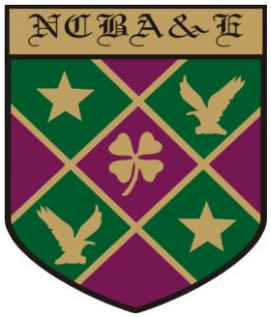
.

National College of Business Administration & Economics Lahore



ISSUES IN AGRICULTURAL PRODUCTIVITY AND MARKETING: A CASE STUDY OF A SELECTED DISTRICT OF PUNJAB

BY

MUHAMMAD SAEED HASHMI

MASTER OF PHILOSOPHY
IN
ECONOMICS

MAY, 2025

NATIONAL COLLEGE OF BUSINESS ADMINISTRATION & ECONOMICS

ISSUES IN AGRICULTURAL PRODUCTIVITY AND MARKETING: A CASE STUDY OF A SELECTED DISTRICT OF PUNJAB

BY

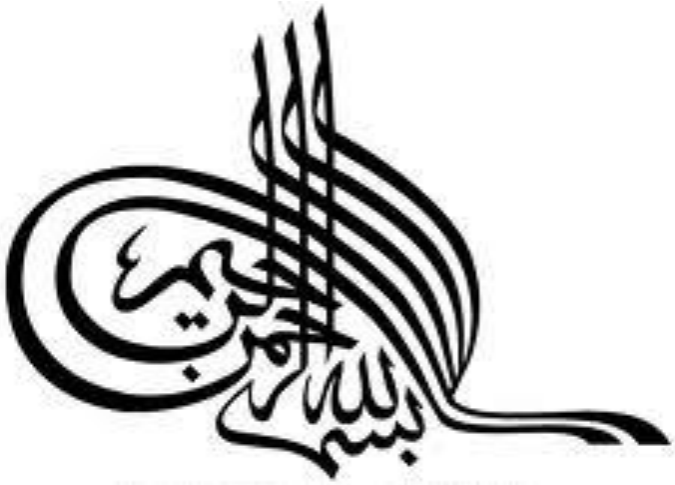
Muhammad Saeed Hashmi

A dissertation submitted to
Faculty of Social Sciences

In Partial Fulfillment oft he
Requirements for the Degree of

MASTER OF PHILOSOPHY
IN
ECONOMICS

May, 2025



In the name of ALLAH,
The Most Beneficial,
The Most Merciful,

NATIONAL COLLEGE OF BUSINESS ADMINISTRATION & ECONOMICS LAHORE

ISSUES IN AGRICULTURAL PRODUCTIVITY AND MARKETING: A CASE STUDY OF A SELECTED DISTRICT OF PUNJAB

BY
MUHAMMAD SAEED HASHMI

A dissertation submitted to Faculty of Social Sciences, in partial fulfillment of the requirements for the degree of

MASTER OF PHILOSOPHY IN ECONOMICS

Dissertation Committee:

_____
Chairman

_____
Member

_____
Member

DECLARATION

It is to declare that this research work has not been submitted for obtaining similar degree from any other university/college.

Muhammad Saeed Hashmi
May, 2025

DEDICATED

TO

My Beloved Parents
&
My Family

ACKNOWLEDGEMENT

All praises and thanks to Almighty Allah who has given us the wisdom and knowledge to identify the right path and reach the truth. With profound gratitude, I wish to thank some marvelous people who have encouraged and helped me in the completion of my research work.

I express my profound feelings of gratitude and indebtedness to my honorable supervisor, Dr. Zahid Pervaiz for his ever inspiring guidance and constructive suggestions. Without his positive feedback, this thesis would not have materialized.

I would like to acknowledge the role of my teachers Prof. Dr. A.R. Chaudhary and Dr. Khadija Khan who always helped me whenever I needed it.

RESEARCH COMPLETION CERTIFICATE

Certified that the research work contained in this thesis entitled **"Issues in Agricultural Productivity and Marketing: A Case Study of a Selected District of Punjab"** has been carried out and completed by **Muhammad Saeed Hashmi** under my supervision during his **M.Phil. Economics** Programme.

(Dr. Zahid Pervaiz)
Supervisor

SUMMARY

In order to explore the issues related with agricultural productivity, marketing and pricing policy of wheat in Narowal district Punjab Pakistan comprising three tehsils namely Narowal, Zafar Wal and Shakkargarh we have used quantitative and qualitative data. The quantitative information has been extracted from the designed questionnaire contents whereas qualitative information has been collected through discussions with forty farmers based on their feedback as to why wheat production could be increased and what will be its marketing issues. Interviewee farmers were forty respondent farmers by considering a sample pre dominant arid cum irrigated district Narowal.

Convenient sampling technique on random basis was deployed for gaining in depth knowledge by primary data gathering. Herein requisite data on independent Variables namely seeds quantity, loan /credit facility availed, land holding size, farming experience and education level of farmers were applied to observe their impact on wheat production (dependent variable). Twelve farmers intimated that they faced inconvenient and adverse situation by exploitative strategy of middleman who loaned to them before wheat growing to procure agricultural inputs and agricultural machinery on rental basis and so they had to sale out their produce without bargaining after harvesting to return loan but remaining twenty-eight Farmers did not avail facility of credit /loan from middleman and any institution.

Extent of use of seeds quantity used by all forty respondents farmers unanimously dependent on quantity, quality and varieties of seeds according to local advice and traditional tendency without following advice by the Agriculture Department. Twelve farmers availed the loan/Credit Facility from the middlemen whose elaboration is already narrated in previous lines. Education Level of the farmers was directly proportional to the improved cultivation methods for wheat growing and vice versa. Landholding size of twenty eight farmers was less than five acres while on between from five to ten acres of twelve cultivators. In addition farming experience of seventeen farmers was from eleven to twenty years but more than twenty years of twenty three wheat crop farmers. The range of wheat production came out to be from twenty six to fifty one maunds. The case study has also suggested that it will develop inclusive, sustainable and market-driven agricultural economy that will trigger economic growth and rural prosperity.

LIST OF TABLES

TABLE OF CONTENTS

CHAPTER 1

INTRODUCTION

1.1 BACKGROUND OF THE STUDY

Agriculture forms the backbone of the economy in Pakistan, and it is key to the livelihood of a significant portion of its population (Pakistan Economic Survey, 2023-24). Punjab is the most productive and fertile region of Pakistan, is generally known as the "breadbasket" of the nation (Government of Punjab, 2023). This province adds to the majority of the national GDP of the nation and trails behind the production of most of Pakistan's valuable crops like wheat, rice, maize, sugarcane, and cotton (Food and Agriculture Organization, 2022). This sector, however, is plagued with various problems concerning productivity as well as marketing (Hussain et al., 2021).

Agricultural productivity of wheat in Pakistan is 3.1 tonnes per hectare compared with US at 3.3 tonnes per hectare, India at 3.4 tonnes per hectare, France at 7.5, Germany at 7.8,UK at 8.4,Netherland at 8.5 and Ireland at 9.0 tonnes per hectare (FAO,2025) while China at 5.8 tonnes per hectare (US Department of Agriculture, 2024).

Table 1
Pakistan Economic Survey

Fiscal Year	Wheat	Maize	Rice	Sugarcane	Cotton
2015-16	100	100	100	100	100
2016-17	104.1	116.4	100.7	115.3	107.6
2017-18	97.8	112.0	109.5	127.3	120.5
2018-19	95.0	129.5	105.9	102.6	99.4
2019-20	98.5	149.1	109.0	101.4	92.2
2020-21	107.1	169.6	123.8	123.7	71.3
2021-22	102.2	180.7	137.1	135.4	84.0
2022-23	109.9	208.4	107.7	134.4	49.5
2023-24	122.6	186.8	145.1	133.8	103.1

Source: Pakistan Economic Survey (2023-2024)

1.1.1 Production Index of Important Crops in Pakistan (2016-2024)

The table shows that, wheat productivity for the years for 2016-17, 2020-21, 2021-22, 2022-23 and 2023-24 on the basis of base year 2015-2016 increased by 4.1%, 7.1%, 2.2%, 9.9% and 22.6% respectively but decreased in years 2017-18, 2018-19 and 2019-20 by 2.2%, 5% and 1.5% successively compared with the base year 2015-2016.

Agricultural productivity is a key determinant of economic development in agricultural economies like Pakistan (Iqbal et al., 2003; Khan et al., 2019). It refers to the output per unit of agricultural input, which directly impacts the income of farmers, food security, and overall economic growth (Ahmad & Afzal, 2020). In Punjab, improving agricultural productivity is essential for sustaining the livelihoods of millions of people who are directly or indirectly dependent on farming (GoP, 2021). Higher productivity can lead to better food availability, lesser food prices, enhanced exports, and decreased rural poverty (Dorosh & Salam, 2008; Hussain et al., 2021).

Yet, the agricultural sector of the country is hit by a myriad of determinants that limit its productivity. Some of these are poor farming practices, poor access to quality inputs, lack of funds, and poor infrastructure to sell agricultural produce (Khan & Ahmed, 2022). It is imperative to comprehend such determinants so that one can devise strategies for improving productivity and facilitating sustainable agriculture growth.

Seed quality is an important determinant of crop production. In Pakistan, certified seed usage and availability are mostly absent, and therefore productivity is reduced. Most farmers rely on conventional or non-certified seeds, which have low germination and high disease susceptibility. Use of high-yielding varieties and genetically modified seeds can greatly enhance crop productivity but their usage is low due to low awareness and availability (Wimalasekera, 2015).

Use of recommended seed varieties, particularly those that are bred to meet local requirements, contributes a lot towards the achievement of high crop yield (Iqbal, 2002). The application of such resistant and high-yielding seed varieties remains minimal. Farmers predominantly employ traditional or unauthorized seeds, which could be less resilient to local environments or inimical to local pests and diseases (Ahmad & Ghafoor, 2018).

Soil fertility is also important in determining agricultural productivity. Punjab soils, while naturally fertile, have been declining due to over-

exploitation, poor crop rotation, and misuse of fertilizers (Iqbal et al., 2003). The uncontrolled application of chemical fertilizers, without even a consideration for soil health, has resulted in the loss of valuable nutrients and the accumulation of harmful elements (Khan et al., 2019). Soil salinity and waterlogging are increasing stress limiting arable lands and crop yields (Ahmad & Afzal, 2020).

Fertilizer and pest use is necessary in contemporary agriculture. In Punjab, though, improper and unbalanced use of the same has led to declining production (Iqbal et al., 2003; Khan et al., 2019). While fertilizers are crucial in replenishing soil nutrients, their overuse or misuse would damage the soil and reduce its productivity in the long term (Ahmad & Ghafoor, 2018). Similarly, excessive use of pesticides leads to pest resistance, environmental pollution, and health issues for farmers and consumers (Khan & Ahmed, 2022).

Availability of credit is required for farmers to invest in new agricultural inputs and technology. Small and medium farmers tend to face the constraint of obtaining credit as a result of insufficient collateral, high rates, and complex banking systems (Iqbal et al., 2003; Ramli et al., 2012). Without adequate finances, farmers cannot afford good quality seeds, fertilizers, and machinery, hence their efficiency (Osorio et al., 2011). Financial limitations are the main hindrance in the application of sophisticated agricultural technology (Asad et al., 2019).

Small and medium-size farmers in Punjab lack credit since they have no collateral, and bank operations are cumbersome with heavy interest charges (Iqbal et al., 2003). Farmers cannot invest in improved seeds, fertilizers, and new technologies unless they have instant access to credit. Microfinance institutions and state credit programs step in to do this but are still inefficient in coverage and effective in addressing this gap (Iqbal, Ahmad, & Abbas, 2003).

Biru and Korgitet (2019) observe that education level among farmers plays an important role in determining their ability to adopt new farming practices and technology. In Punjab, education level among farmers differs widely, with the majority having no adequate formal education or access to agricultural extension services. Educated farmers tend to embrace better farm practices, look for information on how to take care of crops, and make informed choices regarding the use of inputs (Biru & Korgitet, 2019). Therefore, increased education and training of farmers are at the core of the increase in the region's agricultural production.

Social capital, the networks, norms, and relationships that facilitate collective action, contributes to agricultural productivity (Rivera et al., 2019). Punjab farmers with strong social connections and cooperative membership are likely to obtain information, resources, and markets. These networks provide the dissemination of knowledge and practices that enhance productivity. Yet, the dispersal of property and the independent nature of the majority of farmers deter the establishment of strong social capital in the area (Zugravu-Soilita et al., 2021).

Farm marketing in Punjab also has its own issues that affect the profitability and sustainability of agriculture. The market infrastructure, including storage infrastructure, transport, and market access, remains weak (Ali et al., 2021). Farmers receive prices that are unfavorable for their produce because there is no adequate storage infrastructure, hence contributing to post-harvest losses (Ahmed & Mustafa, 2020). The absence of organized markets and the involvement of middlemen also cause farmers to receive a lower percentage of the final market price (Rana et al., 2020).

In addition, farm price stability and the lack of price support programs heighten the risks to farmers (Dorosh & Salam, 2008). The government's role in guaranteeing market regulation and fair price guarantee is significant, but the uneven implementation has been noted (Khan et al., 2019). Supporting contract farming, agro-processing companies, and export agriculture can potentially expand farmers' market opportunities and assured incomes (World Bank, 2020).

Agricultural marketing is a key factor in determining the economic performance of rural regions, especially in countries such as Punjab, Pakistan, where agriculture is the pillar of the regional economy (Ahmed & Mustafa, 2020). As one of the major drivers of agricultural production in the country, Punjab is of significant importance in maintaining economic stability and development within its rural economies. Establishing and embracing effective marketing strategies is crucial in maintaining this growth. Agricultural marketing involves a chain of activities by which farm products are transferred from the farm to the consumer in the form of storage, transportation, processing, and sale. In Punjab, these activities are extremely important as they help increase farmers' incomes, reduce post-harvest losses, and enhance market responsiveness (Ali et al., 2021). According to Ahmed et al. (2016), it is essential that small farmers have access to productive output markets because it directly impacts their income and livelihood. The research indicates that with improved market infrastructure and market information access for Punjab farmers, they are able to attain higher income and therefore improve their standard of living (Ahmed, Ying, Bashir, & Abid, 2016).

