadequate when broader livelihood conditions remain fragile.

Table 21: Comparative Summary: Food Consumption Score (FCS) vs Food Insecurity Index (FII)

Aspect	Food Consumption Score (FCS)	Food Insecurity Index (FII)
Purpose	Measures recent dietary diversity, frequency, and quality	Measures structural food insecurity across multiple dimensions
Focus	Food intake over the past 7 days	Economic access, agricultural resources, and affordability factors
Key Inputs	Food group consumption (weighted by nutritional value)	Wheat consumption, income, land ownership, food expenditure, and subsidised flour access
Calculation Method	Weighted sum of food group frequencies	Normalised additive index of six structural variables
Classification	Poor, Borderline, Acceptable (based on score thresholds)	Severely Insecure, Moderately Insecure, Food Secure (based on tertiles)
Strength	Captures immediate dietary quality	Captures broader structural resilience and vulnerability
Limitation	May miss hidden food stress and coping mechanisms	May miss temporary or sudden nutritional deficits

Source: Authors' compilations.

A comparative overview suggests that while the FCS addresses the immediate dietary symptoms of food insecurity, the FII identifies the underlying structural causes of food insecurity. FCS results signal an urgent need for food supplementation and nutritional interventions. FII results, however, demand longer-term solutions such as income diversification, land reforms, improved market access, and strengthening of social protection systems. Together, the two indices tell a more comprehensive story: households are not only eating poorly today (as indicated by low FCS), but they also lack the economic and agricultural foundations necessary for sustainable food security (as shown by low FII).

Thus, relying exclusively on one measure would obscure essential dimensions of food insecurity. The FCS alone could underestimate the chronic vulnerabilities facing households that still manage some food diversity through coping strategies. The FII alone could miss immediate nutritional gaps affecting household well-being. Therefore, integrating both indices is essential for designing holistic food security interventions that address the urgent symptoms and the deeper structural causes of food insecurity in Gilgit-Baltistan.

11. WHEAT SUBSIDY INTENSITY INDEX (WSII)

The Wheat Subsidy Intensity Index (WSII) was developed to provide a nuanced understanding of the effectiveness of wheat subsidy programs at the household level. Rather than relying on a simple binary indicator (receipt or non-receipt of subsidies), the WSII captures three critical dimensions: (1) whether a household receives subsidised wheat, (2) whether the subsidised wheat is sufficient to meet dietary needs, and (3) whether the subsidised wheat is affordable for the household. This enables a more comprehensive evaluation of subsidy effectiveness and its relationship to food security outcomes.

Construction of WSII:

- Subsidy Received: 1 if the household regularly receives subsidised flour, 0 otherwise.
- Sufficiency: 1 if the subsidised flour is sufficient to meet household dietary needs, 0 otherwise.
- Affordability: 1 if the subsidised flour is affordable, 0 otherwise.

Each household's WSII Score is the sum of these three binary indicators (range 0 to 3), and the normalised WSII Score is calculated by dividing by 3, resulting in a score between 0 and 1.

The results show that most households (around 50%) have moderate effective access to wheat subsidies (WSII=2). However, only 14% of households report full and effective access across all three dimensions.

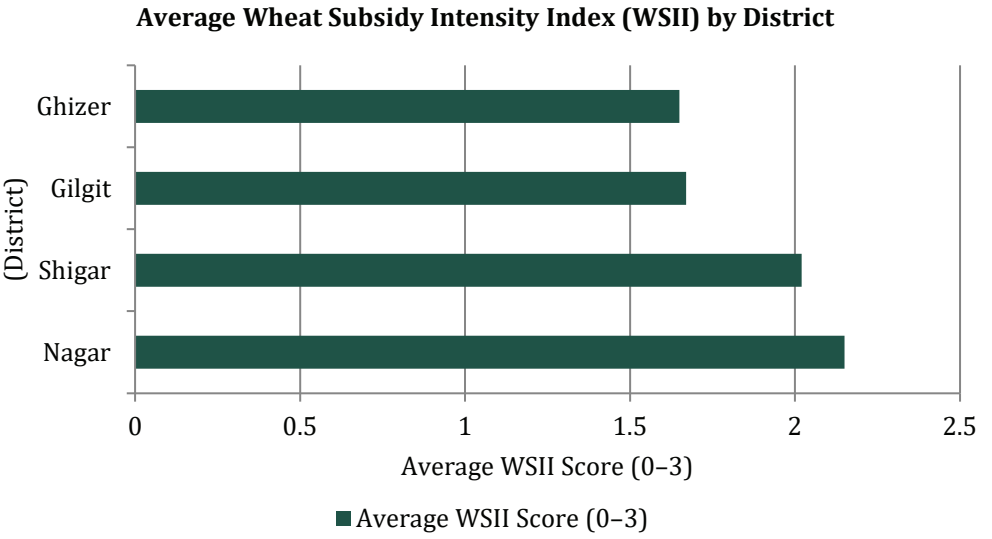
Table 22: WII Score Distribution

WSII Score	Household Count	Percentage (%)
0	46	8.44%
1	150	27.52%
2	271	49.72%
3	78	14.31%

Source: Authors' compilations.

A bar chart visualising the average WSII scores across districts indicates noticeable geographic disparities. Some districts provide more effective access to subsidies due to better administrative efficiency or socio-economic structures.

Figure 7: WII across Districts



Source: Authors' compilations.

The correlation coefficient (+0.083) suggests a very weak positive relationship between WSII and FII. Thus, better access to wheat subsidies has a marginal relationship with lower food insecurity levels.

Table 23: Correlation Matrix: WSII vs FII

Variables	WSII Normalized	Food Insecurity Score (FII)
WSII Normalized	1	+0.083
Food Insecurity Score	+0.083	1

Source: Authors' compilations.

While the WSII captures important dimensions of subsidy access, the analysis reveals that structural and systemic factors beyond subsidy availability primarily drive food insecurity. Even when sufficient and affordable, receiving subsidized wheat does not necessarily equate to improved food security.

Potential reasons include:

- Low household incomes undermine access to complementary foods.
- Limited land ownership restricts agricultural self-sufficiency.
- High food prices for non-wheat staples.
- Inadequate livelihood opportunities constrain economic resilience.

Thus, subsidy programs are vital for immediate food access but cannot substitute for comprehensive socio-economic development initiatives.

The Wheat Subsidy Intensity Index (WSII) effectively reveals disparities in the effectiveness of subsidy programs. The findings highlight that while subsidy receipt is widespread, its full impact is diluted by gaps in coverage, affordability, and access. Additionally, the weak association between WSII and food security outcomes underscores the need for broader, integrated policy interventions, including strengthening monitoring mechanisms to ensure subsidy sufficiency and affordability. Linking food subsidies with income generation, agricultural diversification, and market access programs enhances household resilience through social protection and targeted cash transfer programs. Food security can be sustainably improved beyond immediate subsidy provision through such multi-faceted interventions.

12. DETERMINANTS OF FOOD SECURITY IN GILGIT-BALTISTAN: THE LOGISTIC REGRESSION MODEL

Like other regression analyses, the logistic regression technique is also used in statistical and econometric analysis for predictive purposes. The logistic regression technique models the probability of a discrete outcome variable in relation to one or more predictors, which may be categorical or continuous. This method predicts discrete dependent variables with two or more categories. In this model, a predictor can take any shape; it may be a discrete or continuous variable, or a mix of both. The logistic regression model with a dichotomous outcome variable is referred to as the "Binary Logistic Regression Model." The dependent variable with more than two categories is called the "Multinomial Logistic Regression Model". In our study, the categorical dependent variable (Household Food Security) has two categories: Household Food Secure and Household Non-Food Secure. Therefore, the present study employed a binary logistic regression model for analysing food security. In logistic regression, the maximum likelihood method estimates the coefficients, standard errors, odds ratios, p-values, and other parameters. The study used primary data collected from the four districts of Gilgit-Baltistan, Pakistan, to analyse the impact of wheat subsidy on household food security.

Checking for Assumptions: The Binary Logistic Model

Although "Binary Logistic Regression" exempts some of the main assumptions of linear regression models, like normality, linearity, homoscedasticity, and measurement level, this model has the power to deal with all kinds of interactions as it applies a non-linear log transformation to the predicted odds ratios. However, for the validity and accuracy of the model, some basic assumptions are still required, which are given below.

Sample Size

Determining the representative sample size is key to the success of logistic regression analysis. This technique provides biased results with a relatively small sample size for many predictors, particularly if we have categorical independent variables with limited cases in each category (Greene, 1990). Different authors suggested different sample sizes for the logistic regression model. We can apply the 20:1 rule to collect a representative sample for logistic regression analysis, i.e., at least 20 observations must be for each independent variable in the model. The 20:1 rule applies to all regression models, i.e., dichotomous logistic or linear regression models. The regression model includes several categories of categorical variables that are important for determining the sample size. For example, a predictor in the model with two potential categories will be treated as two separate predictors, rather than one independent variable. In the case of (n) categories of a categorical variable, there must be (n-1) predictors to be included to determine the sample size (Burmeister & Aitken, 2012). (Greene, 1990) proposed a ($N > 50 + 8p$) sample size determination formula for a multiple regression model, where p denotes the number of independent variables included in the model. Our study has multiple predictors for the dependent variable, Household Food Security.

Figure 8 presents a map-based visualisation showing the proportion of survey respondents originating from different districts of Gilgit-Baltistan. Each circle's size and colour intensity represent the relative share of the total sample contributed by each district.

Ghizer district contributed the largest share of the survey sample, with more than half (53.38%) of all surveyed households. This significant overrepresentation may reflect Ghizer's larger rural population or intentional survey targeting based on research needs.

Shigar contributed the second-largest proportion of the sample (21.66%). Despite harsh climatic conditions and rugged terrain, a sizable number of households from this district were included. About 13.35% of the surveyed households came from Nagar. This moderate representation ensures that findings can be generalised more confidently for this district. Gilgit, despite being the administrative and economic hub of the region, had the most minor proportion among the central districts at 11.61%. This might reflect a sampling strategy focused more on rural areas than urban centres.

The map highlights a rural bias in the sampling strategy, with Ghizer and Shigar making up nearly three-quarters of the total sample. This is consistent with the study's objectives, as the research focuses primarily on rural food security, agricultural practices, and the impact of wheat subsidies.

District-level findings should be interpreted cautiously, especially for Gilgit and Nagar, where smaller sample sizes could affect statistical robustness.

As we are at the preliminary research stage, our data set only included a sample size of 85 households, and the final sample across the four districts is 526 households. This sample size is too limited; therefore, we cannot apply logistic regression techniques to analyse the impact of wheat subsidy and other influential factors on food security in the study area. Doing so will produce biased and inconsistent results. Such an analysis will be carried out after the survey is completed and with a reliable sample size.

Figure 8: Proportion of Sample Size in Each Area

Source: Authors' compilations.

Logistic Regression Analysis: Food Security in Gilgit-Baltistan

Disclaimer: There are issues with the reliability and validity of the models presented in the following paragraphs. Different models have predicted different outcomes. This is primarily due to the nature of the data, which is still raw and requires extensive cleaning and reworking. Given time constraint, the following models have been presented to highlight some preliminary findings. Although the findings show a broad picture of the wheat subsidy, they may not present appropriate policy implications. We are continuously working to ensure the robustness of the findings. For a revised version, you may like to ask us.

Model 1: Predicting FCS

This model estimates the probability that a household is food secure based on the Food Consumption Score (FCS > 35). Predictors include the Wheat Subsidy Intensity Index (WSII), age, education, household type, income, land size, and food expenditures. Variables were standardized before regression.

Table 24: FCS Estimates

Variable	Coefficient	Std. Error	z-value	p-value	Odds Ratio
Intercept	-1.8667	0.4342	-4.2997	0.0000	0.155
WSII	-0.4182	0.2638	-1.5854	0.1129	0.658
Age	-0.2193	0.3140	-0.6984	0.4849	0.803
Household Type	0.6223	0.6017	1.0343	0.3010	1.863
Education	0.1500	0.3001	0.4996	0.6173	1.162
Family Size	-0.3737	0.3516	-1.0628	0.2879	0.688
Income	0.1344	0.2373	0.5663	0.5712	1.144
Land Size	0.2456	0.3047	0.8061	0.4202	1.278
Expenditures	-0.3785	0.6887	-0.5495	0.5827	0.685

Source: Authors' compilations.

WSII is a statistically insignificant and negative predictor of food security ($p < 0.01$). Households with higher access to effective wheat subsidies may not have better food consumption outcomes.

Model 2: Predicting FII

This model examines the likelihood of a household falling into the most food-secure tertile based on the Food Insecurity Index (FII). The same set of predictors was used. WSII again emerges as a statistically significant and positive factor.

Table 25: FII Predictions

Variable	Coefficient	Std. Error	z-value	p-value	Odds Ratio
Intercept	-1.2434	0.3728	-3.3348	0.0009	0.288
WSII	0.6027	0.2331	2.5851	0.0097	1.827
Age	-0.1789	0.2798	-0.6395	0.5225	0.836
Household Type	0.6931	0.5385	1.2870	0.1981	2.000
Education	-0.0895	0.2588	-0.3460	0.7294	0.914
Family Size	-0.5125	0.3229	-1.5874	0.1124	0.599
Income	0.1643	0.2339	0.7025	0.4824	1.179
Land Size	0.2226	0.3197	0.6963	0.4862	1.249
Expenditures	0.4829	0.5859	0.8241	0.4099	1.621

Source: Authors' compilations.

The Wheat Subsidy Intensity Index (WSII) is a strong and statistically significant determinant of food security. Other household characteristics, such as education and income, are not consistently significant.

This section presents the results of a binary logistic regression model estimating the probability that a household is food secure, as measured by the Food Insecurity Index (FII_Secure = 1). The key independent variable is the Wheat Subsidy Intensity Index (WSII), which captures whether the household receives subsidised flour and whether that flour is sufficient and affordable. The model also includes controls for respondent age, household type, education level, family size, landholding size, and food expenditures.

The model was estimated using Maximum Likelihood Estimation (MLE) on 121 households. The pseudo-R-squared value is 0.5941, indicating that the model explains approximately 59.4% of the variation in household food security. The model log-likelihood is -33.9589, and the null log-likelihood is -83.6682. The likelihood ratio test is statistically significant ($p = 0.0000$), suggesting that the model provides a better fit than a null model with no predictors.

The analysis indicates that the Wheat Subsidy Intensity Index (WSII) is a statistically significant and positive predictor of food security. The coefficient for WSII is 3.555, and the corresponding odds ratio is approximately 35. This implies that, holding all other variables constant, a one-standard-deviation increase in WSII is associated with a 35-fold increase in the odds of a household being food secure. This strong relationship underscores the potential effectiveness of well-targeted, sufficient, and affordable food subsidy programs in improving household food security.

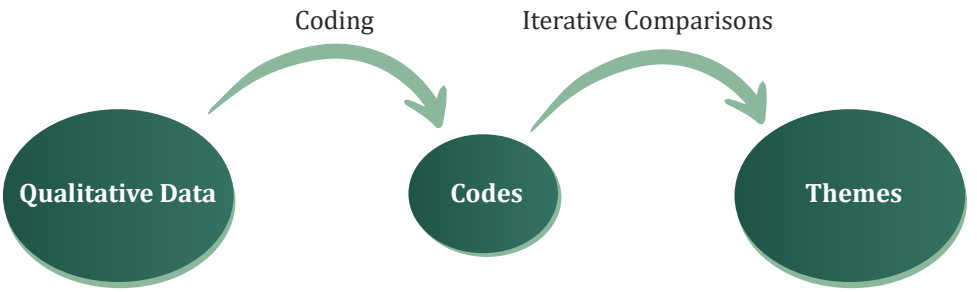
Despite the model's strength as a predictor, it has several limitations. First, the number of observations used in the model is relatively small (121), due to missing data on key explanatory variables. This may limit the generalizability of the results and reduce statistical power for detecting more minor effects. Second, although WSII is enormously significant, other variables such as education, age, and household type were not statistically significant in this model. This could be due to limited sample size, measurement error, or omitted variable bias. Third, the model assumes a linear relationship between predictors and the log-odds of food security, which may oversimplify complex interactions. Lastly, using self-reported data on subsidy access and food expenses may introduce reporting bias or inconsistencies across households.

13. QUALITATIVE THEMATIC ANALYSIS

Thematic analysis stands as one of the most utilised qualitative analytic methods. It functions as a means for identifying, analysing, and reporting patterns, commonly referred to as themes, within a dataset. This approach allows researchers to meticulously organise and describe the dataset, offering a comprehensive view of its intricate details. Our approach involved a systematic step-by-step procedure. Initially, we generated codes to segment and label relevant data segments. Following this, we diligently searched for overarching themes within the coded segments. Once these themes were identified, we defined and named them to ensure clarity and coherence. Finally, we synthesised our findings, providing valuable insights.

Thematic Analysis of the Current Study

Figure 9: Thematic Analysis



Source: Authors' compilations.

The thematic analysis, conducted based on Key Informant Interviews (KIIs) and Focus Group Discussions (FGDs), reveals a nuanced understanding of the multifaceted challenges and dynamics surrounding the wheat subsidy program in Gilgit-Baltistan. Through in-depth conversations with key stakeholders, several major themes have emerged, shedding light on the complex interplay between policy interventions, agricultural practices, food security, and socio-economic factors within the region.

Impact of Subsidy on Local Agriculture System

Subsidy Discourages Local Farming

The analysis of transcripts shows that the wheat subsidy program, intended to enhance food security, has paradoxically disincentivised local farming practices in the region. The cost of farming has increased compared to subsistence production. The availability of subsidised grain and flour in the market has led to the decline of local production. One of the key informants reported:

"The wheat subsidy has disincentivised the local farmer on a greater scale. As the cost of farming is higher and highly subsidised wheat is provided to households on a scale-based basis, people have left farming and rely on the quota-based wheat provided by the government."

This highlights how the availability of subsidised wheat has led farmers to abandon their agricultural activities, as the perceived costs of farming outweigh the benefits when subsidised wheat is readily accessible.

Shift Towards Cash Crops and Away from Wheat

There has been a notable shift towards cash crops and away from traditional staple crops. The reported population increase and limited land availability for wheat production are key reasons behind this shift. Moreover, there is a lack of policy from the public sector for land expansion for agriculture at the provincial level. A key informant from Shigar observed:

"People have taken agricultural spaces to build their houses... Moreover, there is little government intervention to make the barren lands cultivable."

Another responded:

"Our agricultural needs can be fulfilled by investing in barren lands. In addition, inflation has contributed to discouraging people from agriculture."

Such opinions of local people underscore the multifaceted factors contributing to the decline in local wheat farming, including population growth, lack of government support for cultivable land, and rising input costs due to inflation.

Reduced Dietary Diversity

In investigating the impact of wheat subsidy on food security in the region, respondents of the study reported a more significant impact on their dietary patterns. The shift away from diverse crop cultivation with no incentives to traditional farming of staple crops has had a direct effect on the nutritional habits of the community, reducing their intake of diverse food as the majority of their diet intake is met from wheat due to the availability at a sufficient scale with low cost compared to other food crops. A Civil Society Representative lamented:

"Due to the availability of wheat, the dietary intakes of people have almost become homogenous, and people are only taking in wheat and leaving the intake of all other staples."

This highlights the narrowing of dietary diversity, with an overreliance on wheat as the primary staple, which may lead to nutritional deficiencies.

Increased Dependence On Market Fluctuations

Another consequence of the declining local agricultural production, as reported, is an increased dependence on market sources for food. As the ability to cultivate diverse crops diminishes, the community becomes more reliant on purchased wheat, making it vulnerable to market fluctuations and external shocks. A key informant observed:

"In earlier times, we easily grew multiple crops like wheat, barley, and buckwheat, but over time, the demographic shifts coupled with climatic conditions have made it hard for us to grow multiple crops, thus increasing our dependence on wheat."

The subsidy designed to bolster food security inadvertently undermines local agricultural practices. This threatens the economic viability of farming and the dietary diversity crucial for community health and resilience.

Corruption and Inefficiencies in the Distribution System

Black Marketing by Dealers and Millers

As reported from the transcript analysis, the wheat subsidy distribution system is plagued by corrupt practices, including black market and nepotism. The intermediaries in the distribution process, such as the dealership system and mill owners, are heavily involved in corrupt practices, making it difficult for the poor to access their allocated quota.

A Civil Society Representative criticised:

"The system is rotten and corrupt, which encourages black market. People with better links with civil supply officials or dealers are at an advantage over those who do not have access to these channels."

Another observed:

"We have not requested the food department to distribute us flour via millers, but the millers have influence in the system and are using it to gain unfair advantages."

This highlights how those with influential connections can exploit the system for personal gain while disadvantaging those without such access.

Opaque Quota System and Lack of Transparency

The lack of transparency in the quota system is another significant issue, allowing for manipulation and abuse. This opaque system enables dealers to engage in corrupt practices, such as diverting quotas intended for those not present or selling subsidised wheat on the open market at higher prices.

A respondent illustrated:

"People do not have any clear idea about their specific quota, but the dealer distributes among them based on arbitrary criteria... rich people and those people who are not living in Sherqilla are not availing their stipulated quota, but the dealer does receive their portion and sell it either in the open market at higher prices or distributes among their acquaintances."

Moreover, there is no proper compliance mechanism for consumer complaints and suggestions, which makes the system more susceptible to distribution irregularities, and people with inadequate awareness of the system are often excluded. An informant illustrated:

"The majority of the people in this village are either poor or illiterate, and most of the time both. They do not have access to the high officials."

Grain and Flour Quality Issues

Quality control is a significant concern, with reports of adulteration and poor-quality grain and flour being distributed. Most of the time, the flour is of inferior quality and useless to human needs. A Government Official from Sher Qila stated:

"The quality is poor. Often it gets mixed with choker, making it undesirable for domestic use... Sometimes, choker gets mixed with flour, making it unable to eat."

Another replied:

"Most of the time, we are delivered poor-quality food. For example, in the last year, there was grain which most people failed to use for cooking because of poor quality."

The prevalence of corruption, inefficiencies in the distribution system, and quality challenges undermine the intended benefits of the subsidy and exacerbate socio-economic disparities, hindering equitable access to essential food resources.

Changing Dietary Habits and Food Security

Increased Reliance on Subsidised Wheat

The availability of subsidised wheat has led to a growing reliance on this single staple, displacing traditional, diverse dietary practices such as growing maize, barley, and wheat. A respondent reported:

"In our early ages, most people were used to farming and poultry, but people even had to buy milk from shops over time. There is immense business potential to local production..." This illustrates how the community has shifted from self-sufficient practices, such as farming and poultry keeping, towards a greater dependence on purchased food items, including subsidised wheat.

Subsidy's Limitations

While the subsidy plays a role in fulfilling food requirements, it has inherent limitations in addressing the diverse nutritional needs of the community. A participant noted:

"Yes, it does play a great role in fulfilling people's food requirements. However, it is not enough to cover the full nutritional needs..."

This emphasises the need for a more comprehensive approach beyond providing a single staple crop.

Population Growth, Land-Use Changes, and Wheat Subsidy

Population growth and land-use changes have exacerbated challenges to food security and dietary diversity. The encroachment on agricultural land due to population pressures has likely contributed to the decline in local agricultural production, the increasing reliance on external food sources, and the need for wheat subsidies.

A respondent reported:

"The major factor contributing to this phenomenon is the increasing population. Due to population increase, people must forgo considerable agricultural land for their buildings..."

In such circumstances, a subsidy is considered crucial to meet the dietary needs of the local population. A respondent stated:

"This subsidy is the need of the hour because almost 70% of the people in our village are solely reliant on the wheat subsidy; they do not have an agricultural area of their own."

The reliance on subsidised wheat underscores the need for a holistic approach to food security that addresses nutritional diversity and sustainable agricultural practices in the face of demographic shifts.

Challenges Faced by Local Farmers

Outmigration of Young People and Farm Labour

There is an interlinked system of farming in Gilgit-Baltistan, as young people are traditionally associated with agriculture after school hours. The social transition has posed a substantial challenge to the inherent agricultural system. Respondents reported that more emphasis on education has contributed to the outmigration of young people to other cities, leaving the agricultural system lacking traditional labour. An individual reported:

"There are many reasons for this. The first thing is the lack of farm labour, as I noticed due to the migration of the labour class for job opportunities to urban areas."

Moreover, the increase in crop losses due to natural calamities and climatic hazards has forced farm labour to move to urban centres for off-farm wage labour, creating a shortage of farm labour.

This outmigration of young people and farm labour has likely contributed to the decline in local agricultural production, the increasing reliance on external food sources, and the wheat subsidy.

Increased Natural Disasters

The analysis of transcripts reveals that environmental factors, including natural disasters and climate change, pose a significant threat to local agriculture. The increased frequency of climatic events and natural disasters has raised concerns for local agriculture. A local farmer reported:

"After 2010, floods have been frequently observed, and Sherqilla experienced one of the major floods, which caused damage to local agriculture."

These events cause immediate losses and have long-term impacts on the productivity and viability of agricultural lands.

Lack of Awareness about Subsistence Farming

Most participants in the study highlighted that the declining interest in subsistence farming practices is partly attributed to a lack of awareness about their importance. An Agriculture Officer highlighted:

"One of the most important things I observed is the lack of awareness about the importance of subsistent farming in coping with food issues..."

This knowledge gap may contribute to the community's over-reliance on external food sources and the neglect of self-sufficient farming practices.

High Input Costs

Rising input costs, exacerbated by inflation, have made it increasingly challenging for local farmers to sustain their agricultural activities. In GB, there is no subsidy for local farmers on farming inputs, and no access to agriculture credits at the public policy level. A key informant noted:

"Inflation has contributed to discouraging people from agriculture. The cost of threshing, high costs of fertilisers and other ingredients have made it hard for people to invest seriously in agriculture..."

These escalating costs have rendered farming a less viable option for many in the community, further contributing to the decline in local agricultural production.

Local farmers face various challenges, from environmental pressures to economic constraints. Addressing these issues requires comprehensive support systems and strategies to enhance agricultural resilience sustainably.

Need for Improved Policy Interventions

Shift Subsidies Focus to Farm Inputs

In our analysis, participants of the current subsidy programme emphasise the need for enhanced policy interventions. Participants expressed the need to redirect subsidy efforts towards supporting local small-scale farmers with input subsidies such as access to quality seeds, subsidised tractors, and fertilisers. One of the farmers stated:

"Rather than providing consumer subsidies, I suggest this subsidy should be diverted to the local small farm holders in terms of input subsidies for quality seeds..."

Another stated:

"...the government should provide high-yielding seeds and subsidised fertilisers. This will lead to more local production of wheat."

This highlights the importance of prioritising investments in agricultural inputs, such as high-quality seeds, to enhance productivity and sustainability at the grassroots level.

Improved Public Distribution Mechanism

Though respondents highlighted the direction of the current subsidy program to input-focused subsidy programs, a more significant faction of the community also emphasised the importance of the current subsidy in meeting the dietary requirements of the households and urged for improvement in the distribution system to make it more accessible and available. A key informant reported:

"..the low price of subsidised wheat is a gain for poor people, which serves them better. Corruption is rampant, but it must be improved to benefit the poor."

Another highlighted:

"..its distribution to different depots must be passed through strict checks and balances. Due to this lack of checks, most wheat is pilfered."

Therefore, transitioning to a more efficient distribution mechanism is crucial for meeting the objectives of the subsidy program.

Promote Awareness Campaigns

Many participants emphasised the critical role of awareness campaigns in fostering a deeper understanding of local farming practices and promoting the importance of indigenous subsistence farming. A participant emphasised:

"First and foremost, the households need a greater awareness of local farming and the role of subsistent farming as a coping strategy in our areas..."

Thus, it is essential to empower communities with knowledge and skills to adopt sustainable farming practices and mitigate the adverse effects of the subsidy program.

14. CONCLUSION

The thematic analysis of the transcripts underscores the complexity of food security initiatives and their far-reaching implications for the wheat subsidy in Gilgit-Baltistan. The wheat subsidy program was intended to serve as a lifeline for food security. However, like many well-intentioned policies, it has had some unintended and troubling consequences. For generations, the resilient people of this region practised sustainable subsistence farming, growing diverse crops like wheat, barley, and buckwheat to meet their nutritional needs. However, the availability of subsidised wheat has paradoxically discouraged these traditional farming methods. As cultivation costs have risen, many have found it easier to rely on subsidised grains than toil in their fields. This shift from self-sufficient practices has narrowed dietary diversity and increased market dependence, leaving communities vulnerable to price shocks. The rampant corruption plaguing the distribution network of the subsidy has compounded the problem. Unscrupulous dealers and millers engage in black marketing, hoarding supplies to sell at higher rates. Personal connections rather than needs often determine who gets access to the subsidised grains, and the lack of transparency around quotas enables further exploitation of the system. To make matters worse, the subsidised grain is frequently of poor quality, adulterated, and unfit for consumption.