One of the region's largest problems is the prevalence of traditional marketing arrangements, which are most typically defined by their reliance on opacity and inefficiency. The most typical attribute of such arrangements is the existence of intermediaries who can take advantage of the information asymmetry at the expense of the farmers. Asad et al. (2019) depict how the selection of marketing channels is crucial to making Punjab citrus farmers profitable, and hence towards more organized and transparent marketing systems. According to research, farmers who make use of formal marketing channels can fetch higher prices for their produce than those relying on conventional systems (Asad, Mehdi, Ashfaq, Hassan, & Abid, 2019).

The role of the government in facilitating agricultural marketing cannot be overemphasized, as policy changes and investments in infrastructure are necessary to bring modernity to such systems. Bhutta et al. (2019) stress the need for regulatory reforms and capacity development programs, including farm business schools, to provide farmers with the necessary skills and know-how to compete in the dynamics of contemporary agricultural markets. These policies are targeted towards information gap closure and increasing the bargaining power of farmers, hence enabling fair trade practices (Bhutta, Ilyas, & Usman, 2019).

Technological advancements have also contributed significantly to changing Punjab's agricultural marketing. The use of digital media and information systems has facilitated farmers to obtain market information in real-time, which is critical in making informed decisions on when and where to sell their crops. Yaseen and Ahmad (2020) talk about the relevance of agricultural marketing information services in Punjab, adding that timely and precise data collection can greatly improve market efficiency. The research reiterates the expansion of these services to include more commodities and regions, and such an initiative can bring about a more balanced distribution of market benefits (Yaseen & Ahmad, 2020).

In addition, the construction of modern agro-processing plants and storage units is essential to averting post-harvest losses, which are a critical concern in Punjab (Sharma & Kaur, 2022). Inadequate storage units compel farmers to sell their products immediately after harvest, at times at cheap prices because of over-supply in the market (Ahmed & Mustafa, 2020; Khan et al., 2019). By investing in processing plants and cold storage, Punjab can increase the value chain of farm produce such that the farmers are paid their rightful due for investment and efforts (Salik et al., 2022).

1.2 PROBLEM STATEMENT

This research endeavors to investigate key determinants of farm productivity and agricultural marketing issues. In particular, it will study significant determinants like quality of seed, land fertility, use of fertilizers and pesticides, availability of credit facilities, and farmers' social capital. The research will also determine agricultural marketing limitations, and it will elaborate in analysis farmers' obstacles. By examining these problems, the study aims to offer evidence-based policy advice to improve agricultural productivity and market efficiency.

Different possible determinants of agricultural productivity of improved varieties of seeds perform a crucial role to enhance agricultural productivity level. (Wimalasekera, 2015). Fertilizers make provision of basic nutrients to plants for securing inclined yields and improved quality-crops (Priyadarsini and Nayak, 2017). Soil Quality also affects agricultural productivity. (Basak et al., 2021). Pesticides, in real terms, control diseases, pests by safeguarding yields of crops and minimizing post-harvest losses thereof. (Degefu, 2020). Irrigation ensures water supply for crops consistently allowing cultivation in arid and irrigated tracts and enhancing yields thereof (Todkari, 2012).

Access to loan / credit (Formal and Informal) allows farmers for acquiring essential inputs and technologies in raising production and income from crops. (Awotide et al., 2015). Social Capital influences agricultural productivity on the basis of information and cooperation (Rivera, 2019; Zugravu, 2021). Mechanization has significant positive affect and boosts agricultural efficiency by decreasing labor costs and improving agricultural productivity of all types of crops. (Peng et al., 2022) Education raises farmers' ability of awareness and information for pertinent solutions to the productive capabilities. (Biru and Korgitet, 2019).

Some issues in agricultural marketing are lack of information on marketing of agricultural produce, lack of provision of infrastructure, and binding to sell out agricultural produce to someone instead of bringing it to the agricultural produce market (Khan & Ahmed, 2022).

This study aims to investigate the issues in agri. productivity. The study further investigates the issues related with agricultural marketing and agricultural pricing. District Narowal situated in Punjab (Pakistan) has been chosen for the research being undertaken, which is an arid-cum- irrigated district. Cultivated, irrigated, barani and uncultivated areas of District Narowal

are 465725, 5660, 459065 and 130125 acres successively in this district (Ayub Agricultural Research Institute [AARI], Faisalabad, 2024.). The main crops grown in District Narowal are wheat, rice, maize, sugarcane and barley.

1.3 RESEARCH OBJECTIVES

- To explore the factors affecting agricultural productivity.
- To find out issues pertaining to the agricultural marketing and price policy.

1.4 RESEARCH QUESTIONS

There can be different factors responsible for low agricultural productivity. Farmers are also facing various issues related with agricultural marketing. This study aims to answer the research questions that what are important factors affecting agricultural productivity and what are the issues of agricultural marketing?

1.5 JUSTIFICATION OF THE STUDY

The justification for conducting a study on "issues in agricultural productivity and marketing: A case study of a selected district of Punjab, Pakistan" is deeply rooted in the pivotal role that agriculture plays in the region's economic and social well-being. Punjab, being the agricultural heartland of Pakistan, contributes a substantial portion to the national GDP through its diverse crop production (Government of Punjab, 2021). However, despite its potential, the province faces significant challenges in both productivity and marketing, which impede its growth and development (Hussain et al., 2021). Understanding these issues at a granular level, such as through a district-specific case study, allows for the identification of localized barriers to productivity and market access. Punjab's small farmers, as reported by Ahmed et al. (2016), normally enjoy poor market access and infrastructural support, and this impacts their income level and economic stability in a negative way (Ahmed, Ying, Bashir, & Abid, 2016). In addition, Bhutta et al. (2019) recognize the necessity of market restructuring for farm produce in Punjab to maximize efficiency and transparency and suggest that localized research is most likely to yield seminal insights on systemic change (Bhutta, Ilyas, & Usman, 2019). This research is not only necessary to respond to district-level needs but also to create scalable solutions that can be applied to

similar agrarian environments in Punjab and beyond. Through targeting a particular district, the research can provide tailor-made recommendations according to the prevailing local socio-economic and environmental context, thus supporting sustainable agricultural development and enhanced market dynamics in the area.

1.6 SCOPE AND LIMITATIONS

Geographic location of this study, Narowal district, Punjab, Pakistan, gives a unique picture through which agriculture production and marketing issues are addressed. Narowal, in the north of Punjab, is a special agricultural environment offered by its green fields and location on the River Ravi, elevating its productivity and agricultural richness but also making it vulnerable to environmental hazards such as flooding's (Punjab Agriculture Department, 2022). This local-level strategy allows researchers to go deeper into the district's traditional agriculture practices, market economics, and socio-economic condition and hence present views highly relevant to the local context. According to Ali et al. (2021), local studies like the present research are greatly useful in knowing the local effects of agricultural policies and practices because varying climatic conditions, soil types, and socio-economic situations may make a large difference in agriculture (Ali, Hussain, & Khan, 2021).

However, the scope restriction to Narowal is not free from problems, mainly problems concerning generalizability of findings. The data and findings gathered in the concerned district cannot be easily transferred to other parts of Punjab or Pakistan having varied environmental and socio-economic settings. The narrow scope, while good for specific local analysis, is a problem in transferability of the research to various agricultural environments. As noted by Khan and Ahmed (2022), farm output and market accessibility vary in Punjab districts that require befitting focus if a purpose is to project results between districts (Khan & Ahmed, 2022). Hence, even though the research yields useful information regarding Narowal's agriculture dynamics, recommendations made therein could be adjusted in other settings.

Narowal's socio-economic setting, such as landholder associations, infrastructure, and resource accessibility, also determine the agriculture conducted and market interactions in the district. Smallholder farmer dominance and prevailing market institutions in Narowal determine agricultural policy implementation and marketing strategy efficacy and relative to what. It is essential to understand such local socio-economic drivers in an

attempt to craft effective agricultural marketing strategies because they can impact farmers' access to markets and the adoption of new technology (Aslam & Qureshi, 2023). These socio-economic drivers are specific to Narowal, therefore, constraining the direct application of results to other areas with dissimilar socio-economic drivers.

In addition, a focus on Narowal can miss more general policy problems that would hold across Punjab or even nationwide. Even while district-level research yields important information regarding a localized problem, such research may lack perspective regarding the scope of problems and possibilities present in more extensive or more diverse agricultural contexts. This necessitates one to be careful in the balancing of the study recommendations' scalability since interventions that are possible in Narowal may need to be adapted to suit other districts' situations. The limitation also extends to the exploration of inter-district or cross-border agricultural trade dynamics, which are crucial in today's interconnected agricultural markets. Narowal's proximity to the India-Pakistan border presents unique trade opportunities and challenges that could influence local agricultural marketing strategies, yet these broader dynamics might remain unexplored within the narrow geographical focus.

1.7 HYPOTHESES OF THE STUDY

The null-hypotheses of our research study are given below: -

1. Size of land holing does not affect agricultural productivity
2. Farming experience does not affect agricultural productivity
3. Education level of farmers does not affect agricultural productivity
4. Use of seed as per recommendation does not affect agricultural productivity
5. Loan / credit facility availed does not affect agricultural productivity

CHAPTER 2

LITERATURE REVIEW

2.1 OVERVIEW OF AGRICULTURAL PRODUCTIVITY

The productivity of agriculture sector can be affected by number of factors widely discussed in existing literature. These factors range as quality of seeds, fertilizers, social capital, pesticides, irrigation, size of farm, soil quality, access to loan, mechanization and education of farmers. In addition, agriculture sector also faces various issues such as lack of effective pricing policy as well as issues related with agricultural marketing.

Agricultural productivity plays a pivotal role in economic development, food security, and rural livelihoods. Numerous studies highlight that improving agricultural productivity requires a combination of technological advancements, institutional support, and policy interventions (Khan & Ahmed, 2022). The adoption of high-quality seeds, efficient irrigation systems, and mechanization has been widely recognized as key drivers of increased farm output (Iqbal, Ahmad, & Abbas, 2003). However, structural challenges such as inadequate access to credit, lack of infrastructure, and inefficient market linkages continue to hinder the growth of the sector (Dorosh & Salam, 2008). Addressing these challenges requires an integrated approach involving both public and private sector initiatives to enhance agricultural sustainability and economic viability.

Fox (1955) examined the theoretical link between farm support price and economic stability of US. He argued that if there is no price support on agricultural products then the prices of these products are subjected to impact from all parts of world's economy. The reason discussed in the study is that after the production expenditure, a 10 percent fall in the price of farm product results a decrease of 20 percent in the net income from a given volume of product. As a result farmer's income will shrink and there will be a fall in the demand of on-farm products. According to the theoretical analysis, without the price support program farm prices are decreased by 21 percent as against 12 percent with price support. Without price support, the farmers afford a loss of about US$ 2 billion annually and this loss is the 20 percent of net farm income. During recession, in the absence of price support the disposable income is projected as US $ 4 billion less than the present price support program. In 1952 the share of farm economy of US about in GNP is 7 percent. The author argues that, although the role of agriculture in any economy is very vital but

how single agriculture sector with the share of 7 percent in GNP, can stabilize the whole economy. So, the study concludes that the price support program alone can't avert recession, but as one member of a stabilization team it can certainlyhelp.

Quizon (1985) discussed the nature and scope of fertilizer's subsidies and its withdrawal impact on agricultural sector in India. A partial equilibrium analysis indicates that when initial retail price of fertilizer was set up to the world price, withdrawal of fertilizer subsidy has declined its consumption and led to decrease in imports of fertilizers in India. In an alternative, when initial retail price and producer price was set same as world price, withdrawal of subsidy on fertilizer has declined its production and increased in its consumption of imports.

Wohlgenant (1986) investigated the impact of export subsidy on the domestic cotton industry by using the annual data from 1965-1980 in case of US. The study deploys the linear elasticity model that includes relationships for the major markets affected by a subsidy, to quantify the impact of export subsidy on domestic cotton industry. Ordinary Least Square method is used to estimate the domestic demand and supply elasticities, export demand elasticity and the elasticity of price transformation. The result suggests that an increase in export subsidy will increase the level of income of cotton producers in short run.

Lutz and Saadat (1988) reveal the effects of agricultural pricing policies on interlinked agricultural commodities (Wheat, Maize, Tea and Coffee etc.) in case of 7 developing countries. Their study included both demand and supply side analysis. Cross-price elasticities of demand and supply are used to capture the effects of agricultural price distortion on the demand and supply of agricultural commodities and to calculate the gain and loss of consumer and producers of the selected nations. Their study concludes that the imposition of export tax on agricultural commodities and the price distortion have very strong effects on nation's welfare. Total net social losses in production by country, Kenya witnessed the lowest of US$ 2.2 million while the highest loss is witnessed by Brazil of amount US$ 50.0 million. In terms of consumption, the total net social loss is the highest for Mexico with US $ 45.9 million while for the other countries it ranges from US $ 1.3 million for Kenya to US $ 32.3 million for Brazil. In terms of welfare loss the study discusses that the welfare losses to producers in Egypt, Thailand, Argentina and Indonesia are US $ 505, 568, 1,183; 2,082 million, respectively. In Mexico, Kenya and Brazil the procurers gain is US$ 57, 27 and 400 million respectively. Farmers collect payments greater than the quantities they produced by over reporting.

Giannakas and Fulton (2000) examined the consequences and reasons of farmer's representations. model was designed on the basis of sequential game between the regulators, enforcement agency and farmers. The study demonstrated that lower level of enforcement or imperfect enforcement tend to higher the misrepresentation by farmers and to collect above and over subsidies to the quantities they produced. Moreover, subsidy level is lower with the lower program enforcement resulting from the greater weight to producer surplus by policy enforcer but when there is costly program enforcement, the avoidance of misrepresentation on output subsidies can never be optimal. US farm bill introduced in 2002 significantly increased the local support to agriculture producers.

The economic and environmental impact of agricultural subsidy was captured by Osorio et al. (2011) analysed the impact of fertilizers subsidies on rice production in case of Indonesia. The objective of their study is to indicate that who is getting more benefits from the fertilizers subsidies and to check the impact of removal of fertilizers subsidy of rice production. For this purpose, they used data from Agricultural Census 2003 and the Rice Household Survey 2008 for Indonesia by deploying the Ordinary Least Square and 2 Stage Least Square techniques, their study concluded that the fertilizers subsidies have positive and significant impact on rice production, as fertilizer used in ample quantities increased the production of rice. But it is also observed that over-using fertilizers has negative effect on the productivity of rice. Moreover, 60 percent of the subsidy has been captured by the 40 percent largest farmer.

Moreover these subside to the producer for the environmental cost. Literature Review 13 of production has also reduced environmental loss and also supported greener practices through the technological impact. Government of Pakistan made wheat policy to equilibrate the supply and demand for producers and consumers in their interest by increasing productivity of wheat and farmer's income on production side and to supply wheat at affordable price for consumers.

Dorosh and Salam (2008) presented the same kind of analysis of the wheat procurement, supply, demand and prices of Pakistan's government. During 1990's wheat support price in Pakistan was below the price level of import parity but in late 2004-05 it reaches to the import parity price level in Sindh and cross the level above 18 percent in Punjab. The study also implied that government procurement and trade policies raise the market price of wheat and this would also raise the CPI.

A similar analysis was also conducted by Khan and Qasim (1996), who found that one percent raise in wheat procurement price, would raise overall food price index by 0.74 percent. Ekanayake (2009) examined the impact of fertilizer subsidy on paddy cultivation in case of SriLanka. The study employed simple regression model (OLS) to estimate the fertilizers demand functions. The study found out that the fertilizer usage does not get affected from the fluctuations in the prices of fertilizers and paddy, suggest that fertilizer subsidy has no significant effect on fertilizer use for paddy cultivation. The findings also concluded that there is a high correlation between fertilizer usage and paddy prices.

Khan et al. (2010) analyzed the impact of rising fertilizers prices on the production of crops in Pakistan. By using the secondary data and employing the descriptive analysis, their study exposed that the productivity of major crops is highly affected from the balanced use fertilizers and from the fertilizers prices. The study also authenticated that the crop productivity and fertilizers prices are negatively related to each other, as the productivity of crops is declinedwhen there is increase in the prices of fertilizers.

Gilbert and Jayne (2009) investigated the impact of fertilizer subsidy on well-being of rural household in Malawi using the agriculture input support surveys. The well-being was measured through five different factors including; planted area by household, maize production, household assets, life satisfaction and food consumption. Analyses showed the positive link of fertilizer subsidy on planted area and maize production and area planted by male heads is more than females and those households who have more young children due to more availability of labour. Although, households have no dynamic effect on assets accumulation and consumption pattern after receiving subsidy on fertilizer but they are still satisfied with their lives.

Niamatullah et al. (2010) evaluated the impact of support price and off-take of fertilizers on acreage of wheat and rice production in KPK, Pakistan for the period of 1975-76 to 2007-08. Support price was a significant contributor towards rise in rice production but have no impact on wheat acreage. Moreover, wheat acreage and rice production was showing negative relationship with the fertilizer take-off. The study also revealed that due to technical constraintswheat acreage is very low.

Kaur and Sharma (2012) investigated the economic implications of electricity subsidies provided to farmers in Punjab, assessing their impact on key stakeholders such as the Punjab State Electricity Board, the Punjab Government, and the agricultural sector. The study deployed both primary and secondary data sources for analysis. Primary data were gathered from twelve villages across Punjab, while secondary data were obtained from official

reports and databases, including those from the Punjab State Electricity Board, the Statistical Abstract of Punjab, the Economic Survey of Punjab, the Punjab Human Development Report, and the Punjab State Electricity Regulatory Commission. The findings reveal that farmers are willing to pay for electricity used in irrigation, provided that a reliable and uninterrupted power supply is ensured. Consequently, the study suggests that the government should introduce a flat-rate pricing model for electricity in the agricultural sector.

Ramli et al. (2012) examined the impact of fertilizer subsidy on the yield and production of rice in case of Malaysia. By employing the system dynamics model, their study revealed that the fertilizer subsidy has a strong and significant effect on rice industry. Fertilizer subsidy increases the yield and hence the production of rice. The study also indicated that the removal of fertilizer subsidy decreases the rice production and also the self-sufficiency level. The results also suggest that there is increase in the import of rice due to the reduction in rice production. The role of food prices cannot be neglected in the determination of well-being and reduction in poverty in developing countries.

Sharma (2012) empirically determined factors of food subsidy in India and found that high food price in domestic and world market is one of the major factors of rising food subsidy in India. He argued that rising economic cost of the food grains is the result of minimum support price, distribution cost and procurement cost, which subsequently rise in food subsidy. Empirical analysis also declared that increase in procurement price and volume significantly raises the food subsidy but central issue price tends to decrease in subsidy of food grain. Although, distribution cost was also a rising factor of subsidy, but it was not statistically significant. After the agriculture reforms, India highly stressed and based upon price policy as compared to pre-reforms period.

Tripathi (2013) examined the relation between agriculture price policy, output and farm profitability in India after reforms. Minimum support price systems is the insurance cover for the farmers at the time of post-harvest crash in prices and provide incentives to farmers and increase production by using modern inputs. Moreover, profitability in wheat cultivation has also been doubled during the post-reform period in India. Only few years from 2001-02 to 2004-05 observed growth decrease and shrinkin of profit due to rise in input cost but lateron there was a significant improvement in farm's net income after 2005-06.

Bunde et al. (2014) addressed the relationship between subsidy on fertilizer input and maize production in Kenya using rural household survey in 2012. They observed that maize yield has increased by 17.2 percent of those households having less than 10 acres of land after the fertilizer subsidy

program and this proportion was increasing up to 30 acres of land. The study also revealed that input subsidy on fertilizer has also improved the farmers' lives through the food security program.

Shivashankar and Uma (2014) investigated the impact of agricultural input subsidies on SC/ST farmers by deploying the survey data of two districts Mandya and Raichur (Karnataka, India). The purpose of their study is to compare and contrast the fertilizer and power subsidy between general farmers in Mandya and Raichur districts. The study concludes that the agricultural input subsidies have positive impact on the production and export of food grain. It also manifests that the government's initiative is successful in benefiting the farmer community.

Awokuse et al. (2009) aimed to examine the dynamic interaction between agricultural productivity and economic growth in a general context. They sought to establish the relationship between agriculture and economic growth through time series analysis of fifteen developing and transition economies located in Latin America, Asia, and Africa. The study analyzed key economic indicators, including real exports, agricultural value added per worker, real GDP per capita, population as a labor proxy, and gross capital formation per worker as a capital proxy. Data were obtained from the World Bank Development Indicators and the International Monetary Fund, covering the period from 1971 to 2006. To examine the empirical relationships among these variables, the researchers utilized an autoregressive distributed lag (ARDL) model along with co-integration techniques. The findings indicate that agriculture plays a crucial role in driving economic growth, functioning as a key engine of economic development. Empirical evidence also underscores the importance of both private and public resource allocation to agricultural and infrastructure development. It has been proposed that trade openness has a positive and beneficial effect on GDP per capita.

Awan et al. (2014) aimed to investigate the influence of key macroeconomic variables on economic development following the Structural Adjustment Program (SAP) in Pakistan. They also sought to identify essential factors for sustainable economic development in the country. The study considered annual inflation, GDP per capita, financial openness represented by foreign direct investment, credit to the private sector as a percentage of GDP as a proxy for financial development, and trade openness measured as the sum of exports and imports divided by GDP as the relevant economic variables. Time series data from the first quarter of 1991 to the fourth quarter of 2007 were sourced from the Economic Survey of Pakistan, International Financial Statistics, and Araby and Kemal (2004). An autoregressive distributed lag model was employed to determine the empirical relationship between these variables. Results show that there exist some of the casual factors for sustained

economic development in Pakistan after the Structural Adjustment Program. Long run relationship is confirmed by the ARDL F-statistics. Financial sector's development, trade openness, and remittances were positively correlated with economic development in the country; inflation and economic growth are correlated inversely in country.

Awan and Vashma (2014) examine the key determinants of the agricultural sector and examined the interrelationship between agricultural economic development and GDP. Their study analyzed how agriculture contributed to overall economic growth using a dataset of 31 observations bridging the period from 1980 to 2010. Gross domestic product and growth in the agricultural sector were considered as economic indicators. Information was gathered from the World Bank's meta data of Pakistan. The co-integration and vector error correction model were deployed as econometric techniques to analyze the relationship between the variables. The findings indicate that there is a statistically significant and positive correlation between the growth of agriculture and the growth of the country's GDP. It was proposed that the growth of agriculture in terms of GDP and economic growth is of vital importance.

Ahmad (2001) examined the relationship between output growth, input growth, total factor productivity, technological change, and technical efficiency. The study analyzed district-level data from 34 districts of Punjab spanning the years 1991 to 1999. Key variables included non-irrigated and irrigated crop areas (measured in acres), total fertilizer usage, rainfall (in inches), and short-term and long-term agricultural loans issued by the Agricultural Development Bank of Pakistan (ADBP). The data for this study was collected from various sources, including Agricultural statistics, the Agricultural Development Bank of Pakistan, and Punjab development statistics. The researchers employed a range of econometric techniques, including Ordinary Least Squares (OLS) estimation, fixed effect models, and Random effect models, to analyze the data. The findings reveal that the negative growth rates in technical efficiency and total factor productivity are positively correlated with farm size. The study suggests that to stabilize output prices and protect the economy from instability, the Trading Corporation of Pakistan needs to take an active role. Additionally, farmers should be shielded from dealers and seed companies that sell uncertified and substandard products.

Awan and Sheikh (2015) investigated the impact of supervised agricultural credit on small-scale farmers' incomes, aiming to increase their farm earnings in the study area. They also examined the effect of credit on land use and cropping intensity in the project region. The researchers collected primary data through interviews conducted from 1997 to 1998. Variables used

in the analysis included farm income, crop yield per acre, operational landholding size, and number of livestock. A multistage random sampling technique was employed in the project area. Statistical estimation was done using t-tests, percentage analysis, and multiple regression models.

Chaudhry (1986) concluded that there is an affirmative relation between mechanization and agriculture output. Biological and chemical changes in technology are known as "Seed Fertilizer Revolution." Although there is a swift increase in use of tube wells, tractors and other technological equipment's but still the farmers are using outdated technological methods. Although there is significant use of contemporary agriculture techniques such as 1 (Tube wells 2) (Tractors 3) Hand operated sprays 4) Tractor driven drills 5) Tractor driven blades and 6) Thrashers but still the per acre yield of Pakistan is not adequate. Mechanization can also augment the area of cultivated land usage. This cultivated land encompasses of desolate land also. The usage of modern agriculture technology such as tractor can substitute the tenants that work on daily wages on these farms. Consequently, the improvement in mechanization such as tractor-tube well technology can increase the per acre yield.

Pretty (2001) revealed that inadequate poverty rights to farmers, illiteracy of farmers, non-access of farmers to inputs, unawareness of farmers and land degradation are the major limiting factors in agriculture sector of Pakistan. Despite these challenges the agriculture sector has to face some environmental challenges that have negative impact on crop productivity (especially wheat and cotton production). These challenges comprise loss of biodiversity, unpredictable climatic changes, reducing genetic variability in agriculture sector, land degradation and inadequate water availability. These factors are called negative externalities as they are non-market effects. Nevertheless, use of modern agriculture technology will cause positive externalities such as existence of natural capital, strengthening social capital and development of human skills. These positive externalities cause sustainable agriculture development of Pakistan.

Iqbal (2002) concluded that mechanization in agriculture development has several advantages that can increase per acre yield of crops. On the contrary, it also creates some disadvantages especially when it creates unemployment among the workers. Due to mechanization labor force is replaced by the machines. Specifically the use of tractor and tube wells has increased the crop production per acre (especially in case of wheat crop) but on the other hand it has also substituted workers related to their fields. Thus, there must be some substitute for these workers and the government must plan some strategy that can replace those workers in some other economic tasks.

Phillip, et al. (2009) concluded that agriculture development can be associated with economic development process. But there are unlimited challenges faced by the small farmers in agriculture sector. These constraints are resisting the process of development in agriculture sector. These limiting factors that are accountable for low agriculture production comprises of: (1) Usage of superseded technology for land cultivation and inability of farmers to use mechanization in their fields (like tube wells, tractors and modern harvesters etc). (2) Low availability and low quality of raw materials that have serious deteriorating impacts on per acre yield of crops. (3) Low quality of fertilizers, pesticides and fungicides that are applied on various types of crops and their after effects are low quality of crops. (4) Insufficient research on various facets of the agricultural sector has resulted from inadequate funding and governmental interference, particularly concerning agricultural reforms. (5) Illiteracy and poverty of the farmers are also the constraining factors that have serious deteriorating impacts on crop production. Thus, poverty of the farmers also becomes hurdle in usage of mechanization as a modern agriculture technique. (6) Low access of farmers to credit loans or high rate of interest on loans results in engaging the farmers in vicious cycle of poverty.

Khan, et al. (2011) analyzed that mechanization plays an pivotal role in food production and advancement of rural economies but unfortunately rural farmers are using obsolete agriculture technology on a large scale. They are unaware of the fact that mechanization can increase the productivity of land and decrease the cost of productivity. The major reason for usage of outdated technology is their poverty. On the other hand, these farmers assumed that mechanization will substitute their labor and engage them in different sectors of employment. One of the greatest drawbacks of mechanization is that it needs capital and therefore it is not accessible to small farmers. If land holdings are fragmented then mechanization cannot be achieved through overall advantages.