As farmlands are sacrificed to construction due to population pressures, the younger generation migrates to cities in search of jobs and education, dealing another blow to centuries-old farming traditions. Climate change has exacted its toll through increased natural disasters that destroy crops and agricultural lands. With high input costs like fertilisers and equipment, farming is becoming financially unviable for many small landholders.

The wheat subsidy policy requires an urgent course correction rooted in the region's ground realities. Redirecting subsidies towards seeds, equipment, and inputs can re-incentivise sustainable local farming. Stringent monitoring can purge the distribution system of corrupt practices. Awareness campaigns on the benefits of indigenous farming methods can rekindle community interest. A holistic food security strategy must look beyond providing a single staple crop to meet diverse nutritional needs through locally grown, climate-resilient crops. Only by respecting and enhancing traditional self-sufficiency can the subsidies fortify food security. Policies must be anchored in community participation to reestablish the virtuous cycle of sustainable farming and healthy diets, which these mountain communities once took pride in.

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TAXING THE RENTAL INCOME IN AGRICULTURE

Irfan Ahmad Baig[1] and Sami Ullah[2]

ABSTRACT

Globally, taxation has been employed with dual objectives: it is the primary source of income generation worldwide, and it has also been utilised for policy-level incentivization. Pakistan lags far behind in taxing individual income, especially agricultural income. In practice, the tax on agriculture in Pakistan is not an income tax, but rather a land tax. This study estimates the potential revenue from agricultural tax under different tenancy arrangements. The institutional barriers to the levy of and collection of agricultural income tax have also been explored. Similarly, it examines the tax compliance behaviour of farmers. The primary data were collected through cluster sampling from 436 farmers (owners and tenants) and 121 lessors using a well-structured questionnaire. The questionnaire has been administered in four selected districts of Punjab. The data have been analysed using multinomial logit, ordered probit, and logit models. This study suggests that taxing the rental income of absentee landlords at the property tax rate (5%) could generate an additional amount of Rs 18 billion, leading to a total agriculture income tax of Rs. 79 billion in Punjab. Focus Group Discussions suggested that cooperation among institutions and e-based tax collection systems can enhance the efficiency of the system. Another takeaway from FGDs is that the tax compliance behaviour of farmers is influenced by their tax-related knowledge, trust in the government, and relationship with the tax authorities.

The interplay of land tenure systems and land management practices is a complex and context-specific issue with significant implications for agricultural development and rural livelihoods. The study also examines the factors that influence land rental decisions. It also examines the influence of

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land tenure systems on land management practices in Punjab, Pakistan. Our findings suggest that livestock, cultivated areas, and family labour have a significant positive impact on leasing decisions. We also show the implications of absentee landlordism on technology adoption and tax collection. A good working relationship between landlords and farmers could positively impact land and water management practices and technology adoption among farmers. Thus, institutionalising rental markets will improve land and water management practices and technology adoption among farmers.

1. TAXING THE RENTAL INCOME IN AGRICULTURE: ANALYSIS OF ALTERNATE OPTIONS

INTRODUCTION

Tax revenue affects citizens' welfare and living standards, the provision of social services, investment in infrastructure, and the country's economic progress. The tenancy agreements are believed to influence taxation revenue from agricultural income. Given the limited revenue generated from taxing agrarian income, it is crucial to identify the factors that hinder the generation of substantial revenue from agricultural taxation.

Taxation on agricultural income or land varies across countries. Some nations impose land taxes, while others prefer income taxes. Land tax is typically fixed and straightforward, whereas agricultural income tax can be complex to calculate. A combination of both might be the best approach. In Egypt, agricultural tax is typically in the form of land rent, whereas countries such as Chile, Croatia, Australia, and Nepal tax gross agricultural income. Developed countries tend to have a high tax-to-GDP ratio, but in Pakistan, it is only 9.1%, with direct taxes accounting for 4.3% (OECD, 2022).

In Pakistan, agricultural income taxation is contentious because rural areas rely heavily on agriculture, and large landowners often evade taxes due to perceived complexity and ineffectiveness. Therefore, effective agrarian taxation should be simple and administered locally. Provincial governments oversee agricultural taxation, but enforcement is often inadequate, resulting in minimal revenue. Several studies have indicated that proper collection could significantly increase tax revenue. Poor tax collection is attributed to outdated administrative structures and compliance issues. Farmers' knowledge, perceptions, and attitudes influence their compliance. The 'Theory of Planned Behaviour' explains that farmers' tax compliance is affected by attitudes, subjective norms, and perceived behavioural control. Effective taxation, therefore, requires an understanding of these behavioural factors.

Research Objectives

The specific objectives of this study are:

- To evaluate the collection of agricultural income tax under different tenancy arrangements in Punjab.
- To analyse farmers' compliance behaviour concerning laws related to agricultural income tax under different tenancy setups.
- To examine the institutional hurdles in the collection of agricultural income tax.

REVIEW OF LITERATURE

Taxation on agricultural income or land varies significantly across the world. Many countries impose taxes on agricultural land, while others tax the income of farm activities. Land tax is paid as a lump sum, serving as a fixed rent or sort of debt payment regardless of the income generated from land use. Agricultural income tax is levied on earnings from farming activities. Several challenges exist in accurately calculating farmers' agricultural income. Therefore, combining land and output taxes might be worthwhile. In Egypt, farmers pay tax on the land rents they receive under tenancy agreements (Mohammad & Qureshi, 1987). In various countries, agricultural income is treated similarly to income from other sources and taxed accordingly. Chile taxes gross agricultural income at 25 per cent, Croatia at 24 per cent, Australia at 16 per cent, and Nepal at 25 per cent of gross income (OECD, 2020). Moreover, the tax-to-GDP ratio in developed nations is nearly 40 per cent, with personal income tax contributing around 23 per cent of government revenue on average. However, in Pakistan, the tax-to-GDP ratio is a mere 9.1 per cent, while direct tax accounts for only 4.3 per cent of revenues, with income tax making up a small portion (OECD, 2022).

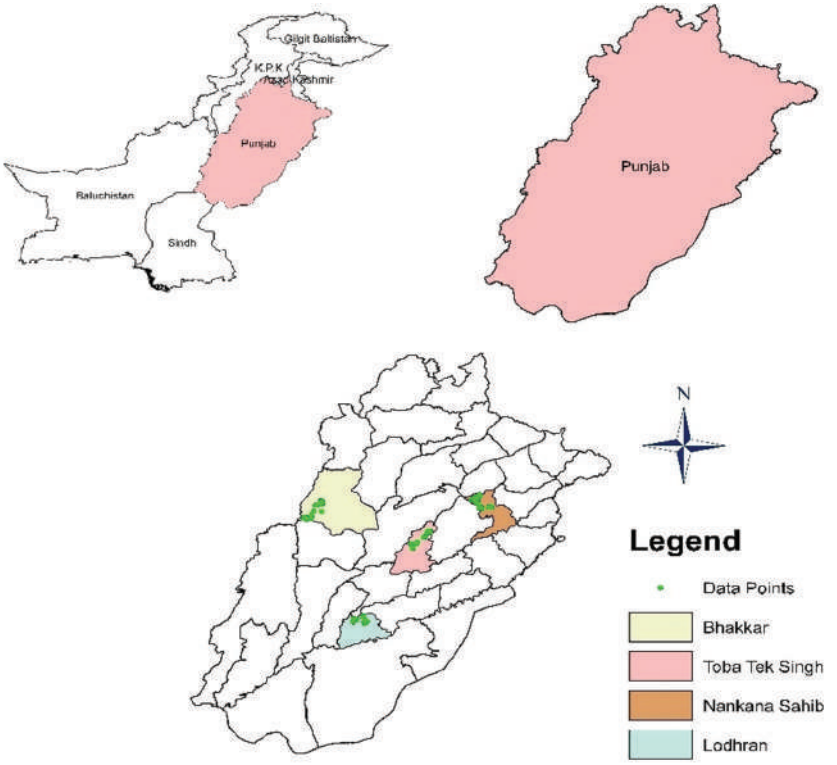
A farmer’s tax compliance is influenced by their tax knowledge, perception, and attitudes. Tax compliance behaviour is also viewed as a social contribution and a psychological contract. Attitudes towards tax compliance are influenced by trust in the government, perceptions of justice, and the socioeconomic status of taxpayers. Several internal and external factors influencing farmers' willingness to meet tax obligations are related to their willingness to cooperate with local authorities and institutions. However, economists focus on external factors such as income, tax rates, and penalties.

RESEARCH METHODOLOGY

Data Collection

The primary data were collected through a multistage sampling process from respondents in Punjab using a well-structured questionnaire via 'Kobo Collect'. Two teams of enumerators were trained in data collection. The questionnaire included questions on socioeconomic characteristics and taxation (Annexure B). Four districts from Punjab were selected: Lodhran (Cotton-Wheat zone), Bhakkar (Low-intensity), Toba Tek Singh (Mixed zone), and Nankana (Rice-Wheat), which were randomly selected from each region (figure 1). A diverse group of respondents, including tenants (20%), sharecroppers (20%), owners (60%), and relevant absentee landlords, was chosen as representatives of the four classes included in the sample. From each district, one tehsil and two mouzas were randomly selected. The sample, comprising 557 respondents, consisted of 436 farmers (owners and tenants) and 121 lessors (Table 1).

Figure 1: Geographical Locations of the Respondents



Source: Author's own calculations.

Table 1: District and Category-Wise Distribution of Data

Districts	Categories			Total
	Owner	Tenant	Lessor	
Lodhran	95	30	20	145
Bhakkar	99	24	24	147
TT Singh	66	31	38	135
Nankana	69	22	39	130
Total	329	107	121	557

Source: Author's own calculations.

Methodology of Tax Collection Estimates under Various Tenancy Arrangements

To analyse the tax scenarios under various tax collection regimes, we employ scenario analysis of how tax collection is affected by different tax rates applicable to owners, tenants, and absentee landlords. We have used the land utilisation data of Pakistan for 2022 (Government of Punjab, 2023).

Methodology of Analyzing the Farmers' Compliance Behaviors Towards Agricultural Income Tax under Various Land Tenancy Arrangements

We employed the logit model developed by (Cox, 1959) and (Walker & Duncan, 1967) to study the determinants farmers' tax compliance behaviour toward agricultural taxation. In the binary logit model, the dependent variable (Tax compliance behaviour) is dichotomous (yes = 1; no = 0), and the independent variables are in both qualitative and quantitative forms.

The Logit function can be derived from the odds ratio as follows:

$$\ln(\boldsymbol{Oddsratio}) = \ln\frac{\boldsymbol{Yi=1}}{\boldsymbol{Yi=0}} = \ln\frac{\boldsymbol{p(y=1)}}{\boldsymbol{(1-p(y=1))}} = \boldsymbol{\beta o + \beta}$$

The logit function of the probability of adoption can be written as:

$$\ln\left[\frac{p(y=1)}{(1-p(y=1))}\right] = \beta o + \beta$$

The empirical form of the model is as follows.

Y*i* (Tax compliance=1, 0=otherwise) = f (age, education level, knowledge of the tax system, whether farmers are taxed on agriculture, satisfaction with tax authorities, governance systems, justice, crime and conflicts, indirect taxes on agriculture, the contribution of taxes to society, the agriculture sector, government responsiveness to farmers, social benefits, and the quality of agricultural services.

Methodology to Examine the Institutional Hurdles in Agricultural Tax Collection

A focus group discussion has been conducted in each tehsil with relevant stakeholders, including farmers and tax collection authorities, to explore the institutional hurdles and suggest better tax policy measures under changing agricultural market conditions.

FINDINGS AND DISCUSSIONS

Tax Collection Estimates under Various Tenancy Arrangements

Table 2 presents the tenure classification of farm-cultivated areas as of 2021. For areas under 1 to 5 acres, the cultivated area is 7.16 million acres, and for areas under 5 to 12.5 acres, the cultivated area is 11.52 million acres and so on. These area figures have been used to estimate the potential tax collection under different tenancy arrangements.

Table 2: Tenure Classification of Farm Cultivated Area in 2021 (million acres)

Land Holding (in acres)	Owner Cultivated Area	Owner Self-Operated Area	Shared and Leased	Tenant Cultivated Area	Cultivated Area
Cat-1 (0.1 to Under 5)	6.12	0.22	0.20	0.61	7.16
Cat-2 (5 to under 12.5)	8.66	0.70	0.84	1.30	11.52
Cat-3 (12.5 to Under 25)	4.22	0.64	0.70	0.72	63.02
Cat-4 (25 to Under 50)	1.94	0.38	0.55	0.32	3.20
Cat-5 (50 to Under 150)	1.23	0.22	0.42	0.17	2.05
Cat-6 (150 and Above)	0.50	0.05	0.19	0.08	0.83

Source: Author's calculations.

The estimates of the income-based agricultural tax show that implementing agricultural income tax without giving a different treatment to lessors' (the ones earning from renting out agricultural land) income may generate tax revenues of Rs. 65 billion. Implementing the progressive income tax on farmers' income and 5% tax on lessors' income (as property tax) may generate an extra Rs. 14 billion (Rs. 79.61 billion in total (65 + 14)). On the other hand, the land-based agricultural tax that has been implemented could generate mere Rs. 4.62 billion. So, any policy intervention to treat land rent as the rent of property and charge the absentee landlords based on their income from agriculture can generate additional agricultural income tax of approximately Rs. 75 billion (Table 3)

Table 3: Tax Collection Estimates: Agricultural Income Tax under Different Scenarios

Sr. No.	Tax Collection: Types	Tax Collection Estimates (Rs. in billions)						
		Cat-1	Cat-2	Cat-3	Cat-4	Cat-5	Cat-6	Total Tax Collection
1	Flat Tax Rate Estimates without Differentiating Lessors' and Farmers' Income (1.2% based on farmers' perceptions)	15.25	24.50	13.00	6.75	4.26	1.72	65.48
2	Flat Tax Estimates Differentiating Lessor and farmers Income (1.2% on farmers and 2.5% on lessor based on farmers' perception)	15.61	25.45	13.59	7.13	4.51	1.84	68.12
3	Different Tax for farmers and Lessors (Progressive income tax based on farmers' perceptions)	12.02	21.95	12.58	7.87	5.33	2.21	61.97

Sr. No.	Tax Collection: Types	Tax Collection Estimates (Rs. in billions)						
		Cat-1	Cat-2	Cat-3	Cat-4	Cat-5	Cat-6	Total Tax Collection
4	Different Tax for farmers and Lessors (Flat tax on farmers 1.2% and 5% on lessors' income)	17.46	30.30	16.68	9.09	5.81	2.45	81.79
5	Different Tax on farmers and Property Tax on Lessors (Progressive tax on farmers' income and 5% on lessors' incomes)	14.62	28.63	16.63	10.12	6.74	2.86	79.61
6	Tax collection based on land-based tax as implemented by the Govt. of Punjab	0.00	0.00	1.89	1.28	1.03	0.42	4.62

Source: Author's own calculations.