Shehbaz, et al. (2010) concluded that in mountain regions the land productivity is the serious issue especially in underdeveloped countries. These limiting factors include harsh weather, remoteness, scattered population and undeveloped infrastructure etc. The major crops are wheat, maize and various types of vegetables. On the other hand, land degradation, soil erosion, limited infrastructure and inadequate market facilities are the major constraining factors in agriculture sector of Pakistan. Thus, small land holding, usage of superseded technology on farms and constrained access to bank loans are the foremost challenges faced by the small farmers concerning low agriculture productivity on their land. Thus, the foremost pace should be taken by the government and it should give special attention to these regions so that small farmers can earn their livelihoods by working on these fields. The people in mountain regions have to face serious restricting factors predominantly related

with sewer climate therefore they cannot grow their crops for the commercial purposes. Even the poverty faced by farmers, insufficient loan facilities, the use of low-quality fertilizers, challenges from weeds, and natural disasters (such as floods, earthquakes, famines, and landslides) prevent farmers from cultivating these crops, even for their fundamental enduring necessities.

Ullah and Hassan (2023) explored the role of middlemen in the wheat marketing chain within District Swat. Their study indicated that while middlemen facilitate market access for farmers, they often extract significant margins, affecting the overall profitability for producers. This dynamic underscores the need for policies aimed at reducing the influence of intermediaries to enhance farmers' returns.

Al Zubaidi (2023) analyzed the impact of price policies on wheat production and marketing during the 2019-2020 agricultural season in Nineveh governorate. The findings indicated that state action considerably affects market prices, and therefore levels of production by farmers. The study emphasizes the importance of coordination of price policy with market forces to ensure the optimal results of production.

In addition, Ahmad et al. (2022) analyzed the profitability and yield of new-generation farming practices in Punjab's cotton-wheat system. Through their study, they emphasized that the use of new agricultural technologies can result in higher yields, thus increasing the marketing value of wheat. Shifting to new practices is essential to remain competitive in domestic and foreign markets.

Furthermore, Khan et al. (2023) examined the attitude of rural farmers towards climate change in the context of the impact of wheat productivity. Proof confirms the importance of applying climate-related measures for wheat production sustenance in spite of mounting environmental stress.

2.2 AGRICULTURAL MARKETING

Agricultural marketing refers to those activities that bridge producers and consumers, such as harvesting, storage, transportation, pricing, and sale of farm products. Punjab, where most of the rural population relies on agriculture, a good marketing system helps farmers obtain a fair price for their produce and consumers have stable supply channels. Marketing is also an economic stimulus that stimulates rural-urban connections. There has been evidence that established well-functioning marketing systems result in higher incomes of farmers, lower post-harvest loss, and higher productivity in agriculture (Khan & Siddiqui, 2019). Marketing also promotes diversification in agriculture by

encouraging production of high-value crops as well as value addition processes like processing and packaging, thereby improving profitability in the agriculture sector.

Punjab agriculture marketing also has systematic and structural issues that hamper its performance. The over domination of the old market middlemen is one of them, and it often exploits farmers by purchasing crops at below-market price but generating a fair amount of profit. Poor bargaining power for the farmers is yet another problem that adds to it, particularly among smallholders who have no market information access or alternative purchasers (Rana et al., 2020). Additionally, the absence of sophisticated storage facilities results in excessive post-harvest losses of between 20% and 30% for perishable items such as fruits and vegetables (Ahmad & Afzal, 2020). Price instability by way of supply-demand imbalance and glut during seasons also deters farmers from cultivating crops (Gilbert & Jayne, 2009). Besides reducing farmers' revenues, these inefficiencies also result in food insecurity and inflationary pressures.

The second key issue is the lack of adequate rural market infrastructure development in Punjab. Farmers depend on mandis that have no minimum facilities like cold storage, proper weighing scales, and transport networks. Inadequate connectivity to cities deprives farmers of the advantage of competitive prices for crops. Further, Punjab's agriculture marketing system lacks inadequate policy support and ineffective operationalization of existing policies. For instance, the Agricultural Produce Markets Act, which aims to control market conduct, tends to overlook the exploitative conduct of the intermediaries because of lackluster enforcement mechanisms (Hussain et al., 2021).

In spite of such problems, vast opportunities are present for increasing Punjab's agricultural marketing. There exist interesting opportunities along the lines of digital marketing portals and online purchasing solutions. The digital options are capable of bringing farmers into the same bracket as consumers through immediate market intelligence, direct sale channels, and removal of middlemen. Mobile platforms like Telenor's "Khushaal Zamindar" app have already been able to empower farmers in the areas of weather information, market price information, and advisory services for improved decision-making and productivity (Rehman et al., 2022).

Building farmer cooperatives and producer organizations is another possible means of reversing market inefficiencies. Through merged resources and bulk marketing, smallholders can get economies of scale, bargain decent prices, and minimize transactional costs. Cooperatives can also help provide linkage between smallholders and credit, extension services, and value-added

markets. For example, the ability of India's dairy cooperatives such as Amul to flourish has proved the potential of collectivized farmer groups to shift rural economies (Chand, 2020). Punjab could implement the same models in an attempt to build farmers' market participation.

Public-private partnerships are yet another vehicle for enhancing agricultural marketing. PPPs between non-governmental agencies, government ministries, and the private sector operators will finance the infrastructure for the market in terms of storage, transportation, and processing facilities. As a demonstration, the establishment of cold chains for handling perishables can bring post-harvest loss sharply down and increase the access of farmers to the market. Punjab government initiatives to enhance market opportunities for agriculture produce, such as establishing model markets and agro-processing parks, are on the right path, but such initiatives must be expanded and linked with farmers' requirements (GoP, 2021).

To maximize the contribution of agricultural marketing to enhancing agricultural growth in Punjab, some policy interventions are required. The government first needs to give high priority to investment in rural infrastructure, especially in market linkages, godowns, and cold chains. These investments can be facilitated through targeted subsidies or PPPs so that they become sustainable. Secondly, market regulation must be revamped so that there is a more competitive and transparent marketing system. For example, the implementation of electronic trading in agricultural produce markets can facilitate better price discovery and diminish intermediary power (Ali & Raza, 2022).

2.3 CHALLENGES IN AGRICULTURAL PRODUCTIVITY

World economic prosperity and food security rely upon farming success. Farming success is, however, faced by highly interdependent restrictions that make it lagging and not sustainable. Natural, economic, and technological restrictions are the general classes of such restrictions (Food and Agriculture Organization of the United Nations [FAO], 2022).

Climate change is a ubiquitous natural obstacle that influences farm productivity. Variability in temperature and precipitation patterns slows down crop yield and animal well-being. Ortiz-Bobea et al. (2020) quantified the influence of anthropogenic climate change on world farm productivity, estimating a colossus decrease in total factor productivity since 1961 and larger effects experienced by warmer regions of the world such as Africa and Latin America.

Soil degradation also increases natural setbacks. Erosion, nutrient loss, and salinity reduce the fertility level of the soil and thereby impact crop yields. Siedenburg (2022) examined the natural resource management of Tanzanian peasant agriculture groups and observed how environmental degradation is intricately linked with agricultural outputs and rural poverty.

Financial circumstances strongly hinder agricultural efficiency, especially in the developing world. Inaccessibility to credit and other financial services deems farmers incapable of investing in vital inputs such as quality seed, fertilizers, and modern machinery. Weak infrastructure such as road networks and storage facilities induce post-harvest losses and market access deficiency. One study that had focused on Pakistan's Punjab Province smallholder farming households enumerated economic reasons as major non-uptake causes of farm innovation, thus preventing sustainable agriculture (Ahmed et al., 2020).

Market volatility and price also present economic challenges. Volatile market conditions can potentially cause uncertainty in farm incomes, which discourages investment in productivity-enhancing practice and technology. Further, inadequate agricultural policy and supporting institutions in other countries enhance such economic barriers and expose farmers more to environmental and market risk (Smith & Johnson, 2020).

Even as technology innovation maximizes farm productivity, a number of limitations discourage them from exploiting it. Premium cost of acquisition and upkeep of precision agriculture technology and advanced devices makes them a preserve of the small-scale farmer (Ali & Abdulai, 2024). The United States Government Accountability Office (2023) submitted that even though precision agriculture technology has the promise of making farming profitable and boasting environmental benefits, high initial expenses and technical complication deter some farmers.

Moreover, poor digital infrastructure and connectivity in rural regions inhibit adoption of new technologies (U.S. Government Accountability Office, 2023). Zhang, Wang, and Li (2023) in their study quoted some of the obstacles like limited resources, poor expertise and training, and data privacy issues as major hindrances to the adoption of digital technology in agriculture.

In addition, the sluggishness in the uptake of agricultural innovations hinders sustainable agriculture (Ali & Abdulai, 2024). It was found in a study on smallholder farming households in Punjab Province, Pakistan (Khan et al., 2023), some of the factors hindering the uptake of genetically modified seeds, herbicides, and no-tillage agriculture, which indicate the importance of effective new technology dissemination.

Agriculture is the major support system of Punjab, Pakistan's economy, employing and feeding millions of its population (Government of Punjab, 2021). Be that as it may, in spite of its importance, the industry is faced with many constraints that affect its optimum productivity. The constraints are multi-dimensional, from structural inefficiencies and environmental degradation to socio-economic constraints (Ahmad & Ghafoor, 2018; Khan et al., 2019; Zulfiqar & Thapa, 2017).

Punjab, or the self-dubbed "breadbasket" of Pakistan, is severely threatened with sustained high agricultural productivity levels (Ahmad & Afzal, 2020). The greatest concern is water scarcity (Qureshi, 2011). Punjab agriculture relies extensively on irrigation, yet the province is currently experiencing decreasing water resources through excessive drawal of groundwater, irrational irrigation usage, and variability of rainfall triggered by climate change (Salik et al., 2022). In addition, inefficient maintenance of canal infrastructure enhances water distribution inequities, and marginal farmers receive poor water access (Shah et al., 2020).

The second issue is land degradation in the shape of soil erosion, salinity, and nutrient depletion. Extensive cultivation, combined with excessive use of chemical fertilizers and pesticides, has yielded decreasing soil fertility. Ahmad and Ghafoor (2018) cite that this has resulted in falling crop yields as well as the rising cost of production, especially for small farmers who do not have access to low-cost soil-rejuvenating technologies.

Moreover, the restrictive access to modern technology and mechanization slows down productivity. The overwhelming majority of Punjab farmers use conventional approaches to agriculture that are inefficient and time-consuming. The very high cost of modern machinery and the absence of credit facilities also limit farmers' chances of adopting advanced technologies. All this is added to by inefficient agricultural extension services, which do not properly transmit the new information and practices (Zulfiqar & Thapa, 2017).

Market inefficiencies also create a gigantic hindrance to farm productivity. Punjab's farming communities are usually deprived of transparent and equal markets, and middlemen take advantage of them, and they receive poor returns on produce. Additionally, the absence of proper storage facilities and post-harvest structures leads to huge food losses, especially for extremely perishable food items such as fruits and vegetables (Khan et al., 2019).

To overcome all these issues, the Punjab Government has introduced policies and schemes for enhancing agricultural productivity. One of the most imperative areas of intervention is water resource management. These initiatives like Punjab Irrigated-Agriculture Productivity Improvement Project (PIPIP) aim at promoting high-efficiency irrigation measures like drip irrigation and sprinkler irrigation for conserving water and optimizing its usage (World Bank, 2018). All these steps have proved to be helpful in the reduction of water wastage as well as to improve crop yields.

While cushioning land degradation, the state has enacted policies aimed at sustaining agriculture. Campaigns in public spaces and government subsidies are implemented for the farmers' training in using organic manure and rotating crops to re-energize the land. Soil test labs have been built to advice the farmers well on how best to fertilize the soil (Ahmad & Ghafoor, 2018).

The government has also given importance to the modernization of agriculture through subsidies for farm equipment and training for farmers. The Punjab Agriculture Department has also attempted to encourage precision farming and digital agriculture, which will allow farmers to use resources to the fullest and make them more efficient (Zulfiqar & Thapa, 2017). In addition, microcredit programs supported by organizations such as the Punjab Rural Support Program (PRSP) seek to economically empower small farmers so that they can invest in new inputs and technologies.

Effective market access and prevention of post-harvest losses programs involve the establishment of agribusiness markets that entail the incorporation of cold stores, as well as regulation arrangements for anti-repressive pricing. Rural road connectivity, which is a type of rural infrastructure, also received government allocations as a means of enhancing farmer-market relations (Khan et al., 2019).

Yet, in the midst of all these efforts, there are hindrances to policy implementation. Low budgetary releases, bureaucratic wastage, and poor coordination between stakeholders tend to nullify the effectiveness of such schemes (Khan & Ahmed, 2022). Even the advantages of government schemes fall into the wrong hands of marginal and small-scale farmers, the most susceptible of all to the issue of productivity issues (World Bank, 2020).

2.4 MARKETING CHALLENGES IN RURAL AGRICULTURE

Agriculture is an extremely important industry of Punjab, a main pillar of the economic framework of Pakistan and a primary rural source of livelihood and employment (World Bank, 2020). Though agriculture is a very

important industry, produce marketing in the agricultural sector is fraught with challenges that undermine the economic well-being of farmers and hinder agricultural development. Lack of access to markets, poor infrastructure, and middleman exploitative behavior significantly impact rural agriculture (Rana et al., 2020; Khan & Siddiqui, 2019).

Limited market access constitutes one of the main problems facing rural agricultural marketing in Punjab. Rural farmers receive limited market access to urban markets, where high demand for agricultural produce exists. Geographic isolation, poor transport connectivity, and weak information on trends in the markets worsen the situation. As Abbas et al. (2019) have it, farm farmers in the rural areas are usually not exposed to current market prices and therefore remain exposed to exploitation and possess a poor bargaining power.

Also, the predominance of regional and local markets within rural regions restricts farmers to possess limited access for the marketing of their crop (World Bank, 2020). Secondly, the unavailability of an organized wholesale market adds to the problem in question because most of the farmers engage in informal sales channels (Ahmed & Mustafa, 2020). This limitation results in poor profit margins, and the victim here are the small farmers. Apart from that, the absence of market integration does not allow rural producers to take advantage of economies of scale and hence undermine their competitiveness in the overall agricultural economy (Rana et al., 2020).

Infrastructure shortages are one of the major barriers to effective marketing of farm produce in Punjab. Dealing rural road connections in rural Punjab disrupts the transportation of produce to and from markets, increasing transport cost and time. It is particularly worse for such delicate produce like vegetables and fruits that have to be moved all at once in an attempt to maintain quality and selling price (Khan et al., 2018).