Aanalyse Farmers' Compliance Behaviours towards Agricultural Income Tax under Various Land Tenancy Arrangements

Table 4 presents the descriptive statistics of the variables used to analyse the compliance behaviour of farmers and lessors regarding agricultural income tax. It categorises the respondents into three groups: owner, tenant, and lessor. The average education levels for owners, tenants, and lessors are 8.76, 7.02, and 9.77 years, respectively. The average ages of owners, tenants, and lessors are 42.7, 41.8, and 48 years, respectively. The average tax compliance rates for owners, tenants, and lessors are 38.62, 40.18, and 58.68. A significant proportion (18.09%) of respondents (owners, tenants, and lessors) are aware of agricultural income tax. Only 0.3% of farmers 'strongly agree' that farmers are fairly treated within the tax system. Furthermore, just 0.07% of farmers are ''strongly satisfied with the tax authorities.

Table 4: Tax Compliance Behaviour of Farmers and Lessors

Variables	Unit	Categories		
		Owner	Tenant	Lessor
Knowledge of Agri. Income Tax	Poor (%)	31.745	47.66	24.79
	Fair (%)	40.56	34.58	47.11
	Good (%)	22.195	13.08	19.01
	Very Good (%)	4.555	1.87	8.26
	Excellent (%)	0.935	2.80	0.83
Fair Treatment of Farmers in the Tax System	Strongly Disagree	19.39	23.36	21.49
	Disagree	50.67	42.06	43.80
	Neutral	24.445	28.97	24.79
	Agree	4.495	5.61	9.92
	Strongly Agree	1	0	0
Satisfaction Level with Tax Authorities	Strongly Dissatisfied	28.6	31.77	30.58
	Dissatisfied	42.55	44.86	39.67
	Neutral	19.915	17.76	23.14
	Satisfied	8.71	5.61	6.61
	Strongly Satisfied	0.22	0	0
Satisfaction Level with Govt. Authorities	Strongly Dissatisfied	39.545	42.06	36.36
	Dissatisfied	38.715	42.06	42.15
	Neutral	16.64	12.15	19.01
	Satisfied	4.12	3.74	2.48
	Strongly Satisfied	0	0	0
Satisfaction Level with the Justice System	Strongly Dissatisfied	37.995	42.06	36.36
	Dissatisfied	32.065	28.04	31.40
	Neutral	24.1	23.36	27.27
	Satisfied	5.34	0.93	4.13
	Strongly Satisfied	0.5	5.61	0.83
Do Agriculture Taxes Contribute to the development process of Society?	Strongly Disagree	18.735	16.82	13.22
	Disagree	33.84	33.64	29.75
	Neutral	26.445	31.77	27.27
	Agree	20.045	15.89	21.49
	Strongly Agree	0.435	1.87	8.27
Do You Think Govt? Waste Taxpayer Money?	Strongly Disagree	5.365	5.61	9.92
	Disagree	15.89	14.02	8.26
	Neutral	15.86	19.63	19.83
	Agree	32.31	37.38	41.32
	Strongly Agree	30.57	23.3	20.66

Variables	Unit	Categories		
		Owner	Tenant	Lessor
Poor Agricultural Services from Govt.	Strongly Disagree	9.61	11.21	10.74
	Disagree	13.67	25.23	21.49
	Neutral	31.035	18.69	26.45
	Agree	30.41	36.45	29.75
	Strongly Agree	15.27	8.41	11.57
Crime Rate and Conflict	No Crime	29.1	15.89	26.45
	Some What	55.13	66.35	62.81
	High	15.77	17.76	10.74
Are there heavy indirect taxes on Agri.?	Strongly Disagree	9.395	10.28	12.39
	Disagree	12.27	19.63	10.74
	Neutral	12.11	10.28	18.18
	Agree	28.285	28.04	30.58
	Strongly Agree	37.94	31.77	28.09
Agri. Tax contribute growth of Agri.	Strongly Disagree	18.735	16.82	13.22
	Disagree	33.84	33.64	29.75
	Neutral	26.445	31.77	27.27
	Agree	20.045	15.89	21.49
	Strongly Agree	0.435	1.87	8.27
Govt. Listen to Farmers	Strongly Disagree	37.185	35.51	27.27
	Disagree	42.36	44.86	44.63
	Neutral	17.205	12.15	23.97
	Agree	3.03	6.54	4.13
	Strongly Agree	0.22	0.93	0
Are there any Social Benefits you receive from Govt?	Yes	14.27	14.95	25.62
	No	85.73	85.05	74.38

Source: Author's own calculations.

The results of binary logistic regression for the tax compliance behaviour of farmers are reported in Table 5. The table shows various factors affecting the tax compliance behaviour of farmers and lessors across different tenancy arrangements, including owners, owner cum tenants, tenants, and lessors. The results for the pooled data are also presented in Table 5.

Table 5: Factors Affecting the Tax Compliance Behavior Using Binary Logistic Regression

Tax Compliance	Owner	Tenant	Lessor	Pooled
Knowledge of Agri. taxes	0.206	0.436	0.478**	0.335***
Fair treatment of farmers	-0.176	-0.550	0.386	0.149
Satisfied with the Tax Authorities' performance	0.046	1.48***	0.612*	0.503***
Satisfied with the governance system	-0.189*	0.332	-0.210	-0.102
Satisfied with the judicial system	0.022	0.401**	0.119	0.006
Crime & conflicts	0.285	0.641	0.766*	0.211
Indirect taxes in Agriculture	0.088	-0.538**	-0.271	-0.236**
Tax contribution towards society	-0.198*	0.161	0.479*	0.447***
Tax contribution towards Agri. sector	-0.281**	0.611*	0.239	0.408***
The government listens to farmers	-0.074	0.267	-0.024	0.186
Taxes are used for social benefits	0.974***	1.684**	1.033**	0.836***
The government wastes tax revenue	-0.217**	-0.243	-0.209	-0.085
Poor Agricultural services	-0.162	0.303	0.085	-0.111
Education	0.041	-0.038	0.072	0.041*
Age	0.000	-0.044**	0.027	0.002
Constants	-0.304	-3.021*	-6.50**	-3.93***
Number of obs.	329	107	121	557
LR chi2(15)	50.78	38.07	48.90	148.12
Prob > chi2	0.0000	0.000	0.000	0.0000
Log likelihood	-192.28	-53.089	-57.920	-298.77
Pseudo R2	0.1167	0.263	0.297	0.20

*Notes: (*** p<0.01, ** p<0.05, * p<0.1).*
Source: Author's own calculations.

The knowledge (i.e., awareness) of the agriculture tax system statistically impacts tax compliance, especially of the lessor. This kind of statistical significance is also observed in the pooled sample. The coefficient for the lessor is 0.478, statistically significant at the 1% level, indicating a statistically positive relationship between awareness of agricultural tax and tax compliance behaviour. Similarly, the pooled sample shows a significant coefficient of 0.335 at the 1% level. These findings suggest that initiatives aimed at increasing awareness of agricultural taxation are likely to improve compliance rates, thereby increasing tax revenue from agriculture. Other important factors, such as satisfaction with the tax authorities, also demonstrate a statistically positive impact on tax compliance. Conversely, satisfaction with the governance system shows a statistically significant,

negative effect on tax compliance among owner-farmers. The results indicate a positive, significant relationship between the tax authority's attitude and farmers' compliance behaviour, where a unit increase in satisfaction with the tax authority leads to higher compliance. However, one study revealed that there is no significant relationship between the tax authority's attitude and farmers' tax compliance behaviour.

Perceptions of the justice system, crime, and conflict situations in the area also influence tax compliance. Tenants who are satisfied with the judicial system have a positive coefficient (0.401), indicating a positive impact of an efficient justice system on compliance behaviour. Conversely, the effect of crime and conflicts on lessors is statistically significant (0.766), suggesting that lower levels of crime and conflicts improve tax compliance among lessors. The results are like those of Palil (2010); on the other hand, Assfaw & Sebhat (2019) find no significant relationship between the two.

Higher indirect taxes have a statistically negative impact on tax compliance, as indicated by the significant negative effects for owners (-0.538) and the pooled sample (-0.236). This suggests that when indirect taxes rise, farmers are less likely to comply with tax laws regarding agricultural income tax. The belief that taxes support agriculture and society markedly improves the compliance rate. For instance, the coefficient for pooled data demonstrates that farmers are more likely to comply with tax laws when they believe their taxes benefit society and the agricultural sector. The finding is similar to Assfaw & Sebhat (2019) and Biru (2020).

Social benefits also have a statistically positive impact on tax compliance. These results are similar to Biru (2020) and Assfaw & Sebhat (2019), which indicates that when farmers receive benefits or rewards after paying taxes, they are more inclined to be compliant.

The government's wasteful use of tax money, i.e., inappropriate use of tax funds, has a statistically negative impact on farmers' tax compliance behaviour. Tax compliance is also affected by education. According to the pool data, higher compliance is associated with higher levels of education among farmers; the education coefficient is 0.041 and is significant at the 10% level. Mutai & Omwono (2022) and Assfaw & Sebhat (2019) also show similar result. However, Mensah et al. (2020) shows that education has no significant effect on tax compliance.

Institutional Hurdles in Agricultural Income Tax Collection

Three focus group discussions were held in May 2024 across three districts: Nankana Sahib, Lodhran, and Bhakkar, involving stakeholders such as farmers and tax authorities. The research team recorded all discussions. Several open-ended questions were asked to stimulate discussion, which are summarised below along with the respective responses.

Farmers rent out land because the youth have migrated to urban areas and lack family support to cultivate it. Many farmers also believe they can earn off-farm income opportunities in cities where access to civic amenities is better. They use the rental income for consumption.

In response to a question about issues related to the agricultural tax, most farmers replied that they pay the land-based tax demanded by the village 'numberdar', which ranges from Rs. 2000 to 6000. The 'numberdar' does not provide them with a receipt for the land tax paid. Farmers believe that official receipts for the tax paid would increase their trust in the tax collection system. They also feel that income-based taxation would not be effective, as most farmers are small-scale, less educated, and unable to keep records of their income. Preparing income-expenditure statements is nearly impossible for them. Abiana (water tax) is paid by tenants, while landlords pay land-based tax (if applicable).

Regarding the issue of rising land rents, most people attributed this increase to the high wheat prices in recent years. Similarly, the higher prices of other cereals, such as maize and potatoes, also contributed to the rise in rents. Conversely, fuel and electricity costs remained relatively low. The farmers believe that, given the circumstances, they can earn more by renting land rather than cultivating it themselves, possibly because renting offers them the chance to pursue other economic opportunities. From the tenant's perspective, the situation is not considered sufficiently favourable, especially due to the increase in input costs and the decline in prices of maize and wheat.

Regarding income-based agricultural taxation, farmers believe that the unpredictability in agricultural markets for farm inputs and outputs makes it difficult to agree on predetermined estimates of agricultural income tax, which are determined by the government. Therefore, an straightforward tax estimation system, along with ensuring benefits for farmers in return, could persuade farmers to pay taxes.

The 'Kanungos'—government officials—have stated that land-based agricultural tax is typically collected twice annually, with collection targets usually achieved at only about 70%. Income-based taxation of agriculture remains challenging because the Patwaris—government officers—are responsible for estimating farmers' income based on cultivated land and standard estimates of yield and costs. The tax authorities believe that it is not practical for a Patwari to estimate the incomes of hundreds of farmers within his assigned area and then collect the tax.

Tehsil tax authorities believe that land fragmentation is causing a gradual decline in average farm size. For instance, only about 2000 farmers in Tehsil Lodhran own land exceeding 12.5 acres. As a result, land-based taxes generate low revenue. Another major challenge is the shortage of human resources, as only a few officials (Patwaris) are responsible for evaluating the harvests of nearly 50,000 farmers in the Tehsil. Additionally, poor cooperation among various government departments hampers tax collection; for example, the collaboration between the Revenue Department, the land record authority, and the agricultural department is weak. Tax authorities also believe that technology could help address this issue. Digitising the tax collection process could boost revenue, as the traditional Patwari system is ineffective for managing income-based taxation. Greater cooperation among government institutions to share information could strengthen the capacity of tax collection agencies.

CONCLUSION

Changes in rental markets influence tax collection, highlighting the need to review the current tax system for effective agricultural taxation amid changing rental conditions. The project's specific aims are to estimate tax revenue across various tenancy arrangements, assess farmers' compliance with agricultural income tax, and identify institutional barriers in collecting agricultural taxes.

Data have been gathered from 557 respondents, comprising 436 farmers (owners and tenants) and 121 lessors from three districts of Punjab: Bhakkar, Lodhran, and Toba Tek Singh. Both statistical and econometric techniques, including logistic regression, have been utilised.

Currently, the Punjab province generates around Rs. 2.5 billion from land-based tax on agriculture, falling short of the target of Rs. 4.5 billion. Exploring alternative options under different tenancy arrangements could

generate additional revenue. Our findings suggest that imposing a property tax at 5% on lessors' income could generate an extra Rs. 18 billion, bringing the total agricultural income tax in Punjab to Rs. 79 billion.

Farmers' tax compliance behaviour is positively influenced by their satisfaction with tax authorities and the government. An increase in tax-related knowledge has a statistically significant positive effect on compliance behaviour. However, the perception that there are substantial indirect taxes on agriculture decreases farmers' compliance behaviour. Similarly, the belief that agricultural services are poor also reduces tax compliance.

We also show that the centuries-old patwari system remains a major institutional obstacle to implementing an income-based agricultural tax. Using technology, including digitisation, to assess and collect this tax is the way forward.

RECOMMENDATIONS/ POLICY IMPLICATION

Historical evidence shows that many large farmers have opted to lease out their agricultural lands and shift their livelihoods to urban centres. They earn rental income without paying taxes, as they declare the rent as income from agricultural sources. There is a need to redesign agricultural taxation tools to better improve agricultural income tax. Due to changes in the rental market structure, absentee landlords are becoming increasingly common. Therefore, the tax system must focus on farmers who have leased out their land and are earning rental income. Our analysis revealed that treating agricultural leasing income as rental income and subjecting it to the property tax regime could generate an additional Rs. 18 billion in Punjab, thereby increasing the total annual agricultural tax revenue in the province to about Rs. 79 billion.

Enhancing the capacity of provincial tax authorities and introducing greater sophistication and transparency in estimating agricultural income tax owed by farmers would increase their confidence in the tax system. Digitising the entire process of estimating agricultural income, tax payable, and its collection would not only improve efficiency but also build trust in this system. This is likely to encourage farmers to be more willing to pay agricultural income tax.

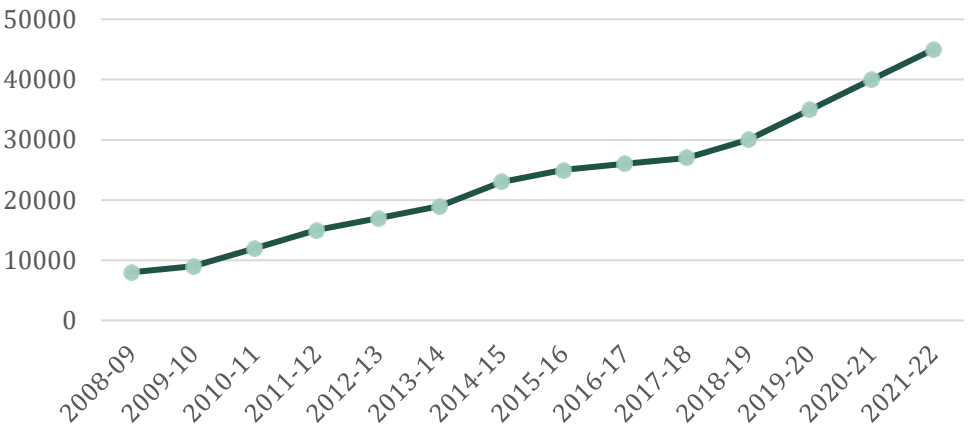
2. TENANCY ARRANGEMENTS AND ITS EFFECTS ON LAND AND WATER MANAGEMENT

INTRODUCTION

Agriculture is a crucial sector for Pakistan's economy, employing approximately 42% of the labour force. Around 65% of the population relies on agriculture for their livelihood. (GOP, 2021). Nonetheless, land distribution in Pakistan remains very unequal, with a small number of large landowners owning the majority of agricultural land. According to some estimates, only 2% of large-scale farmers control 45% of the land. (GOP, 2010; Naseer et al., 2016). These large landowners possess extensive land holdings and have better access to off-farm income opportunities, which creates significant disparities among different groups of farmers, especially small landholders who find it difficult to acquire additional land for their livelihoods. This unequal land distribution leads to notable social and economic inequality in rural communities.

Higher land concentration is linked to land absenteeism, where owners do not live near their farmland and do not manage it directly. This negatively affects farm productivity and the distribution of agricultural surplus. (Boberg-Fazlić et al., 2022; Dower & Pfutze, 2020; Keswell & Carter, 2014). Historical data show a rising trend of tenancy, especially in Punjab, with absenteeism raising concerns about the long-term sustainability of resources and agricultural productivity. Some studies (Deininger et al., 2022; Ali et al., 2012) suggest that transferring land to motivated small farmers boosts efficiency; others highlight negative effects on productivity and irrigation investments, especially in developing countries, if land agreements are not fully secured. (Ali et al., 2012; (Kumari & Nakano, 2016). Evidence suggests that secure land rights and long-term land contracts improve farm efficiency and productivity. (Jacoby & Mansuri, 2008). The motivation to engage in land rental markets differs among developing economies, with small landholders competing against corporate farms. (Han et al., 2021). Successful long-term leasing arrangements are enabled by access to credit, family labour, and superior land qualities. (Rashid & Sheikh, 2015).

Figure 2: Agricultural Land Rent in Punjab (Rs. / acre)



Source: GOP (2022).

As agricultural land rents rise (Figure 2), leasing out farmland has led to the issue of absentee landlords who have a less personal connection to the land and community as they only collect the rent. Absenteeism results in a lack of interest in the farm's long-term success, leading to short-term thinking and a focus on quick profits over sustainable practices. This disengagement reduces investments in long-term productivity, ultimately affecting agricultural output. It highlights the need for better access to local resources, services, and information, which could positively influence the farm's productivity.

Research Objectives

The studies mentioned above have explored the effects of tenancy arrangements on crop yield and soil fertility. However, they have not examined the factors influencing leasing decisions, resource use efficiency, technology adoption, or access to agricultural services and inputs. Therefore, the specific objectives of this study are:

- To investigate the determinants of renting agricultural land
- To examine the implications of absentee landlords' land on water management and
- technology adoption.

REVIEW OF LITERATURE

Greater land concentration is also linked to land absenteeism, where landowners do not live on or directly manage their land. This absenteeism harms farm productivity and causes an imbalance in the distribution of agricultural surplus. (Boberg-Fazlić et al., 2022; Dower & Pfutze, 2020); Keswell & Carter, 2014). Absentee landlords frequently neglect to invest in technology, resulting in underuse and inefficiency in agricultural methods.

Historical data indicate that tenancy trends have been increasing over time, particularly in Punjab. Mohammad & Qureshi (1987) and Naseer et al. (2016) reported that larger farms, ranging from 50 acres to 150 acres and above, are operated under some forms of tenancy at 41% and 67%, respectively. There is a growing trend of tenancy, which has also raised concerns about absentee landlords, who often lack a direct stake in the productivity and efficient use of resources.

The global literature on land tenure and productivity presents a mixed picture. Some studies like Ali et al. (2012), and Deininger et al. (2022), suggested an increase in allocative efficiency and production by transferring land from less motivated but affluent farmers to small farmers with ample family labour. Jin & Deininger, (2009) and Lohmar et al., (2001) have highlighted the more effective use of potentially idle land when rented to more diligent small landholders. Additionally, research by Feng et al. (2010) suggests a higher use of chemical fertilisers on the rented lands, with no adverse impact on yield in the short term.

Conversely, various studies have reported adverse impacts of land tenure systems, especially in developing countries (like Pakistan, India, and other Asian and African countries), on productivity and irrigation investments. (Ali et al., 2012; Kumari & Nakano, 2016; Akram et al., 2019a). These studies also emphasise the importance of secure land rights, such as long-term contracts and ownership, in encouraging investments in soil quality and productivity-enhancing measures, thereby boosting farm efficiency and yield. (Jacoby & Mansuri, 2008). Sharecropping arrangements are associated with reduced productivity and resource use efficiency, as shown by (Kassie & Holden, 2007; Besley & Ghatak, 2010). Nonetheless, some studies, like those by Lawry et al., (2017) and Ghebru & Holden, (2013), have reported positive impacts of secure land tenure on income, welfare, and consumption patterns, ultimately improving overall livelihoods.

The motivation to participate in land rental markets differs between developing and transitional economies, where small farmers must compete for land with corporate farms. (Han et al., 2021). Small landholders with better access to assets (Machinery, etc.) have a greater tendency to rent-in land (Abate & Schaapp, 2022). Moreover, farmers belonging to clusters also have a higher tendency to rent-in land for farming. Literature also suggests that the capacity to work through legal aspects, awareness of government policies (legislation), and access to credit, facilitate successful long-term land leasing arrangements. Similarly, the availability of family labour, and the requisite skill also facilitate land leasing arrangements (Adenuga et al., 2021; Akram et al., 2019b). Other studies, like Rashid & Sheikh, (2015), attach a higher value and probability of leasing to lands having better location and physical characteristics like fertility, access to surface water, and good-quality groundwater.

RESEARCH METHODOLOGY

Methodology to Investigate the Causes of Renting-in Land

To examine the renting-out decisions, we use multinomial logistic regression. The dependent variable (Y) indicates the farmer's type of tenancy status.

Literature indicates that several factors can influence a farmer's or landlord's leasing decisions. These include the availability of labour, primary occupation, age, education, land type, proximity to land, access to roads and credit, local rent levels, etc. (Bawa & Callahan, 2021; Goswami, 2017). The functional specification of the model is as follows:[3]

$$Yi* = \beta 0 + \beta 1EDUi + \beta 2FAMTi + \beta 3\,DISMi + \beta 4LSi + \beta 5AGMACHi + \beta 6APIi + \beta 7CAi + \beta 8FAMBi + \beta 9DISTi + \beta 10TYPLi + \beta 11PSINi + \beta 12LNDRi + Ui \quad (1)$$

The latent variable Yi indicates the categories of farmers based on their tenancy status. Ui represents the random disturbance term, which is presumed to follow a normal distribution with a mean of zero.

[3] Description of variables is placed at Annexure-II.

Methodology to Examine the Implications of Absentee Landlords on Land and Water Management and Technology Adoption

The ordered probit model is utilised to identify factors influencing the adoption of land and water management practices and technologies. The indices of Water Management Practices (LWMP) and Technology Adoption (TA) were developed using Principal Component Analysis and composite indexation methods.

The ordered probit model is a simple extension of the binary probit model that can be utilised when dealing with multiple ranked discrete dependent variables. (Munkin & Trivedi, 2008). If the dependent variable has more than two values, but these values have a natural order, the ordered probit model is suitable. (Gailmard, 2014).

The dependent variables for the ordered probit model can be expressed as a threshold model with a latent dependent variable, as shown below:

$$\boldsymbol{Y^* = \beta^{!} X + \varepsilon} \qquad (\mathbf{2})$$

where Y* = unobserved dependent variable (while we cannot observe Y*, we can observe only the categories of response), X = a vector of respondent characteristics, $\beta^{!}$ the vector of regression coefficients that we wish to estimate. It is assumed that ε, a vector of unknown parameters to be estimated is normally distributed with a zero mean. The Eq. (2) can be used to specify the empirical model given in the Eq. (3) below:

$$\boldsymbol{Y^* = \beta_o + \beta_1 EDU + \beta_2 AGE + \beta_3 FMEM + \beta_4 FEXP + \beta_5 DISM + \beta_6 WEATH + \beta_7 CULAREA + \beta_8 LNDT_i + \beta_9 LLV + \beta_{10} DGS + \beta_{11} DBL + \beta_{12} HCD + \beta_{13} DIST_i + \varepsilon} \qquad (\mathbf{3})$$

Where Y* = Land and water management practices for the first phase and technology adoption of the second phase regression (ordered dependent variable with 0, 1, and 2).

FINDINGS AND DISCUSSIONS

Investigating the Causes of Renting in Land

Table 6 presents the descriptive statistics of the variables used to analyse the causes of land renting. It categorises farmers into three groups. The owner category includes farmers who own and cultivate their land. Tenants do not own land and use rented land for cultivation. The table indicates that the average years of education for owners and tenants are 8.76 and 7.02,

respectively. Additionally, 44.25% and 43% of respondents live in a joint family system. The average farming experience across all categories is 18.42 years. The proportion engaged in non-agricultural businesses is 18% and 18.6%, respectively. It also shows that the average farm size for owners and tenants is 13.55 and 10.49 acres, respectively.

Table 6: Socioeconomic Characteristics of Farmers under Different Tenancy Status

Variable	Unit	Categories	
		Owner	Tenant
Education	Years	8.765	7.02
Family Type	Joint (%)	43.5	45
Distance to Agri. Market	Kilometers	4.575	5.85
Farming Experience	Years	19.485	17.36
Business other than agriculture	Yes (%)	18	18.68
Livestock	Yes (%)	79	69.15
Total Cultivated Land	Acres	13.55	10.49
Agri. Machinery	Yes (%)	41.25	59
Canal Irrigated Area	%	7.24	12.14
Tubewell Irrigated Area	%	13.3	20.56
Canal + Tubewell Irrigated Area	%	78.8	67.28
Barani/Rainfed Area	%	0.655	0
Rent of Canal Irrigated Area	Rs./Acre	57,857	99,000
Rent of Tubewell Irrigated Area	Rs./Acre	58,666.5	96,695
Rent of Canal + Tubewell Irrigated Area	Rs./Acre	5,4493.5	89,305

Source: Author's calculations.

The multinomial logistic regression analysis identifies the factors affecting the likelihood of land rental among different categories of farmers (Owners, Owner-cum-Tenants (OCT), and Tenants). The results shown in Table 7 present the coefficients for the owner-cum-tenant and tenant categories, with the owner as the reference category.

Table 7: Estimates of Multinomial Logistic Regression for Land Leasing Decisions

	Categories		
Variables	Owner	Owner-cum-Tenant	Tenant
	Base		
Education	-	-0.075**	-0.160***
Family Type (Nuclear=0, Joint=1)	-	0.818 ***	0.354
Distance to Market	-	-0.005	0.056**
Farming Experience	-	-0.042***	-0.052***
Livestock	-	0.888**	0.007

	Categories		
Variables	**Owner**	**Owner-cum-Tenant**	**Tenant**
No. of Family Labor	-	-0.013	0.633***
Agriculture Machinery	-	0.074	-1.07**
Agri. Practices Index	-	0.006	-0.121**
Cultivated Area	-	0.059***	0.042**
Family Business	-	-0.285	0.065
District Names (Base: Bhakkar)			
Nankana Sahb	-	0.785*	0.982**
TT Singh	-	0.448	1.074**
Lodhran	-	1.34***	1.611***
Type of Land			
Canal + Tube Well	-	0.672	-0.074
Tube Well	-	1.677**	1.633**
Land Rent	-	0.003**	0.001
Constant	-	-7.069***	-0.974*
Number of observations	436		
Pseudo R2	0.1850		

Source: Author's own calculations.

In the Owner-cum-tenant category, each additional year of education decreases the likelihood of renting land by 8 per cent in log odds compared to the base category (owner). This finding aligns with the study of Schulte et al. (2022). The family structure is of significant importance, with joint families in the owner-cum-tenant (OCT) category being notably more likely to lease land. This pattern could be linked to shared resources and labour availability within joint family systems. Similarly, owning livestock increases the likelihood of leasing land for owner-cum-tenant families, suggesting that these families may need additional land to support their livestock activities.

Distance to the market has a significant positive effect on the likelihood of leasing land by OCT. However, an increase in distance to the market also raises the likelihood of tenants renting land. Similar findings were reported by. Kassegn & Abdinasir (2023), who noted that proximity to markets facilitates easier access to agricultural inputs and better opportunities for selling produce, thereby making leasing more appealing. The number of family labourers also significantly increases the likelihood of tenants renting in land, which aligns with the findings of Kundu & Goswami (2022), who highlighted that the availability of family labour can reduce labour costs and make leasing land feasible.