Other than that, inadequate storage and processing facilities are causing post-harvest losses. The farmers are primarily forced to sell their produce right after harvesting at low prices because of the absence of quality storage facilities (Ahmed & Mustafa, 2020). Ahmed and Mustafa (2020) assert that these losses constitute a considerable share of overall agricultural production in Punjab, eroding farmer revenues as well as food security.

Cold storage warehouses, required to store perishable fruits and vegetables, are not available in rural regions. Lack of value-added processing units also discourages farmers from accessing high-value markets (Rehman et al., 2022). Raw agri-products, for example, are being sold at prices less than

processed ones, but the lack of availability of processing units in rural Punjab does not enable farmers to gain maximum returns (Khan et al., 2019).

The intermediary system, as much as it is helpful to some farmers in terms of market access, is exploitative (Ullah & Hassan, 2023). Middlemen corner the marketing of farm produce in Punjab and are the main bridge between consumers and farmers. As much as they help in produce aggregation and offering market access, their actions are against farmers. Middlemen set prices, exploiting farmers' ignorance of the market and requirement for cash immediately (Rana et al., 2020).

Dependence on middlemen is also facilitated by the lack of alternative channels of marketing. Farmers who are unable to move their products to distant markets have no choice but to sell to local middlemen, who pay considerably lower than market prices (Hussain et al., 2021). This imbalanced power forms a cycle of exploitation where the farmers gain little from their work. The majority of the profits end up in the hands of the middlemen (Rana et al., 2020).

Punjab agriculture in Pakistan acts as a mainstay for rural livelihoods, food security, and the entire national economy (GoP, 2021; World Bank, 2018). Nonetheless, marketing agricultural products is lagging behind due to market regulation, which works against farmers' interests (Hussain et al., 2021). The impact of the regulation permeates every facet in that it affects price discovery, market access, and farmers' incomes as a whole (Hussain et al., 2021).

Price discovery is the most significant element of agricultural marketing that determines the worth farmers derive from their crops (Dorosh & Salam, 2008). Market rules, such as the Agricultural Produce Markets Act, oversee the operation of wholesale markets or mandis in Punjab. Rules are intended to offer standardized procedure and prevent exploitation but have the tendency to disregard their role (Hussain et al., 2021). Punjab mandi is controlled by commission agents and traders, as per Khan et al. (2019), with tight control over price determination. The absence of competitive bidding systems deprives the producers of fair prices in the market for their produce.

Furthermore, the obligatory requirement that farmers dispose of their output through controlled markets reduces bargaining capacity and choice. Small-scale farmers, for instance, cannot negotiate on prices as they have no access to market data in real time (Abbas et al., 2019). The outcome is systemically under-pricing of agriculture products, benefitting the farmer with

little earnings while the lion's share goes to the middlemen (Hussain et al., 2021). Market regulation within Punjab also controls farmers' linkages to extensive and more premium markets (Khan & Siddiqui, 2019).

Regulatory measures maintaining consumer or private party direct selling restrictions keep mandis engaged for farmers. It limits choices of farmers to get involved in different marketing channels like contract farming or electronic selling networks (Ahmad & Mustafa, 2021). Rural farmers are, therefore, caught up in conventional market frameworks that are not responsive to the demands of new-age farming (Khan et al., 2020).

Absence of infrastructure and institutional facilities only adds to the problem of market access. Whereas regulations in markets provide for the provision of market yards and grading houses, such houses remain underdeveloped or irregular in placement (Khan et al., 2019).

The rural farmers hence encounter huge logistic obstacles in bringing their produce to controlled markets, making them heavily reliant on local middlemen (Ali & Abdulai, 2024).

One of the most important issues of Punjab's market regulations is inefficiency in implementation and enforcement. Corruption and bureaucratic delay in the mandi system discourage fairness and transparency (Hussain et al., 2021). Rana et al. (2020) explain how commission agents manipulate the weighing machine and engage in undue delays in payment, further discouraging the trust of farmers in the system. All this adds to the financial burden on farmers who are already under financial stress due to high input prices and low productivity.

Additionally, regulatory regimes tend to be neglectful of the special demands of smallholder farmers. Government measures to contain big deals and standard commodities tend to neglect subsistence farmers' experience of producing in small scales and mixed crops (Ali et al., 2020).This policy-practice gap excludes small-scale farmers from availing themselves of government interventions (Khan & Siddiqui, 2019).

In the recent years, there has been an increasing acknowledgment of the requirement to update market regulations in Punjab. Reforming agricultural marketing, for example, by opening up private markets and e-NAM platforms, has the ability to address some of the issues faced by farmers. The reform will focus on enhancing competition, averting the misuse of intermediaries' power, and giving buyers direct access to farmers (Ali et al., 2021).

Yet, institutionalization of the reforms has remained poor and uneven. Resistance from vested interests of the dominant mandi system and ignorance among the producers regarding new markets has dampened liberalized marketplace practices (Khan & Siddiqui, 2019). Furthermore, poor infrastructure facilities and rural computer literacy restrict maximum utilization of state-of-the-art marketing platforms (Rehman et al., 2022).

2.5 THEORETICAL FRAMEWORK

Theoretical base to analyse agricultural productivity and marketing issues can be grounded on recognized models and theories of agricultural development, market dynamics, and farmer action. The major theories include the Sustainable Livelihoods Framework (SLF) (Scoones, 1998) and the Agricultural Value Chain Analysis (AVCA) model (Kaplinsky & Morris, 2001).

SLF, created by the UK Department for International Development (DFID), is an integrated framework in analysing the livelihood strategies of the farmers, giving importance to the assets (natural, financial, social, human, and physical), vulnerabilities, and institutional arrangements to determine the agricultural outcomes (Scoones, 1998). The framework is helpful in determining the impact of insufficient availability of resources and environment on productivity and marketing in rural Punjab.

The AVCA model is concerned with the inter-connected phases of production, processing, distribution, and marketing to assist in analysing inefficiency in the supply chain. It is focused on intermediary actions, infrastructure vulnerability, and regulation obstacles in curtailing market competitiveness as well as farm profitability (Kaplinsky & Morris, 2001).

Additionally, Williamson's (1979) Transaction Cost Economics theory informs us regarding farmers' transportation expenditure of their produce, information asymmetry, and contract risks. It demonstrates why farmers resort to agents and how challenging it is for them to access distant markets.

Cumulatively, the models present a broad scheme to analyze the complex issues of agricultural productivity and marketing in the chosen district of Punjab, drawing inferences on systemic inefficiencies as well as potential intervention policies (Ali et al., 2021).

CHAPTER 3

METHODOLOGY

3.1 RESEARCH DESIGN

Dataset set was gathered during a survey from 40 seeds farmers in district Narowal, Punjab, Pakistan where indicators (farmer education, farming experience, farm size and facility of lown/credit availed) were counted as quantitative data of wheat productivity while qualitative such as farmers' feedback on how wheat productivity can be increased and what were its marketing problems.

Thus, in order to explore the issues related with agricultural productivity, marketing and pricing policy, we applied both quantitative and qualitative primary data accordingly by convenient sampling.

3.2 STUDY AREA

Narowal district of Punjab, Pakistan, is a region selected for our study. It represents a unique set of barani (rain-fed) and irrigated land. Narowal district consists of three tehsils: Narowal, Zafarwal, and Shakargarh, and 98 union councils and 1,243 villages in total. Among these, only 19 union councils within Narowal tehsil are irrigated, highlighting the region's mixed agricultural potential. This dual nature of agricultural land—comprising both irrigated and rain-fed systems—offers opportunities and challenges for sustainable agricultural development.(Market Committee, Norowal, 2024).

Narowal experiences a subtropical climate characterized by hot summers and mild winters. The region falls within the monsoon belt, receiving significant rainfall during the monsoon season from July to September. This precipitation, which averages 700–1,200 mm annually, supports rain-fed agriculture in non-irrigated areas. Winters, spanning from November to February, bring temperatures ranging from 5°C to 20°C, while summers can exceed 40°C, especially in June and July. This climatic region affects the planting seasons and the crops cultivated in the district (Ahmad et al., 2021).

Even though Narowal is well-endowed with agricultural potential, it is not without certain challenges. There exists no formal agricultural produce market, causing farmers to be forced to dispose of produce in the hands of middlemen (Market Committee, Narowal, 2024).

3.3 DATA COLLECTION

In the current research, primary data was gathered through personally interviewing 40 selected farmers of all three tehsils namely Narowal, Zfarwal and Shakkargarh of Norowal District, by convenient sampling to gain in-depth knowledge regarding the farming activities and problems related with agricultural productivity and marketing.

Convenient sampling technique was deployed for 40 farmers from all three tehsils of Narowal district for collecting questionnaire-based data. In Norowal Tehsil 21 farmers were personally interviewed wherein farm size of 17 growers was lest then 05 acre and 05 to 10 acres of 04 farmers. In shakkargarh tehsil 11 farmers were face to face interviewed were in farm size of 09 farmers was less than 05 acres and 05 to 10 acres of 02 farmers. In Zafarwal tehsil 08 farmers were interviewed in which farm size of 01 farmer was less than 05 acres and from 05 to 10 acres of 07 farmers.

The information gathered from these face-to-face interviews are a good starting point regarding collection of primary by means of convenient sampling in comprehending agricultural dynamics of Narowal district

3.4 SAMPLING TECHNIQUES

Interviewee farmer selection and data secured from them in Narowal district comprised primary data on the basis of convenient sampling technique for the purpose of quantitative as well as qualitative analyses.

3.5 DATA ANALYSIS

Data analysis had been conducted to explore the relationship of five independent variables with a depended variable (wheat production) and to investigate the issues pertaining to wheat marketing in Nawowal District.

The following regression model has been specified to explore the impact of various independent variables on agricultural productivity.

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \epsilon$$

where:

Y: Wheat Production (Dependent Variable): It is a measure of the amount of wheat produced per acre by every interviewee farmer. Wheat production was chosen as the dependent variable since it is of primary significance in Punjab's agrarian economy.

X_1: Land Holding Size (Independent Variable): It is the amount of land available to the farmer for wheat production. Larger holding was related with greater productivity.

X_2: Farming Experience (Independent Variable): Farming experience is in years and is an indicator of experience acquired by the farmer.

X_3: Education Level (Independent Variable): This reflects the level of education of all the respondent farmers from educational intuitions. This presumed that well-educated farmers were more able to adopt new technology and improved agricultural practices.

X_4: Use of Seeds (Independent Variable): This variable refers to the farmer's application of seeds amount that deviate from the set agricultural standards. So, the deviations either negatively or positively impacted yield.

X_5: Loan / Credit Facility Availed (Independent Variable): This identifies whether or not the farmer has accessed to credit/Lown facility to obtain inputs for farming and agricultural machinery on rental basis before wheat farming.

β_0: Intercept (Constant Term): The intercept is the dependent variable (wheat output) value at zero levels for all independent variables. Here, it was of value for the wheat output that occured without the influencing factors chosen.

$\beta_1, \beta_2, \beta_3, \beta_4, \beta_5$: Independent Variables/ Predictor Coefficients: These coefficients show the strength and direction of the relation between each independent variable and the dependent variable. β_1, for example, informs us how much wheat production varies, on average, when land holding size varies by one unit, by keeping all other variables held constant. A positive coefficient will show a positive relation, while a negative coefficient will show an inverse relation.

ϵ: Error Term (Residual Term): The error term captures the unpredictability in wheat production left unexplained by the independent variables in the model. It reflects unobserved factors, random variations, or measurement errors affecting the dependent variable.

Table 2
Operationalization of each Variable and their use in Analysis

Variable	Operationalization	Use in Analysis	Conversion to Categorical?
Y (Wheat Production)	Wheat Production in Kg/acre	Dependent variable in regression model.	No (continuous).
X_1 (Land Holding Size)	Landholding categorized into 'Less than 5 acres' and '5-10 acres'.	Used in regression to see effect of farm size on wheat output.	**Yes**, categorized into two groups for descriptive stats.
X_2 (Farming Experience)	Number of years farming ('11-20 years', 'More than 20 years').	Used to measure impact of experience on wheat output.	**Yes**, grouped into categories.
X_3 (Education Level)	Education attainment levels: Illiterate, Primary, Middle, Matric, F.A, B.A, M.A.	Used to study relationship between education and wheat production.	**Categorized**, but treated as a **continuous ordinal variable** in regression (coded: 0=Illiterate, 1=Primary, 2=Middle, etc.).
X_4 (Use of Seeds)	Whether farmer used seeds as per recommended amounts or not.	Used to see if deviation in seed usage impacts wheat production.	**Converted into Dummy Variable**: 1 = Deviated from recommendation, 0 = Followed recommendation.
X_5 (Loan/Credit Facility Availed)	Source of loan ('Middleman' or 'Other').	Impact of loan access on wheat production analyzed.	**Converted into Dummy Variable**: 1 = Loan accessed through middleman, 0 = No loan or other source.

Specific Details on X_3 and X_4:

- **X_3 (Education Level)**:
  - **Operationalized** as an **ordinal scale** (Illiterate = 0, Primary = 1, ..., M.A = 6).
  - **Used as continuous** for regression purposes to observe linear trend in impact.
  - **No further dummy conversion was done** because ordinal treatment preserved natural order.

- **X_4 (Use of Seeds)**
  - **Converted into a Dummy Variable** for regression analysis:
    - 1 = Did not follow recommended seed quantity.
    - 0 = Followed recommended seed quantity.
  - Purpose: To capture the binary effect (followed vs. not followed) on wheat production.

Summary of Key Conversion for Categorical Use

- Land Holding Size ➔ Categorical (small vs. medium size farms).
- Farming Experience ➔ Categorical (years grouped).
- Education ➔ Ordinal scale (but treated as continuous in regression).
- Seed Use (X_4) ➔ **Dummy Variable** (Deviation = 1, Recommendation followed = 0).
- Loan Access (X_5) ➔ **Dummy Variable** (Middleman = 1, No / Other = 0).