Irrigation methods significantly influence land renting decisions. Lands irrigated by tube wells are more likely to be rented in than those irrigated by canals. This preference may be due to the perceived reliability and control over the water supply offered by tube wells. (Niamatullah et al., 2022).

Geographical location also affects renting choices. The likelihood of renting land is greater in Lodhran compared to other districts such as Toba Tek Singh, Nankana Sahib, and Bhakkar, with notably high coefficients for both owner-cum-tenant (1.34) and tenants (1.611). This highlights regional variations in land rental markets.

The analysis also indicates that landowners who adopt better agricultural practices and have access to farm machinery are more likely to retain their land, reflecting their dedication to intensive farming and the utilisation of their investments. Conversely, land rent has a positive influence on the likelihood of renting-in land for owner-cum-tenant (0.003), although this effect remains relatively small.

Economic Implications of Absentee Landlords on Land and Water Management Practices (LWMP) and Technology Adoption (TA)

The variables in Table 8 show that the average education level of the owner and the tenant is 8.76 and 7.02 years, respectively, while the average age is 42.3 years. Additionally, the average family size is 7.8. The average farming experience totals 18.42 years. The mean distance to the nearest agricultural market is 5.21 kilometres. Furthermore, a significant number of owners and tenants receive updates on weather, prices, and production technology via their phones. The average farm acreage for owners and tenants is 13.55 and 10.49 acres, respectively.

Table 8: Socioeconomic Characteristics of Farmers under Different Tenancy Status

Variable	Unit	Categories	
		Owner	Tenant
Education	Years	8.765	7.02
Age	Years	42.725	41.8
Family Member	No.	7.85	7.9
Distance to Agri. Market	Kms	4.575	5.85
Farming Experience	Years	19.485	17.36
Weather information on the phone	Yes (%)	49.5	41.12
Total Cultivated Land	Acres	13.55	10.49
Canal Irrigated Area	%	7.24	12.14
Tubewell Irrigated Area	%	13.3	20.56
Canal + Tubewell Irrigated Area	%	78.8	67.28

Source: Author's calculations.

Table 9 presents the distribution of the Land and Water Management Practices Index (LWMPI) across different land tenure arrangements, such as owners and tenant farmers. The land and water management practices index is divided into three levels: Low (1-4), Medium (5-7), and High (8-10), reflecting various degrees of involvement in water and land management practices.

Table 9: Land and Water Management Index

LWMP Levels	Owner (%)	Tenant (%)
Low (1-4)	40.68	57.01
Medium (5-7)	50.67	38.28
High (8-10)	13.65	4.71

Source: Author's own calculations.

Table 10 presents the distribution of the Technology Adoption index across various land tenancy arrangements: owner and tenant farmers. The index is divided into three levels: Low (1-4), Medium (5-7), and High (8-10), indicating different degrees of technology use in agricultural practices

Table 10: Technology Adoption Index

Technology Adoption Levels	Owner (%)	Tenant (%)
Low (1-4)	50	59
Medium (5-7)	32	32
High (8-10)	18	9

Source: Author's own calculations.

This highlights substantial difficulties in accessing and adopting advanced agricultural technologies, which could be due to short-term land tenure and limited investment capacity among stakeholders.

Table 10 presents the results of an ordered probit regression analysis examining how various factors affect land and water management practices under different tenancy arrangements. We estimated two separate regression models, dividing the data into two groups: Owners and Tenants. The dependent variable, land and water management practices, is categorised into three levels: 0 (low), 1 (medium), and 2 (high). Along with other explanatory variables, the regression models include three variables representing the lessor's support for the farmers. The control variables encompass age, education, number of family members, farming experience, distance to market, availability of weather information, total cultivated area, family labour size, land type, and the district where the land is situated.

Table 11: The Effects of Tenancy Arrangements on Land and Water Management Practices with Ordered Probit Model

Land and Water Management Practices	Owner	Tenant
Education	0.005	-0.018
Age	0.008	0.029*
Family Member	-0.008	-0.053
Farming Experience	-0.012	-0.028*
Distance Market	-0.002*	0.015
Weather Information	0.370***	0.447*
Total Cultivated Area	0.019***	0.030**
Land Type		
Canal + Tube Well	-0.374	-0.412
Tube Well	-0.039	-0.508
Support by absentee landlords		
Landlord Visit	-	-0.002
Documents Govt. Subsidy	-	1.017**
Documents Bank Loan	-	0.587
Help Crop Damage	-	-0.759
/cut1	-0.421	1.313
/cut2	1.184**	3.205*
Observations	329	107
Pseudo R^2	0.063	0.1677

*Notes: (*** p<0.01, ** p<0.05, * p<0.1).*
Source: Author's calculations.

The results are interpreted based on the estimated coefficients, which indicate the direction and significance of the relationships between the predictors and the levels of Land and Water Management Practices Index (LWMPI). Age has a significantly positive effect on land and water management practices in the tenants' category. This indicates that older farmers are more likely to engage in better land and water management practices (Oduniyi & Tekana, 2021).

Distance to the market has a significant adverse effect on the LWMPI in the owners' category. This implies that a greater distance to markets may reduce effective land and water management. Weather information has a significantly positive effect on LWMP in both the owners' and tenants' category. This underscores the importance of access to weather information in better promoting land and water management practices (Frisvold & Murugesan, 2013).

The cultivated area has a significantly positive effect across both the owners' and tenants' categories, indicating that larger cultivated areas are linked to higher levels of land and water management practices. Additionally, further significant positive effects are seen in all categories for farmers receiving

subsidies. This demonstrates that access to government subsidies promotes better land and water management practices. This serves as a key point that distinguishes the thresholds between the management practice categories. Significant values clearly indicate differences between low, medium, and high levels of land and water management practices.

The ordered probit regression results offer insights into the factors influencing land and water management practices under different tenancy arrangements. Age, access to weather information, and total cultivated area consistently encourage higher levels of these practices. Conversely, farming experience and family size decrease the likelihood of adopting advanced land and water management practices. Additionally, proximity to markets and access to government subsidies play a crucial role in enhancing these practices.

Table 9 shows the impact of absentee landlords on farmers' adoption of technology. We estimate two different equations from the ordered model, using data from both owners and tenants. The technology adoption index has three levels: small (0), medium (1), and high (2). In addition to various control variables, the regression equations also include treatment variables that reflect landlords' support for the farmers.

The results are analysed based on the estimated coefficients, which indicate the direction and significance of the relationships between the predictors and levels of technology adoption. Education has a clearly positive effect on technology adoption, especially for owners and tenants. This implies that higher education levels increase the likelihood of adopting medium- or high-tech solutions in these groups. (Challa & Tilahun, 2014). Distance to the market has a notably positive impact on technology adoption in both the owner-cum-tenants and tenant combined groups, as well as in owners and tenants separately, indicating that proximity to markets encourages greater technology adoption.

The total cultivated area consistently shows significant positive effects for both owners and tenants, indicating that farmers with larger cultivated areas are more likely to adopt higher levels of technology. (Hu et al., 2022). The canal-plus tubewell irrigation system has a notably positive impact on data concerning owners and tenants compared to the canal-based irrigation method. Similarly, tubewell-based irrigation demonstrates a significantly positive effect on technology adoption, as indicated by pooled data, in comparison to canal-based systems. This emphasises the importance of irrigation infrastructure in encouraging technology adoption, with farmers equipped with tubewells being more inclined to embrace new technologies.

The coefficients of landlord visits have a notable positive effect on the case, as well as on technology adoption by tenants. This may suggest a stronger relationship between landlords and farmers in decision-making. Landlords who utilise subsidies and loans also have a significant positive impact on tenants. This indicates that access to subsidies and loans encourages higher levels of technology adoption. (Wu et al., 2022).

Table 12: The Effects of Tenancy Arrangements On Technology Adoption

Technology Adoption	Owner	Tenant
Education	0.057**	0.015*
Age	0.021**	0.053*
Family Member	0.011	0.041
Farming Experience	-0.007	-0.052**
Distance Market	-0.008*	0.065**
Weather Information	-0.056	0.349
Total Cultivated Area	0.063***	0.086***
Land Type		
Canal + Tube Well	0.180*	0.148**
Tube Well	-0.153	0.915
Landlord support to farmers		
Landlord Visit	-	0.009*
Documents Govt. Subsidy	-	0.788*
Documents Bank Loan	-	-1.092
Help Crop Damage	-	0.476
Districts		
Lodhran	-0.659***	0.323
Nankana sahib	0.231	0.922
Toba Tek Sing	0.219	0.696
/cut1	2.383***	4.242**
/cut2	3.593***	5.026***
Observations	329	107
Prob > chi2	0.0000	0.0002
Pseudo R2	0.2270	0.2604

Source: Author's calculations.

CONCLUSION

Agriculture is vital to Pakistan's economy, but over time, the highly uneven land distribution—where 2 per cent of large farmers own 45 per cent of the land—creates significant social and economic inequality. Large landowners generally have better access to off-farm income, while smallholders find it difficult to access more land. A high concentration of land also leads to absenteeism, with owners not living on or managing their land, thereby reducing productivity. While transferring land to motivated small landholders can boost efficiency, securing land rights and long-term contracts is essential.

Our results indicate that farmers with more family labour and those living away from markets tend to rent land. Similarly, farmers who own livestock are more likely to rent land. Compared to the Bhakkar district, the probability of farmers renting land is higher in the other districts assessed. This might be due to greater crop production in these districts. Relative to land irrigated by canals, the likelihood of renting tubewell-irrigated land is increased. This suggests that farmers prefer to retain canal-irrigated land for themselves and are more inclined to rent out land irrigated by tubewells.

Regarding the economic implications of absentee landlords on land and water management, those absentee landlords who support farmers in obtaining subsidies have a notable positive impact on land and water management practices. Conversely, absentee landlords who frequently visit their land and assist tenants in acquiring government subsidies and bank loans also have a significant positive impact on farmers' adoption of new technology. This suggests that strong working relationships between landlords and tenants can enhance soil health and promote the adoption of technology.

RECOMMENDATIONS/ POLICY IMPLICATION

Land leasing arrangements significantly impact agricultural productivity by influencing land-based investments, particularly in land structure improvements and high-efficiency irrigation systems. The negative impacts of leasing arrangements can be minimised through formal lease agreements with longer durations. It is essential to regulate land leases by promoting long-term contracts.

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ANNEXURES

Annexure I

Table 13: Punjab Agricultural Income Tax Rates in Punjab, Pakistan

Area-Based Agricultural Income Tax		
Sr. No.	**Land Ownership**	**Tax Rate: (Rs. per acre)**
1	Up to 12.5	**0**
2	12.5 acres to 25 acres	300
3	26 acres to 50 acres	400
4	50 acres or more	500
	Mature Orchards Irrigated	600
	Mature Orchards Unirrigated	300
Income-Based Agricultural Income Tax		
1	If total income does not exceed Rs. 400,000/=	0
2	If total income is more than Rs. 400,000 but does not exceed Rs. 800,000/=	1000
3	If total income is more than Rs. 800,000 but does not exceed Rs. 1200,000/=	2000
4	If total income is more than Rs. 1,200,000 but does not exceed Rs. 2,400,000/=	5% of the amount exceeding Rs. 1,200,000
5	If total income is more than Rs. 2,400,000 but does not exceed Rs. 4,800,000/=	Rs. 60,000 plus 10% of the amount exceeding Rs. 2,400,000
6	If total income is more than Rs. 4,800,000/=	Rs. 300,000 plus 15% of the amount exceeding Rs. 4,800,000

Source: Government of Punjab (n.d.).

Annexure-II: Description of Model's Variables

Sr. No.	Objective		Methodology	Dependent variables	Independent variables
1	Investigate the causes of renting land and the possible implications of absentee landlords' land on water management practices and technology adoption.	Investigate the causes of renting land	Multinomial logistic regression	Tenancy Status (Y=0 if owner, Y=1 if tenant and Y=2 if owner cum tenant)	Education, family type, distance to market, farming experience, livestock, family labour, agricultural machinery, agricultural practices index, total cultivated area, family business, land type, land rent, district name
		Implications of absentee landlords on land and water man-age-ment practic-es (LWMP)	Ordered probit model	Land and Water Management Practices Index (y=0 poor, Y=1 moderate and Y=2= high)	Education, age, family member, distance to market, weather information, cultivated area, type of land, landlord visit, and whether the landlord provides land documents; for govern-ment subsi-dies, bank loans, and assistance with crop damage and district support.

Sr. No.	Objective		Methodology	Dependent variables	Independent variables
	Investigate the causes of renting land and the possible implications of absentee landlords' land on water management practices and technology adoption.	Implications of absentee landlords on technology adoption (TA)	Ordered probit model	Technology Adoption Index (y=0 poor, Y=1 moderate and Y=2= high)	Education, age, family member, distance to market, weather information, cultivated area, type of land, landlord visit, landlord providing land documents for government subsidy, bank loan, and assistance with crop damage, as well as district information.
2	Tax collection estimates under various tenancy arrangements		Scenario analysis	...	...
3	Analyse the farmers' compliance behaviours towards agricultural income tax under various tenancy arrangements.		Binary logit model	Tax compliance (y=0 No, y=1 yes)	Please consider your age, education level, and knowledge of the tax system, and let me know if there is anything else I can assist you with. Farmers' treatment of agricultural tax, satisfaction with attitude of tax authorities,

Sr. No.	Objective		Methodology	Dependent variables	Independent variables
					governance system, and justice, crime and conflicts, indirect taxes in agricultural tax contribute to society, the agriculture sector, the government listens to farmers, social benefits, and poor agricultural services
4	Examine the institutional hurdles in agricultural income tax collection		Focus Group Discussions (FGDs)	...	...

Source: Author's own computaions.

Annexure III: Research Questionnaire

Questionnaire serial number: _____ Survey date: _____

Investigator: _____ District: _____

Tehsil: _____ Village: _____

Dear respondent

Objective: REQUEST TO FILL THE QUESTIONNAIRE

The Study Seeks to find out the Taxing the Rental Incomes in Agriculture: Analysis of Alternate Options.

The information you provide shall be confidential and used only for Academic and Research purposes. Please answer all questions as accurately and honestly as possible.