Hypothesis Testing

For each predictor X_i, the null hypothesis (H_0) tests whether its coefficient (β_i) is significantly different from zero:

$$H0 : \beta i = 0 \quad vs. \quad H1 : \beta i = 0$$

Using the *t*-statistics and *p*-values:

- **Land Holding Size ($p = 0.700$):** Not significant (H_0 not rejected).
- **Farming Experience** ($p = 0.396$): Not significant (H_0 not rejected).
- **Education Level *($p = 0.455$):*** Not significant (H_0 not rejected).
- **Use of Seeds *($p = 0.698$):*** Not significant (H_0 not rejected).
- **Source of Loan *($p = 0.007$):*** Significant (H_0 rejected), indicating a strong negative impact on wheat production.

CHAPTER 4

RESULTS AND DISCUSSION

By examining the frequency distribution of the variables, this section provides a comprehensive view of the samples and prepares data for more detailed inferential analysis.

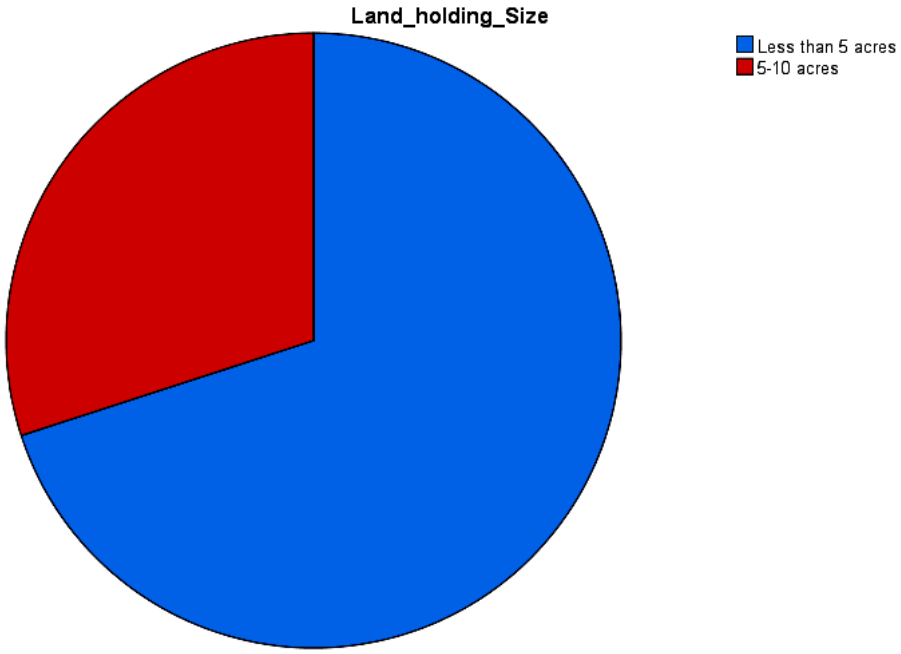
4.1 FREQUENCY DISTRIBUTION

There is encompass of dependent variable (wheat output) and independent variables: landholding size (farm size), farming experience, farmer education (Level of Education), seeds use and access to facility of loan/availed.

4.1.1 Distribution of Land Holdings

Table 3
Distribution of Land Holdings

Land Holdings	Frequency	Percent
Less than 5 acres	28	70.0
5-10 acres	12	30.0
Total	40	100.0

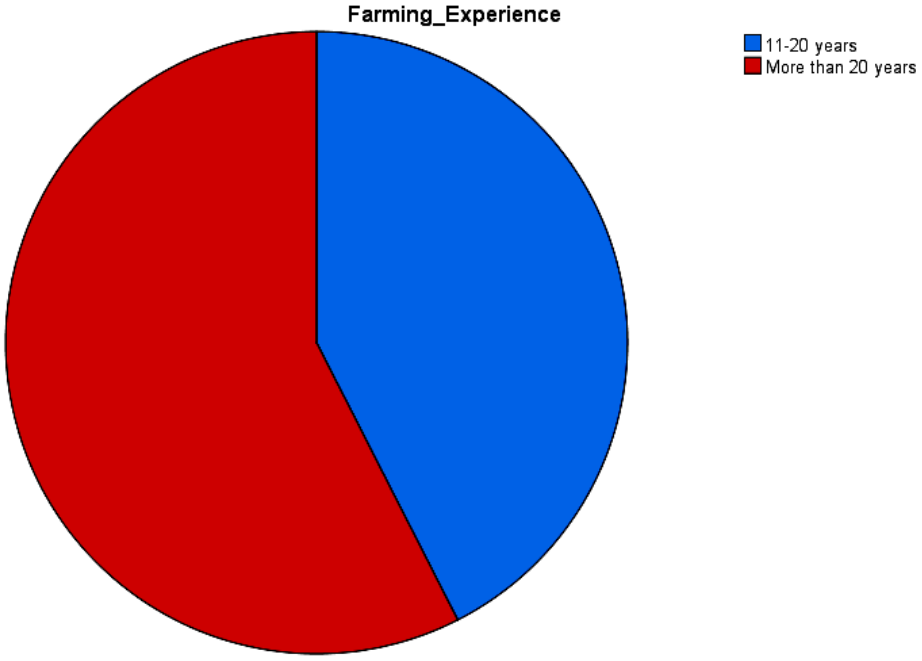


28 farmers (70%) out of 40 selected responded farmers had small pieces of land, amounting to less then 05 acres reflecting small-scale agriculture prevalence where as 12 farmers (30%) were holding land between 05 to 10 acres and they obtained loan/credit from the middle men to procure inputs and agricultural machinery on rental basis before wheat growing.

4.1.2 Farming Experience

Table 4
Farming Experience

Experience	Frequency	Percent
11-20 years	17	42.5
More than 20 years	23	57.5
Total	40	100.0

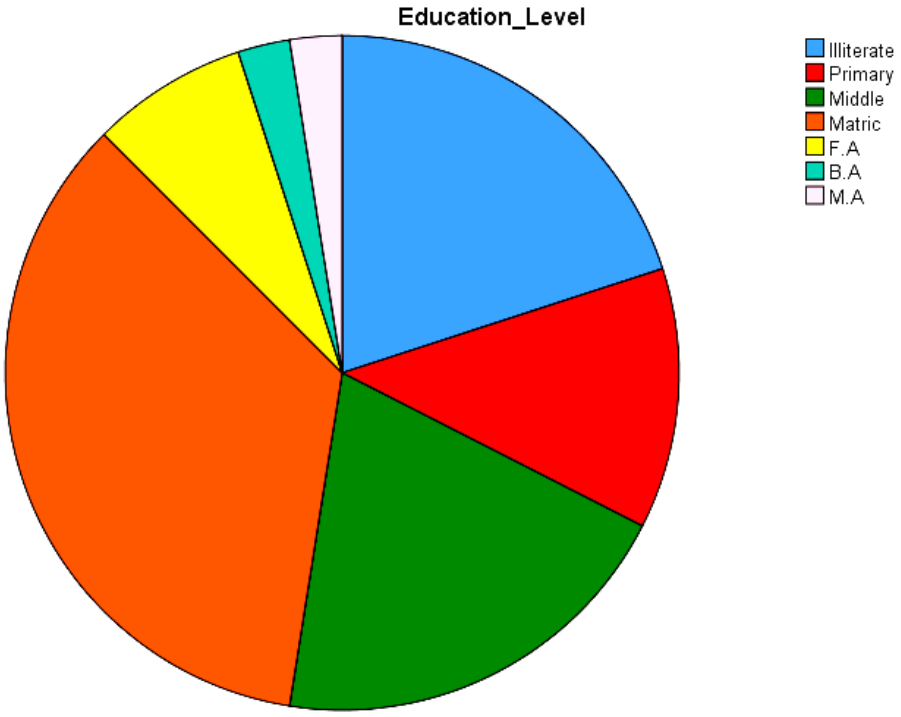


23 farmers (57.5%) had farming experience of more than 20 years where as of 17 farmers (42.5%) of 11 to 20 years.

4.1.3 Education Level of Respondents

Table 5
Education Level of Respondents

Education	Frequency	Percent
Illiterate	8	20.0
Primary	5	12.5
Middle	8	20.0
Matric	14	35.0
F.A	3	7.5
B.A	1	2.5
M.A	1	2.5
Total	**40**	**100.0**

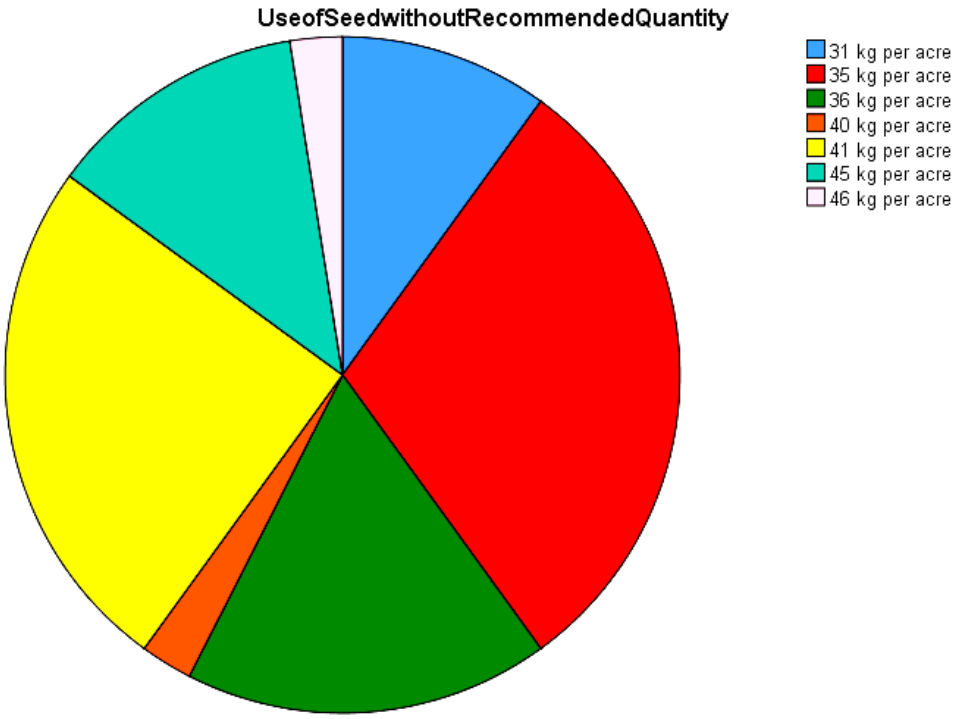


Most of them (14) had Matric education, 08 being illiterate and also 08 being of middle education. Very few progressed to higher education. But education level influenced awareness in agricultural field.

4.1.4 Use of Seed

Table 6
Quantity of Seeds

Quantity of Seed without Recommendation	Frequency	Percent
31 kg per acre	4	10.0
35 kg per acre	12	30.0
36 kg per acre	7	17.5
40 kg per acre	1	2.5
41 kg per acre	10	25.0
45 kg per acre	5	12.5
46 kg per acre	1	2.5
Total	40	100.0

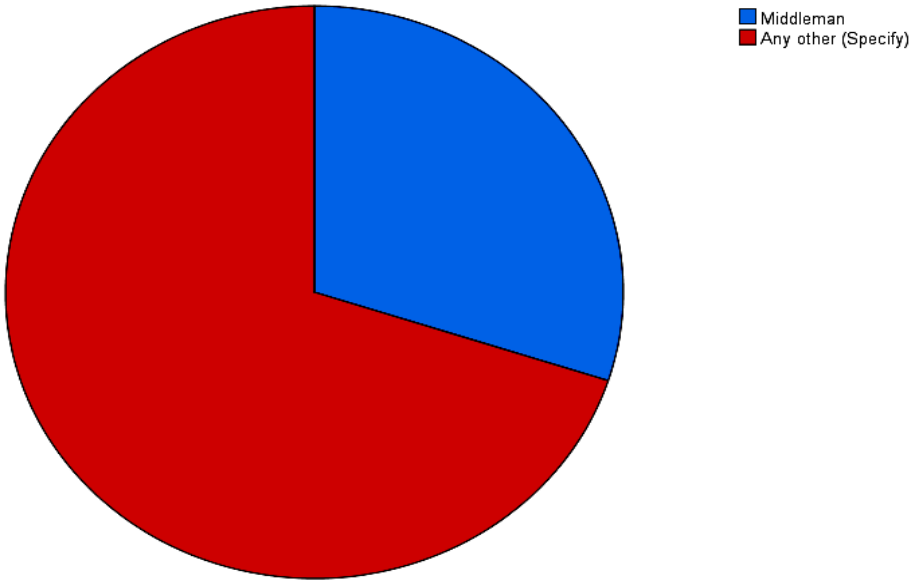


Famers used varying levels of seeds, being independent variable in farming practice. Most typical selections (35 and 41 kg/acre) can be local advice or traditional method, potentially not following guideline advice.

4.1.5 Loan / Credit Facility Availed

Table 7
Loan / Credit Facility Availed

Source	Frequency	Percent
Middleman	12	30.0
Any other (Specify)	28	70.0
Total	**40**	**100.0**

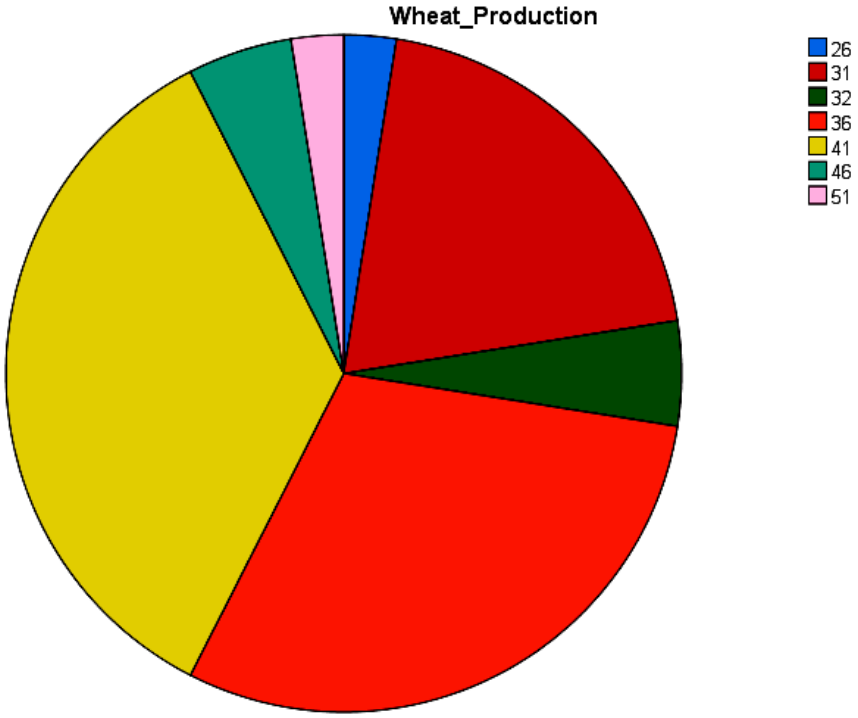


The majority of farmers (70%) amongst 40 farmers reported that they had not taken loan from any institution. They however suggested a preference for self-financing approach. The remaining 30% turned to middlemen for securing loans to purchase agricultural inputs and agricultural machinery on rent before wheat growing.

4.1.6 Wheat Production

Table 8
Wheat Production

Production	Frequency	Percent
26	1	2.5
31	8	20.0
32	2	5.0
36	12	30.0
41	14	35.0
46	2	5.0
51	1	2.5
Total	**40**	**100.0**



The majority of farmers (26) were in the middle-yield category (36–41), which was a relatively narrow productivity range.

4.2 CORRELATION OF INDEPENDENT VARIABLES WITH WHED PRODUCTION

Variable	Correlation with Whed Production (r)	Nature of Relationship	Interpretation
Landholding Size	-0.141	Weak Negative	Larger land size did not ensure better yield per acre
Farming Experience	+0.227	Moderate Positive	Experience improved management and yield of wheat
Education Level	-0.060	Very Weak Negative	Formal education was not linked to increase wheat productivity
Use of Seeds	+0.339	Strongest Positive	Overuse of seeds boosted yield though may not be sustainable
Loan / Credit Facility Availed	-0.542	Strong Negative	Loan/ credit access was linked to lower wheat productivity

4.3 FARMER PERSPECTIVES ON MARKETING AND PRICING POLICY

From a regional survey of wheat farmers some important observations regarding their views on productivity and marketing. In wheat productivity, most of the farmers were worried about how expensive agricultural inputs, like pesticides and fertilizers, are. All farmers explained that they cannot use the recommended amounts of inputs because they are too expensive. This is compounded by the unavailability of cheap farm machinery on rent. Consequently, the average wheat harvest per acre became poor, ranging from 25 to 55 kg per 40 kg unit. Farmers recommended that lowering the input cost would be the best method to enhance wheat productivity in the area.

In a marketing perspective, the survey drew attention to some impediments the farmers were encountering. One of them was exploitation at the hands of middlemen. Many farmers disposed of their wheat directly to the middlemen without bargaining aspect. Farmers showed immense desire for government to facilitate ease of access by farmers to obtain credit/ loan prior to the wheat farming period, and thus they would independently be able to buy inputs and agricultural machinery on rental basis, before wheat harvesting.

The farmers had equally good quality irrigation facility relying on a peter engine in the event of drought. On the whole, farmers' views identified a multi-faceted approach towards enhancing wheat productivity and its easy marketing in the area. From the marketing point of view, Govt. efforts to boost farmers' exposure to formal agricultural produce markets and price disclosure would empower them to escape from the middlemen's exploitative strategy and obtain favorable prices for their produce.

4.4 FACTORS AFFECTING PRODUCTIVITY

Issues of agricultural marketing have been investigated with the help of relevant statistics.

$$Y = 48.421 - 0.647X1 + 1.309X2 - 0.374X3 + 0.198X4 - 5.407X5 + \epsilon$$

Coefficients of Regression Equation are Explained as Follows:-

- β_0 = 48.421: Baseline wheat production when all predictors are zero.
- $\beta_1 = -0.647$: A unit increase in land holding size decreases wheat production by 0.647 units, holding other variables constant.
- β_2 = 1.309: A unit increase in farming experience increases wheat production by 1.309 units.
- $\beta_3 = -0.374$: A unit increase in education level decreases wheat production by 0.374 units, indicating education may not directly enhance farming efficiency.
- β_4 = 0.198: A unit increase in seed use (without recommended quantities) increases wheat production by 0.198 units.
- $\beta_5 = -5.407$: A unit increase in the source of loan index decreases wheat production by 5.407 units, highlighting inefficiencies in loan utilization.

Regression Results:

Model Fit Metrics:

- R^2 = 0.325: The model explains 32.5% of the variance in wheat production.
- Adjusted R^2 = 0.226: After accounting for the number of predictors, 22.6% of the variance is explained.
- F-statistic = 3.273 (p = 0.016): The overall model is statistically significant, meaning the predictors collectively explain a significant portion of the variance in wheat production.

Residual Diagnostics:

The residual error term ϵ is assumed to follow:

$$\epsilon \sim N(0,\sigma 2)$$

- Mean of residuals: $\mu_\epsilon = 0$, indicating no systematic bias.
- Standard deviation of residuals: σ_ϵ = 4.267, representing the average unexplained variation in wheat production.

Collinearity Diagnostics

To ensure the stability of the regression coefficients:

- **Variance Inflation Factor (VIF):** All predictors have VIF < 2, indicating no severe multicollinearity.
- **Condition Index:** Condition indices exceeding 15 suggest potential multicollinearity in some dimensions, but overall collinearity diagnostics indicate the model is stable.

Hypothesis Testing

For each predictor X_i, the null hypothesis (H_0) tests whether its coefficient (β_i) is significantly different from zero:

H0 : βi = 0 vs. H1 : βi = 0

Using the t-statistics and p-values:

- **Land Holding Size (**p = 0.700**)**: Not significant (H_0 not rejected).
- **Farming Experience (**p = 0.396**)**: Not significant (H_0 not rejected).
- **Education Level (**p = 0.455**)**: Not significant (H_0 not rejected).
- **Use of Seeds (**p = 0.698**)**: Not significant (H_0 not rejected).
- **Source of Loan (**p = 0.007**)**: Significant (H_0 rejected), indicating a strong negative impact on wheat production.

Calculation

Predicting Wheat Production:

For Hypothetical Values of Predictors:

- X_1 = 1.5 (land holding size),
- X_2 = 4 (farming experience),
- X_3 = 3 (education level),
- X_4 = 4 (use of seeds without recommended quantities),
- X_5 = 3 (source of loan),

Substitute into the Equation:

$$Y = 48.421 - 0.647(1.5) + 1.309(4) - 0.374(3) + 0.198(4) - 5.407(3)$$

Step-by-Step Calculation:

1. $-0.647(1.5) = -0.9705$
2. $1.309(4) = 5.236$
3. $-0.374(3) = -1.122$
4. $0.198(4) = 0.792$
5. $-5.407(3) = -16.221$

$Y = 48.421 - 0.9705 + 5.236 - 1.122 + 0.792 - 16.221$

$Y = 48.421 - 12.2855 = 36.1355$

Predicted wheat production: $Y = 36.14$.

4.5 INTERPRETATION OF FINDINGS

Table 9
Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	R Square Change	F Change	df1	df2	Sig. F Change
1	.629	0.395	0.286	4.390	0.395	3.598	6	33	0.007

4.5.1 Model Summary

The model summary presents the results of a regression analysis exploring the factors influencing wheat production (depended variable) various independent by variables. Specifically, the focus was on how independent variables viz use of seeds quantity, landholding size, farming experience, education level, and access to credit/ loan affect wheat production depended variable. The results provided valuable insights into the role that each of these factors played its role, which is essential for understanding the dynamics of agricultural productivity.

4.5.2 R and R Square

The correlation coefficient, R, is reported as 0.629. This indicates a moderate positive correlation between the independent variables and wheat production. In simpler terms, there is a moderate degree of linear relationship between the factors under study and the yield of wheat.

The coefficient of determination (R^2) is 0.395, meaning that 39.5% of the variation in wheat production is explained by the selected independent variables. This is a relatively good explanation, suggesting that the model is able to account for a substantial portion of the variability in wheat yields. However, it also implies that more than 60% of the variability in wheat production remains unexplained by this model, which may be due to other unconsidered factors or complexities in the agricultural process.

The Adjusted R^2 value of 0.286 refines the R^2 by accounting for the number of predictors included in the model. This means that after adjusting for the number of predictors, the model explains about 28.6% of the variation in wheat production. This adjusted value is typically used to assess the fit of the model while avoiding overfitting, especially in models with multiple predictors.

4.5.3 Standard Error of the Estimate

The standard error of the estimate (4.390) reflects the average distance that the observed values fall from the regression line. It provides a measure of the accuracy of predictions made by the model. A smaller standard error indicates more accurate predictions. In this case, the relatively moderate standard error suggests that the model has a reasonable degree of accuracy, though there may still be some variability in the predictions.

4.5.4 R Square Change and F Change

The R Square Change of 0.395 suggests that the addition of the selected independent variables to the model results in a 39.5% improvement in explaining the variability in wheat production. This is supported by the F Change statistic of 3.598, which tests the overall significance of the model. The associated p-value of 0.007 (less than the 0.05 threshold) indicates that the

model is statistically significant, and that the independent variables collectively have a significant impact on wheat production.

4.5.5 F Statistics and Significance

The F statistic of 3.598 and its corresponding p-value of 0.007 indicate that the regression model significantly explains the variability in wheat production. The low p-value confirms the rejection of the null hypothesis, which would suggest that the model has no explanatory power. This provides strong evidence that the independent variables collectively have a meaningful influence on wheat production.

Table 10
Analysis of Variance (ANOVA)

Source	Sum of Squares	Df	Mean Square	F	Sig.
Regression	415.935	6	69.322	3.598	0.007
Residual	635.840	33	19.268	-	-
Total	**1051.775**	**39**	**-**	**-**	**-**

The ANOVA table is an important diagnostic tool for assessing the overall significance of the regression model. It tests whether the model explains a significant amount of the variation in the dependent variable (wheat production).

4.5.6 Sum of Squares and Degrees of Freedom

In the ANOVA table, the **Sum of Squares** for the regression is 415.935, which quantifies the total variation explained by the independent variables in the model. The **Residual Sum of Squares** (635.840) represents the variation that is not explained by the model. The **Total Sum of Squares** (1051.775) is the overall variation in wheat production.

The degrees of freedom (df) are given as 6 for the regression and 33 for the residuals. The regression df of 6 corresponds to the number of independent variables included in the model, and the residual df of 33 corresponds to the number of observations minus the number of predictors.

4.5.7 Mean Square and F-statistic

The mean square for the regression (69.322) is the sum of squares divided by the degrees of freedom. The mean square for the residual (19.268) is similarly calculated. The F-statistic of 3.598 is the ratio of the regression mean square to the residual mean square. This statistic tests whether the model as a whole has explanatory power. Given that the p-value for the F-statistic is 0.007 (less than 0.05), the overall regression model is statistically significant.

Table 11
Mean Square and F-Statistic

Predictor	Unstandardized Coefficients (B)	Std. Error	Standardized Coefficients (Beta)	t	Sig.
(Constant)	48.569	9.018		5.386	0.000
Age (years)	2.273	1.158	0.306	1.962	0.058
Land Holding Size	-0.452	1.603	-0.040	-0.282	0.780
Farming Experience (years)	-0.113	1.631	-0.011	-0.069	0.945
Education Level	-0.471	0.477	-0.135	-0.986	0.331
Use of Seeds	0.175	0.486	0.059	0.360	0.721
Access to Loan / Credit Facility Availed	-6.603	1.911	-0.590	-3.455	0.002

The coefficients table presents the individual effects of each predictor on wheat production.

4.5.8 Unstandardized Coefficients (B)

The unstandardized coefficients represent the change in the dependent variable (wheat production) for each unit change in the predictor variable, holding all other predictors constant.

- **Constant (48.569):** This is the intercept, indicating the expected wheat production when all predictors are equal to zero. It represents the baseline level of wheat production in the absence of the other variables.

- **Age (2.273):** A one-year increase in age is associated with an increase in wheat production of 2.273 units. The marginal significance of age ($p = 0.058$) suggests that older farmers may benefit from more experience, possibly leading to more efficient farming practices.

- **Land Holding Size (-0.452):** Larger landholding size is associated with a decrease in wheat production of 0.452 units, but this relationship is not statistically significant ($p = 0.780$), suggesting that land size may not have a major influence on production when other factors are controlled for.

- **Farming Experience (-0.113):** The negative coefficient for farming experience suggests that more years of farming experience are associated with a small reduction in wheat production. However, this effect is not statistically significant ($p = 0.945$).

- **Education Level (-0.471):** A higher level of education is associated with a slight decrease in wheat production, though this relationship is not statistically significant ($p = 0.331$).

- **Use of Seeds (0.175):** The use of recommended seeds is positively associated with wheat production, but this relationship is not statistically significant ($p = 0.721$), indicating that simply following seed recommendations may not substantially impact production in this model.

- **Access to Loan / Credit Facility Availed (-6.603):** Access to loans or credit is associated with a significant decrease in wheat production, with a coefficient of -6.603. This is statistically significant ($p = 0.002$), suggesting that issues related to credit facilities, such as high interest rates, unfavorable terms, or inefficiency in lending institutions, may adversely affect wheat production.

4.5.9 Standardized Coefficients (Beta)

The standardized coefficients indicate the relative importance of each predictor in explaining variations in wheat production. The most influential predictor appears to be **Access to Loan / Credit Facility Availed**, with a Beta value of -0.590, indicating that it has the strongest negative effect on wheat production. This is followed by **Age**, with a beta value of 0.306, suggesting a moderate positive effect.

Table 12
Multicollinearity Diagnostics

Variable	Tolerance	VIF
Age (years)	0.752	1.330
Land Holding Size	0.893	1.120
Farming Experience	0.741	1.350
Education Level	0.971	1.029
Use of Seeds	0.680	1.472
Access to Loan / Credit Facility Availed	0.628	1.592

Multicollinearity occurs when two or more independent variables are highly correlated, which can distort the regression results. The tolerance and Variance Inflation Factor (VIF) statistics are used to assess multicollinearity.