QUESTIONNAIRE

Taxing the Rental Incomes in Agriculture: Analysis of Alternate Options

A RASTA funded project (2023-24)

Objectives:

1. To investigate the causes of renting out/ renting in land and sharecropping and the possible economic implications of absentee landlords on water management and technology adoption.

2. To estimate the potential collection of agricultural income tax under various scenarios.

3. To analyse the farmers' compliance behaviours towards agricultural income tax under various land cultivation methods (tenancy, sharecropping, own cropping).

4. To examine the institutional hurdles in agricultural income tax collection.

A. Socioeconomic characteristics (Tick the option where needed)

A1. Name of Respondent: _____

A2. Education: _____ years

A3. Age: _____ years

A4. Farming experience: _____ years

A5. Distance to nearest agricultural market: _____ Km

A6: Did you get a loan from a bank or borrow money in the last two years from any source?

Yes ☐ No ☐

A7: What is your major source for loans or borrowing?

1= ZTBL, 2= Commercial banks; 3= Arthi and shopkeepers

4= Friends and relatives; 5= others _____ (specify)

A8. Does any family member do an off-farm job? Yes ☐ No ☐

A9. Does any family member do business other than farming?
Yes ☐ No ☐

A10. Primary occupation: Agriculture ☐ Job ☐
Business ☐

A11. Do you have livestock animals? Yes ☐ No ☐

A12. Do you have a mobile phone? Yes ☐ No ☐

A13. What type of phone? Simple ☐ Smartphone ☐

A14. Do you receive weather information on your phone? Yes ☐ No ☐

A15. Do you receive information on the prices of agricultural inputs and outputs via the phone? Yes ☐ No ☐

A16. Do you learn the production technology of crops on the phone?
Yes ☐ No☐

B. Farm Particulars

B1. Total agricultural land: _____ acres

B2. Total cultivated area: _____ acres

B3. Own area _____ acres.

B4. Area rented in _____ acres.

B5. Area shared in _____ acres.

B6. Area rented out _____ acres.

B7. Area shared out _____ acres.

B8. Rent of canal irrigated land _____ (Rs. / acre/year)

B9. Rent of tube-well irrigated land _____ (Rs. / acre/year)

B10. Rent of tube-well + Canal irrigated land _____ (Rs. / acre/year)

B11. Rent of Barani/Rainfed land _____ (Rs. / acre/year)

C. Labor

C1. Total Number of permanent workers on the farm: _____ No.

C2. Number of family workers on the farm: _____No.

D. Land Tenure Arrangements and Economic Implications

D1. For how long have you been cultivating the same land? _____ years

D2. Does the landlord permit the use of land documents to obtain government subsidies or support? Yes ☐ No ☐

D3. Does the landlord allow the use of land documents to secure a bank loan? Yes ☐ No ☐

D4. Does the landlord help you financially in case of crop damage?
Yes ☐ No ☐

D5. What is your relationship with the landlord?
a) Relative b) Friend c) Acquaintance

D6. How frequently does the landlord visit the land?

a)Weekly ☐ b) Monthly ☐ c) Once in 6 months ☐
d) Once a year ☐ e) Once in two years or more ☐

D7. What is the level of involvement of your landlord (if applicable) in making decisions related to crop cultivation?

a) Highly involved ☐ b) Somewhat involved ☐ c) Not involved ☐

D8. What is the level of involvement of your landlord (if applicable) in making decisions related to water management on the land you cultivate?

a) Highly involved ☐ b) Somewhat involved ☐ c) Not involved ☐

D9. What is the level of involvement of your landlord (if applicable) in making decisions related to technology adoption on the land you cultivate?

a) Highly involved ☐ b) Somewhat involved ☐ c) Not involved ☐

D10. What is the level of involvement of your landlord (if applicable) in making decisions related to land conservation and management practices?

a) Highly involved ☐ b) Somewhat involved ☐ c) Not involved ☐

D11. Please write if there is anything else you want to share regarding land tenure arrangements _____.

E. Farm and Land Management Practices

E1. Which techniques are used in the water and land management of agricultural fields? (Select Multiple)

a) Sprinkler Irrigation ☐ b) Drip Irrigation ☐ c) Furrow Methods ☐

d) Laser land levelling ☐ e) Crop Rotation ☐ f) Mulching ☐

g) Green Manuring ☐ h) FYM ☐ g) Water testing ☐

i) Soil testing ☐ j) Agro-forestry ☐ k) Cemented water courses ☐

E2. What type of modern agricultural practices do you adopt?

a) Tunnel farming b) Organic fertilisers c) Drone sprayer

d) Vertical Farming e) others, please specify _____

E3. Do you own agricultural machinery? Yes ☐ No ☐

E4. If so, please specify the type of machinery.

a) Tractor ☐ b) Trolley ☐ c) Tiller ☐ d) Chisel ☐ e) Harrow ☐

f) Blade ☐ g) Laser leveler ☐ h) Thresher ☐ i) Rotavator ☐

j) Boom Sprayer ☐ k) Bund maker ☐ l) Peter engine ☐

m) Tube well ☐ n) Solar system for the tube well ☐

o) Silage maker ☐ p) Reaper ☐ q) Subsoiler ☐ r) Happy Seeder ☐

E5. Do you apply FYM? Yes ☐ No ☐

E6. Do you apply gypsum? Yes ☐ No ☐

E7. Do you adopt crop rotation? Yes ☐ No ☐

E8. Do you apply fertilizer as per crop requirements? Yes ☐ No ☐

E9. Do you do soil sampling? Yes ☐ No ☐

E10. Land leveler? Yes ☐ No ☐

E11. Do you do water sampling? Yes ☐ No ☐

E12. Do you do moisture conservation? Yes ☐ No ☐

E13. If yes, which method do you use? _____

F. Cropping Area and Yield

F1. If Cultivated Own land

	Name of Crop	Area/ acres	Soil fertility Very good=1, good=2, Poor=3	Underground water quality Very good=1, good=2, Poor=3	Cost of Production (Rs./acre)								Yield (Munds)	Price/ Munds
					Seed	Land preparation	Pesticide	Fertilizer	Labor	Canal Irrigation	Tube well Irrigation	Harvesting		
Kharif Crop														
Rabi Crops														

F2. If cultivated, Share in the land

	Name of Crop	Area/ acres	Soil fertility Very good=1, good=2, Poor=3	Underground water quality Very good=1, good=2, Poor=3	Cost of Production (Rs./acre)								Yield (Munds)	Price/ Munds
					Seed	Land preparation	Pesticide	Fertilizer	Labor	Canal Irrigation	Tube well Irrigation	Harvesting		
Kharif Crop														
Rabi Crops														

F3. If cultivated Rented-in land

	Name of Crop	Area/ acres	Soil fertility Very good=1, good=2, Poor=3	Underground water quality Very good=1, good=2, Poor=3	Cost of Production (Rs./acre)								Yield (Munds)	Price/ Munds
					Seed	Land preparation	Pesticide	Fertilizer	Labor	Canal Irrigation	Tube well Irrigation	Harvesting		
Kharif Crop														
Rabi Crops														

G. Lessor Information

G1. Age of the head of the household: _____years

G2. Education of the head of the household: _____ years

G3. Where do you live? Rural Area ☐ Urban Area ☐

G4. Number of family members: _____

G5. Rented out acres: _____ Acres

G6. Farming Experience: _____years

G7. How do you rate your knowledge of agriculture?

a) Very poor b) Poor c) Neutral d) Good e) Very good

G8. Pieces of rented out land: _____ No

G9. Rent of rented-out land: _____ Rupees/acre

G11. Distance of rented-out land from home: _____ Km

G12. Primary source of family income: Agricultural rent ☐ Job ☐ Business ☐

G13. Do you own livestock: a) Yes ☐ b) No ☐

G14. The proportion of total household income other than agriculture: _____ %

G15. Involvement in decision making: a) Yes ☐ b) No ☐

G16. Proportion of landholding under irrigation:

Canal___Acres; Tube wells ___ Acres; Canal+Tubewell: ____ Acres; Rainfed____ Acres

G17. How often do you visit the land you rent out?

a) Weekly ☐ b) Monthly ☐ c) Once in 6 months ☐

d) Once in a year ☐ e) Once in two years or more ☐

G18.Please write if there is anything else you would like to share about the Lessor or Leasing arrangements.

H. Tax Scenarios, Budgeting and Scenario Analysis, Farming practice, tax compliance behaviour and trust in the tax system

H1. Do you perform financial planning and record-keeping?

Yes ☐ No ☐

H2. How frequently do you file agricultural income tax returns?

a) Never b) Rarely c) Sometimes d) Always

H3. In your opinion, how important is it for farmers to comply with agricultural income tax regulations?

a) Not important b) Little important c) Average

d) Important e) Very Important

H4. How do you rate your knowledge of agricultural income taxes?

a) Poor b) Fair c) Good d) Very Good
e) Excellent

H5. Do you think farmers are treated fairly in the agricultural tax system?

a) Strongly Disagree b) Disagree c) Neutral
d) Agree e) Strongly Agree

H6. How much are you satisfied with the tax authorities?

a) Strongly Dissatisfied b) Dissatisfied c) Neutral
d) Satisfied e) Strongly Satisfied

H7. How much are you satisfied with the governance system?

a) Strongly Dissatisfied b) Dissatisfied c) Neutral
d) Satisfied e) Strongly Satisfied

H8. How much are you satisfied with the justice system?

a) Strongly Dissatisfied b) Dissatisfied c) Neutral
d) Satisfied e) Strongly Satisfied

H9. How do you rate the crime and conflict situation in your area?

a) No crime b) Somewhat c) Extreme

H10. Do you think that there are heavy indirect taxes on agriculture?

a) Strongly Disagree b) Disagree c) Neutral
d) Agree e) Strongly Agree

H11. Do you believe in paying agri. taxes is a fair way to contribute to society?

a) Strongly Disagree b) Disagree c) Neutral
d) Agree e) Strongly Agree

H12. Do you believe that agricultural tax compliance positively contributes to the growth of the agricultural sector?

a) Strongly Disagree b) Disagree c) Neutral
d) Agree e) Strongly Agree

H13. Do you think that the government listens to farmers?

a) Strongly Disagree b) Disagree c) Neutral
d) Agree e) Strongly Agree

H14. Do you receive any social benefits after paying taxes? Yes □ No □

H15. Have you faced any penalties for non-compliance with agricultural tax? Yes ☐ No ☐

I. Taxes on Absentee Landlords and Sharecropper Income

I1. There should be separate taxes on the income of landlords and sharecroppers. Yes □ No□

I2. Whose income should be taxed more? a) lessor b) lessee.

I3. Assuming the imposition of tax on rental incomes, would this impact your decision on the current land tenure arrangement? Yes ☐
No ☐

I4. What would be a suitable rate of agricultural income tax on farmers cultivating their own land?

a)1%-5% b) 6%-10% c) 11%-15%

d) 16%-20% 2) >20%

I5. What would be a suitable rate of agricultural income tax on sharecroppers?

b) 1%-5% b) 6%-10% c) 11%-15% d) 16%-20%
2) >20%

I6. What would be a suitable rate of agricultural income tax on tenants?

a) 1%-5% b) 6%-10% c) 11%-15% d) 16%-20%
2) >20%

I7. What would be a suitable rate of agricultural income tax on lessors?

a) 1%-5% b) 6%-10% c) 11%-15%

d) 16%-20% 2) >20%

PART II

FOOD & AGRICULTURE

Policy Briefs

IMPACT OF GOVERNMENT POLICIES ON OLIVE PRODUCTION IN PAKISTAN

Khair Muhammad Kakar

INTRODUCTION

As Pakistan's agriculture is transitioning more towards commercialisation, leaving behind subsistence farming, a greater number of farmers are exploring their options. In pursuit of this, Pakistan's agricultural sector is undergoing a shift towards high-value crops, with olive cultivation gaining significant attention due to its potential economic and environmental benefits. It has been a while since olive plantations were initially established in Potohar, but they have since expanded to many areas of Pakistan. The government has implemented several policies and programs to promote olive growth. However, farmers and industry face challenges such as limited technical knowledge, inadequate access to quality plant materials, and a lack of processing and marketing facilities.

This study examined the influence of government policies on olive production in Pakistan. It evaluated policy interventions, their effectiveness, and identified gaps and areas for development. It also considered the challenges faced by farmers and explored the potential socio-economic and environmental advantages of olive cultivation.

METHODOLOGY

A multistage stratified sampling method was used to gather data through questionnaires for farmers and Key Informant Interviews (KIIs) with stakeholders across several olive-growing regions.

RESULTS

- **Status of Olive Plantation:** There is a widespread and concerted effort across provinces, with a substantial number of trees (5.6 million) and acres (45623) dedicated to olive cultivation. Balochistan (1.6 million trees), Khyber Pakhtunkhwa (KPK) (1.4 million trees), and Punjab (2.1 million trees) are the main contributors.

- **Status of Olive Oil Extraction Units:** A decentralised and widespread strategy involving both public and private sectors is evident. Processing infrastructure is established across various provinces, with 34 olive extraction units throughout Pakistan, featuring capacities ranging from 50 kg per hour to 600 kg per hour.
- **Socioeconomic Indicators of Olive Producers:** The average education level is 13.26 years, with an average farming experience of 8.84 years. Access to essential services, such as extension services, subsidies, and weather information, remains limited for a significant proportion of farmers.
- **Farmers' Responses to Policy Interventions:** Farmers showed interest in increased investment if the government offered various incentives, including subsidies for costs, processing units, training, and drought-resistant varieties. Better water availability and crop insurance were also regarded as positive factors.
- **Farmers' Concerns:** Access to high-quality inputs (fertilisers, pesticides, herbicides) and markets (both national and international) were identified as significant concerns.
- **Results of the Analysis of Agricultural Policies:** The Policy Analysis Matrix (PAM) shows that Balochistan has a comparative advantage in olive production due to a lower domestic resource cost (DRC). However, price volatility and policy inconsistency require attention.

KEY FINDINGS

- Government policies have contributed to the initial growth of the olive sector.
- Limited access to essential services, high input costs, and inadequate market access inhibit olive production.
- Farmers are receptive to government support and better policies.
- Balochistan possesses the potential for higher productivity.

RECOMMENDATIONS

- **Policy Continuity and Targeting:** Ensuring consistent and targeted policy interventions based on regional needs and crop specificities would further strengthen this sector.

- **Improved Access to Inputs:** Facilitating access to high-quality fertilisers, pesticides, and herbicides at affordable prices is the need of the hour.

- **Market Development:** Emphasising the promotion of domestic and international markets for olive products through branding, packaging, and compliance with international standards would further bolster this valuable economic activity.

- **Water Management:** Implementing strategies to improve water availability under the decreasing water availability circumstances and enhancing irrigation efficiency for olive cultivation would help farmers cope with the challenge of water scarcity.

- **Technical Support:** Providing training and extension services to farmers on best practices in olive orchard management, pruning techniques, and pest control is essential, for which all stakeholders should be capacity strengthened.

- **Processing Infrastructure:** Investing in establishing additional processing units, especially portable ones, to overcome capacity constraints. This is crucial for more remote areas where access is limited.

- **Climate-Smart Practices:** Encouraging the adoption of climate-resilient olive varieties and adaptation strategies is essential for the development of the olive sector. Olive breeding is another area that requires improvement and investment.

CONCLUSION

The olive sector in Pakistan has great potential for economic growth, employment opportunities, and environmental sustainability. By addressing current challenges and implementing recommended policy improvements, the government can significantly enhance olive production and help Pakistan become a significant player in the global olive oil market.

THE POLITICAL ECONOMY OF WHEAT SUBSIDY AND FOOD SECURITY IN GILGIT-BALTISTAN

Saranjam Muhammad Baig, Kifayat Ullah, and Attaullah Shah

BACKGROUND

The households in Gilgit-Baltistan (GB), Pakistan, have been receiving a uniform wheat subsidy since the 1970s to ensure food security in this geographically isolated and economically vulnerable region. Despite the provision of 1.6 million subsidised wheat bags annually, GB continues to face significant food insecurity, with over 50% of the population affected by insecurity. This situation raises concerns about the effectiveness and sustainability of the current subsidy program.

KEY ISSUES IDENTIFIED

Inefficient Targeting

The current subsidy is evenly distributed, regardless of household income levels, leading to inefficiencies. Wealthier households benefit as much as poorer ones, diminishing the programme's impact on the most vulnerable.

Operational Challenges

The public distribution system is opaque and vulnerable to corruption, including black marketing and pilferage. These problems hinder the subsidy from reaching those who need it most. This further worsens food insecurity.

Impact on Local Agriculture

The subsidy discourages local wheat farming, increasing dependence on imported supplies and decreasing dietary variety. This has also caused a decline in the cultivation of nutritionally rich local crops, such as barley and buckwheat.

Economic and Environmental Costs

The subsidy adds to the federal budget deficit and has lasting effects on both fiscal stability and environmental sustainability. The opportunity cost of maintaining the subsidy involves underinvestment in public goods and a lack of agricultural innovation.

POLICY RECOMMENDATIONS

Targeted Subsidy Programs

Redesign the subsidy to target low-income households, ensuring that the benefits reach the most vulnerable. This approach can improve efficiency, lessen the fiscal burden, and better tackle food insecurity.

Improved Distribution Transparency

Improve the transparency of the wheat distribution system by establishing clearly defined quotas and compliance mechanisms. This could include digitising the supply chain to monitor wheat allocations and prevent leakages.

Support Local Agriculture

Redirect subsidies to support local wheat production and diversify crops in GB. Promote the cultivation of traditional grains, which are better adapted to the region's agro-climatic conditions and enhance nutritional security.

Sustainable Food Systems

Invest in sustainable dependency on external wheat supplies. This includes expanding arable land through innovative farming techniques and promoting resilient crop varieties.

Long-term Policy Reforms

Consider gradually phasing out universal subsidies in favour of targeted support combined with investment in public goods such as education, health, and infrastructure. Such reforms can lead to broader economic development and improved regional food security.

CONCLUSION

The wheat subsidy in Gilgit-Baltistan requires urgent reforms to address its inefficiencies and ensure it achieves its primary objective of providing food for vulnerable groups. By focusing on targeted support, increasing transparency, and boosting local agriculture, the policy can better serve the region's people while encouraging sustainable development.

TAXING THE RENTAL INCOME IN AGRICULTURE

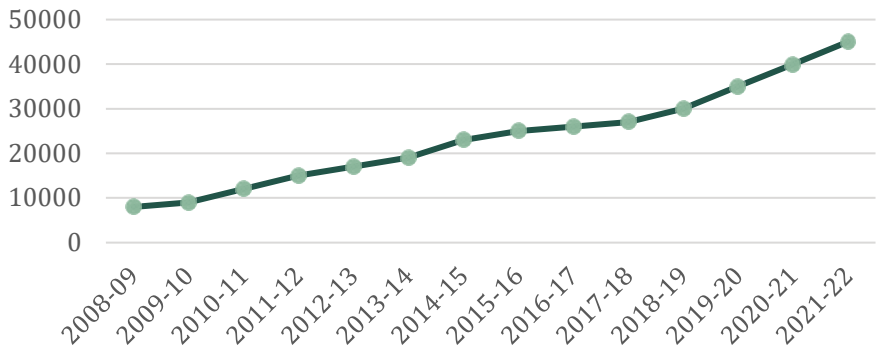
Irfan Ahmad Baig and Sami Ullah

INTRODUCTION

Agriculture is a vital sector of Pakistan's economy, characterised by a highly skewed land distribution, with only 2% of large farmers owning 45% of the land. These prominent landholders dominate land ownership and have better access to off-farm income opportunities, creating a significant disparity with small landholding farmers who find it difficult to secure additional land for their livelihoods. Meanwhile, the trend of leasing out agricultural lands has increased over time among large landlords. (Figure 1)

Absentee landlords have little personal connection to the land and the people who work on it. They simply rent out the land to earn income. Taxing absentee landlords could generate revenue for the government, which can then be used to fund public services, infrastructure development, and other essential governmental and community needs. These requirements call for a comprehensive reform of the agrarian tax structure in developing countries.

Figure 1: Agricultural Land Rent in Punjab (Rs. / acre)



Source: Government of Pakistan. 2022. Pakistan Economic Survey 2021-22.

Different countries have different tax systems for agriculture and land rental income. While some countries apply land-based taxes, others prefer to tax income directly. Similarly, agricultural land rents are also considered rental incomes in many tax systems – absentee landlords often face distinct tax consequences. Due to computational difficulties, taxes on agricultural income can be complicated. Land-based tax, on the other hand, is fixed with no computational difficulty.

Agriculture taxation in Pakistan has been subject to many challenges for a long time. An improvised agrarian income tax under different tenancy arrangements and its compliance in Pakistan is of prime importance to ensure wealth redistribution, equitable growth and higher tax revenue.

Taxation on agricultural income or land varies worldwide. Some countries impose land taxes, while others prefer taxing agricultural income. Land tax is simple and fixed, whereas taxing agricultural income involves more complex calculations. In Egypt, taxes are applied to land rents, whereas countries like Chile, Croatia, Australia, and Nepal tax gross agricultural income. Developed nations generally have a high tax-to-GDP ratio, but in Pakistan, it is only 9.1%, with direct taxes making up 4.3%. In Pakistan, agricultural income tax falls under provincial jurisdiction and is poorly enforced, producing minimal revenue.

Poor tax collection results from outdated administrative structures and compliance issues. Tax compliance relies on farmers' knowledge of tax-related matters, as well as their perceptions and attitudes. The Theory of Planned Behaviour states that attitudes, subjective norms, and perceived behavioural control, influence farmers' tax compliance.

To sum up, the literature highlights the multifaceted nature of land rents, leasing decisions, and agricultural taxation. Understanding these dynamics is crucial for fostering equitable relationships between landlords and tenants, promoting sustainable agricultural practices, and establishing effective taxation systems that support rural development. Therefore, the specific objectives of the study are: to investigate the causes of land renting and the potential implications of absentee landlords on land, water management, and technology adoption.

- To estimate tax revenue from agriculture under different tenancy arrangements.
- To analyse the farmers' compliance behaviours towards agricultural income tax under different tenancy arrangements.

- Examine the institutional hurdles in levying and collecting agricultural income tax.

METHODOLOGY

This study utilises both primary and secondary data. The primary data was collected using a multistage random sampling process and a well-structured questionnaire via Kobo Collect. Four districts of Punjab, namely Lodhran (Cotton-Wheat zone), Bhakkar (Low-Intensity Punjab), Toba Tek Singh (Mixed zone), and Nankana (Rice-Wheat Punjab), were randomly selected. Tenants, sharecroppers, landowners, and absentee landlords were chosen for interviews. One tehsil and two mouzas were randomly selected from each district. The total sample comprised 557 respondents, including 436 farmers (owners, tenants, owner-cum-tenants) and 121 lessors. Different econometric techniques, such as multinomial logistic regression (for renting decision), ordered probit model (for land and water management practices and technology), scenario analysis (for tax collection), and logit model (for farmers' tax compliance behaviour), were employed.

FINDINGS

The multinomial logistic regression analysis reveals the factors influencing the likelihood of renting land among different categories of farmers in Punjab. A one-year increase in education and farming experience significantly decreases the likelihood of renting land, while joint family type, livestock farming, total cultivated area, tube-well irrigation, and land rent increase the likelihood of renting land for the owner-cum-tenant category. Education, farming experience, agricultural machinery, and the agriculture prices index significantly decrease the likelihood of renting land. In contrast, distance to market, number of family labourers, cultivated area, and tube-well irrigation increase the likelihood of renting land by tenants. The likelihood of leasing land is higher in District Nankana and Lodhran compared to Toba Tek Singh and Bhakkar.

We conducted an ordered probit regression to analyse the effects of several factors on land and water management practices. The results are as follows: In the owner-cum-tenant category, age

and 'land and Water Management practices (L&WMP)' are positively influenced by weather information and total cultivated area. Farming experience, distance to market, and Lodhran district negatively affect L&WMP. In the tenant category, total cultivated area, documents for government subsidy, and district Lodhran have a significant positive impact on L&WMP. No variables show a negative impact in this case. The Impact of Absentee Landlords on Farmers' Technology Adoption: In the owner-cum-tenant category, education, total cultivated area, canals plus tube-well irrigation, landlord visits to the land, and documents for government subsidy have a significant positive impact on technology adoption. In the tenant category, education, age, and total cultivated area significantly positively influence technology adoption, while farming experience has a significant negative effect.

We have estimated tax revenue from agriculture under different tax regimes. Total tax collection will be Rs. 65.48 billion per year based on a flat tax rate without granting different treatment to lessors' income (1.2% based on farmers' perceptions). Total tax collection is expected to be Rs. 79.61 billion based on different taxes on farmers and Property Tax Lessors (progressive income tax on farmers' income and 5% on lessors' incomes).

Our results suggest that tax revenue is likely to improve with the simplification of procedures, transparency in the tax collection system, the use of tax revenue for the welfare of society, the use of tax revenue for the betterment of the agricultural sector, and the responsiveness of policies towards farming issues. Several factors have a negative impact on the tax compliance behaviour of farmers. These include dissatisfaction with the governance system, indirect taxes on agriculture, and poor agricultural services. In the owner-cum-tenant category, the use of tax revenues for the betterment of the agriculture sector and farmers' education level has a significant positive impact on compliance behaviour. The perception that the government wastes tax money hampers farmers' compliance behaviour. In the tenant category, respondents with long-term land contracts, increased profitability from crops, and provision of civic amenities in the area also have a significant positive impact on compliance with the tax system.

Three focus group discussions were conducted in May 2024 in Nankana Sahib, Lodhran, and Bhakkar with farmers and tax authorities. The lessons learnt from the FDGs include that young people tend to

migrate to urban areas with better access to amenities and off-farm income sources. They use family rental income for consumption. Farmers are already paying land-based tax through the village 'Numberdar'. Providing formal receipts for land-based tax payments could boost their trust in the tax collection system. Tenants pay Abiana (water tax), while landowners pay land-based taxes (where applicable). Secure, long-term formal land tenure arrangements will encourage farmers to invest in land and water management. Market uncertainty in inputs and outputs discourages farmers from paying agricultural income tax. Local tax authorities believe that income-based tax is a preferable option compared to land-based tax. Lack of coordination among various government departments, including the revenue department, land record authority, and agricultural department, hinders tax collection.

CONCLUSION

The growing number of absentee landlords and tenants lack a personal connection to their land and workers, resulting in short-term thinking and an emphasis on quick wins rather than sustainable practices. Effective taxation of absentee landlords could generate significant revenue for the government, thereby supporting fairer growth and better public services.

Results of the analysis showed that farmers living in rural areas with access to family labour tend to rent-in agricultural land. Similarly, farmers who own livestock often also rent land. The likelihood of renting-in land in low-intensity districts, such as Bhakkar, is higher than in other districts due to the greater availability of surplus land among large landholders. Canal-irrigated areas have a greater probability of land retention compared to tubewell-irrigated or arid areas. Interestingly, absentee landlords who frequently visit their land and support tenants in accessing government subsidies and securing bank loans have a significant positive effect on technology adoption among farmers.

Currently, Punjab province generates around Rs. 2.5 billion against a target of Rs. 4.5 billion through a land-based tax on agriculture. However, adopting a progressive income-based agricultural tax could increase the tax collection to Rs. 65 billion. Levying a 5% tax on lessors' income from renting out agricultural land may generate an additional Rs. 14 billion (Rs. 79.61 billion in total).

The tax compliance behaviour of farmers is positively influenced by their satisfaction with the attitude of tax authorities, transparency in the collection process, access to

authorities, and farmers' knowledge of the tax system. However, the perception that there are high indirect taxes on agriculture reduces farmers' compliance behaviour. Similarly, the perception of poor agricultural services also decreases tax compliance. We demonstrate that the centuries-old patwari system continues to be a significant institutional barrier to income-based taxation of agriculture.

POLICY RECOMMENDATION

Leasing agricultural land significantly impacts productivity because it influences investment in land improvements and the use of efficient irrigation systems. The negative effects of leasing arrangements can be mitigated through formal lease agreements with longer durations. There is a need to regulate land leasing by encouraging long-term land leases.

Historical evidence suggests that a high percentage of large farmers have opted to lease out their agricultural lands and switch their livelihoods to urban centres. These landlords enjoy rental income without having to pay taxes on income from rental properties. They manage to save on tax by declaring this income as coming from agricultural sources. There is a need to revisit and redesign agricultural taxation, especially for farmers who have leased out their lands and are earning rental income. Our analysis shows that considering agricultural leasing income as rental income and subjecting it to the property tax regime would increase agricultural income tax collection to Rs. 79 billion.

Enhancing the capacity of provincial tax authorities and increasing transparency in agriculture income tax estimation and collection would foster confidence in the tax system among farmers. Implementing digitalisation and IoT tools would boost efficiency in the tax system.

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