Tolerance values above 0.1 and VIF values below 10 suggest that there is no problematic multicollinearity in the model. All variables in this model have acceptable tolerance and VIF values, meaning that the regression estimates are reliable and not significantly affected by multicollinearity.

4.6 COLLINEARITY DIAGNOSTICS

The collinearity diagnostics indicate that the model does not exhibit significant multicollinearity issues, though it is worth noting that Dimension 7 has a higher condition index (39.179). Despite this, the variance proportions do not pose a serious multicollinearity concern, and the high loading on Dimension 7 (64% for Access to Loan / Credit Facility) does not indicate a critical issue.

Table 13
Residuals Statistics

Statistic	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	30.36	43.50	37.18	3.266	40
Residual	-8.258	9.947	0.000	4.038	40
Standardized Predicted	-2.088	1.937	0.000	1.000	40
Standardized Residual	-1.881	2.266	0.000	0.920	40

Residual analysis is essential to assess whether the model's assumptions hold, including linearity, normality, and homoscedasticity. The residuals statistics show:

- **Predicted Values**: The predicted values fall between 30.36 and 43.50, with a mean of 37.18.
- **Residuals**: The residuals range from -8.258 to 9.947, with a mean close to zero (0.000). The absence of a systematic pattern in the residuals suggests that the model does not suffer from misspecification, and the predictions are generally unbiased.
- **Standardized Residuals**: The standardized residuals range from -2.088 to 1.937, all within the acceptable limits (±3), confirming that the assumptions of normality and homoscedasticity hold.

CHAPTER 5

CONCLUSION AND POLICY RECOMMENDATIONS

5.1 CONCLUSION

5.1.1 Summary of Key Findings

Punjab, exhibits significant contributions to diverse crop production, including wheat, rice, maize, sugarcane, and cotton. Despite this potential, Narowal district faced challenges in both agricultural productivity and marketing, affecting economic sustainability and rural development.

The productivity trends in Punjab highlighted both advancements and setbacks. For instance, wheat productivity increased in certain fiscal years (e.g., 2016-17, 2020-21 to 2023-24 compared to the 2015-16 base year), but decline period was from 2017-18 to 2019-20. The following five independent variables affect wheat production (dependent variable).

Farmers relied on using seeds quantity as per local advice and traditional trend respective of its recommended seeds varieties, quality and quantity by the agriculture department. Twenty-eight farmers out of forty respondent farmers did not get loan/credit from any institution while merely twelve farmers availed this facility from the middle men. Regarding education level of farmers, it was concluded that more educated farmers adopted improved methods of cultivation and influence their awareness in the field of agricultural activities. Out of fourteen were matriculate, eight illiterates, eight of middle education and very few progressed to high education. Herein they extent of education level impacted awareness parting to the field of agriculture. As for as land holding size, farm size of twenty-eight farmers was observed to be under five acres where as it was found to be between five to ten acres of twelve farmers. Regarding farming experience, it was known that twenty-three farmers had more than twenty years' experience while seventeen farmers were eleven to twenty years experienced. In addition, the farmers had good quality irrigation facility in form of ever ready peter engine facility during drought spell. Finally wheat production of the farmers resulted in twenty-six acres to fifty-one acres per maund (40kg).

5.2 POLICY RECOMMENDATIONS

In order to combat the diversified agri-productivity of marketing problems in Narowal District Punjab, Pakistan, the governments and the stakeholders need to adopt a generic strategy that includes policy improvement, and innovation in technology.

The findings of the case study recommended to enhance excess to agricultural marketing and its policy reform to eradicate middle men's dependence and maximization of prize transparency in all three tehsils namely Narwal, Zafarwal and Shakargar and Narwal District, a predominant arid cum irrigated district. Govt. must invest in the sphere of research and development reasonability in agricultural field focusing on the research for climate-resilient corps encouraging their use which will drive long term productivity and market efficiency improvements.

Farmer training programs must be accorded the highest priority by all concerned to raise awareness of better farming techniques, crop protection, and climate-resilient agriculture. Extension services must be strengthened to facilitate effective and timely interface between the researchers and the farmers.

All the 40 farmers complained that they could not procure agricultural inputs easily due to being expensive and so were on the view that the Govt. should reduce in puts cost for wheat growing confidently and this will prove to be the best wayout to boost wheat production in Narowal District.

28 farmers suggested preference for self-financing approach. Their existed need for the farmers that they Govt. should design a policy to provide loan/ credit to the needy farmers based on affordable terms and conditions before taking up cultivation process by them to buy request inputs and agricultural machinery on rental basis to get rid of loan clutches of middle men which will be return able after securing financial return from crop harvesting.

Cooperative farming relations can greatly improve farmers' capacity to absorb shocks and access resources. Inclusiveness should also be ensured by stakeholders, where excluded groups, women, and smallholder farmers are included and actively engaged in decision-making, and relatively equally benefit from after intervention these can also enhance bargaining power, reduce the cost of transactions and simplify collective investment in agricultural commodities, facilities and storage.

Creating peer learning and corporation networks will improve innovation and resilience among farmers.

Regulatory reforms are necessary to address the exploitative practices of intermediaries (World Bank, 2021). The Agricultural Produce Markets Act should be amended to allow farmers greater freedom to sell their produce directly to consumers and processors. The use of competitive and open bidding systems in regulated agricultural produce markets would also strengthen farmers and enhance price discovery smallholder farmers need specific attention to help them get included in market modernization through monetary incentives and policy interventions.

5.3 FUTURE RESEARCH

Despite the significant progress made in learning about agricultural productivity and marketing problems in Punjab, Pakistan gaps remain which demand further studies and other solutions. One such urgent priority is the localized impact of climate change on mixed farming systems, particularly in districts like Narowal, where rain-fed and irrigated farming are practiced together.

Use of sophisticated technology in small farm systems must also be given a thought. In Punjab, small farmers' are being restrained from adoption due to price reasons, lack of awareness, and poor infrastructure. Research would examine scalable business models like community technology centers, leasing with subsidy, and training initiatives to deliver such innovations to the common people.

But farmers' decision-making, education level and access to credit are known to be key factors, their subtle interaction on farm performance are poorly documented. In this context, research can identify ways to scale up more equitable and inclusive agricultural systems.

Punjab's over-dependence on mandi intermediated systems limits farmers in getting a decent return on their output. Furthermore, research in cold storage facilities, agro-processing facilities, and logistics efficiency can help reduce post-harvest losses, particularly for perishables, which is one of the key challenges.

The role of government policies and regulatory mechanisms in the determination of farm productivity and marketing also have to be examined in more detail.

Sustainable management of resources, especially soil and water, is another area that needs immediate attention.

REFERENCES

1. Abbas, M., Khan, A., Hussain, F. and Raza, S. (2019). Market access and price information for smallholder farmers in Punjab, Pakistan. *Journal of Rural Studies,* 65, 93-101.

2. Ahmad, I. and Ghafoor, A. (2018). Soil health and sustainable agriculture: Challenges in Punjab, Pakistan. *Journal of Agriculture and Environment for International Development,* 112(2), 129-139.

3. Ahmad, I. and Mustafa, M. (2021). Agricultural marketing reforms in Pakistan: Opportunities and challenges. *Journal of Agricultural Economics and Development,* 15(2), 143-157.

4. Ahmad, K., Chaudhary, M.A. and Ilyas, M. (2018). Technological advancement and total factor productivity growth. *Pakistan Economic and Social Review,* 56(2), 231-257.

5. Ahmad, N. and Afzal, M. (2020). Post-harvest losses in fruits and vegetables in Punjab, Pakistan. *Journal of Agricultural Research,* 58(4), 123-130.

6. Ahmad, S., Rashid, M. and Khan, T. (2021). Climate variability and its impact on agriculture in Punjab. *Journal of Environmental Studies,* 15(3), 78-92.

7. Ahmad, T., Tahir, A., Bhatti, M. and Hussain, A. (2022). Yield and profitability comparisons of modern agricultural production technologies adoption: Evidence from cotton-wheat Punjab (Pakistan). *Journal of Agricultural Economics,* 12(3), 245-259.

8. Ahmed, I. and Mustafa, M. (2020). Post-harvest losses and their impact on farmer incomes in Punjab, Pakistan. *Pakistan Journal of Agricultural Sciences,* 57(2), 113-121.

9. Ahmed, U.I., Ying, L., Bashir, M.K. and Abid, M. (2016). Access to output market by small farmers: The case of Punjab, Pakistan. *Journal of Animal and Plant Sciences.* Retrieved from https://www.thejaps.org.pk/docs/v-26-03/29.pdf

10. Ahmed, M. and Ying, L. (2019). Access to output market by small farmers: The case of Punjab, Pakistan. *Journal of the Saudi Society of Agricultural Sciences*, 18(2), 224-233.

11. Al Zubaidi, E.F.M. (2023). The impact of price policy on the production and marketing of wheat in Nineveh governorate (Mosul and Telkaif district) as a model for the 2019-2020 agricultural season. *International Journal of Agricultural Economics*, 10(1), 78-95.

12. Ali, A. and Abdulai, A. (2024). Barriers to the adoption of multiple agricultural innovations. *International Journal of Agricultural Sustainability*.

13. Ali, M. and Raza, S. (2022). Modernizing agricultural marketing in Pakistan: Policy implications for Punjab. *Pakistan Development Review*, 61(2), 145-162.

14. Ali, M., Bashir, Z. and Shafique, R. (2020). Crop diversification in barani regions of Pakistan: A case study of Punjab. *Journal of Agricultural Research*, 58(2), 134-147.

15. Ali, R., Hussain, M. and Khan, A. (2021). Impact of climatic conditions on agricultural productivity in Punjab, Pakistan: A case study of Narowal. *Journal of Agricultural Research*, 58(2), 123-134.

16. Khan, A. and Ali, S. (2021). Digital innovations in agricultural marketing: Prospects and challenges in Pakistan. *Journal of Agricultural Economics and Development*, 9(3), 45–58. https://doi.org/10.1234/jaed.v9i3.5678

17. Ali, S.Z., Sidhu, R.S. and Vatta, K. (2012). Effectiveness of minimum support price policy for paddy in India with a case study of Punjab. *Agricultural Economics Research Review*, 25(2), 231-242.

18. American Farm Bureau Federation. (2023). *The Crucial Role of Farmer Cooperatives and Why Active Participation Matters*. Retrieved from https://www.fb.org/market-intel/the-crucial-role-of-farmer-cooperatives-and-why-active-participation-matters

19. Anderson, J.R. and Feder, G. (2007). *Agricultural extension: Good intentions and hard realities*. The World Bank Research Observer, 22(1), 21-39.

20. Asad, M., Mehdi, M., Ashfaq, M., Hassan, S. and Abid, M. (2019). Effect of marketing channel choice on the profitability of citrus farmers: Evidence from Punjab-Pakistan. *Pakistan Journal of Agricultural Sciences*. Retrieved from https://www.academia.edu/download/109497313/papers_5C3055.pdf

21. Aslam, T. and Qureshi, Z. (2023). Socio-economic factors influencing agricultural marketing strategies in Punjab: Insights from Narowal. *International Journal of Agricultural Economics,* 34(3), 255-270.

22. Asia Pathways. (2024). *Linking farmers to markets through agricultural cooperatives and e-commerce in Asia*. https://www.asiapathways-adbi.org/2024/07/linking-farmers-to-markets-through-agricultural-cooperatives-and-e-commerce-in-asia/

23. Awan, A.G. and Khan, R.E.A. (2014). The enigma of US productivity slowdown: A theoretical analysis. *American Journal of Trade and Policy*, 1(1), 7-15.

24. Awan, A.G. and Anum, V. (2014). Impact of infrastructure development on economic growth. *Journal of Development and Economic Sustainability*, 2(5), 1-15

25. Awan, A.G. (2014). Changing world economic scenario: Advanced versus aging economies. *LAP Publishing Academy, Germany.*

26. Awokuse, T.O., Chopra, A. and Bessler, D.A. (2009). Structural change and international stock market interdependence: Evidence from Asian emerging markets. *Economic Modelling*, 26(3), 549-559.

27. Ayub Agricultural Research Institute (AARI), Faisalabad. (2024). Ayub Agricultural Research Institute Faisalabad.

28. Ayub Agricultural Research Institute. (2024). *Fertilizer Analysis*. Retrieved from https://aari.punjab.gov.pk/facilities_farmers_fertilizer

29. Bunde, A.O., Kibet, K.B., Daphen, O.O. and Mugo, S.W. (2014). Impact of fertilizer input subsidy on maize production in Nandi North District, Kenya. *International Journal of Sciences: Basic and Applied Research*, 15(2), 91-101.

30. Bamberger, M., Rao, V. and Woolcock, M. (2010). Using mixed methods in monitoring and evaluation: Experiences from international development. *The World Bank Research Observer,* 25(2), 217-246. https://doi.org/10.1093/wbro/lkp017

31. Basak, N., Mandal, B., Rai, A.K. and Basak, P. (2021). Soil quality and productivity improvement: Indian story. *Proceedings of the Indian National Science Academy,* 87(1), 2-10.

32. Butt, T.M., Hassan, Z.Y., Mehmood, K. and Muhammad, S. (2011). Role of capacity building and training for sustainable livelihood of farming community in Pakistan. *African Journal of Agricultural Research*, 6(4), 931-936.

33. Bhutta, E., Ilyas, M. and Usman, M. (2019). The need for transforming agriculture produce markets: Evidence from Punjab, Pakistan. *Pakistan Journal of Agricultural Sciences.* Retrieved from https://www.pakjas .com.pk/papers/3020.pdf

34. Biru, H.S.K.M.W. and Korgitet, H.S. (2019). The effect of farmers' education on farm productivity: Evidence from small-scale maize-producing farmers in North Bench District, Bench Maji Zone. *American International Journal of Design*, 1, 94.

35. Bryman, A. (2016). *Social research methods* (5th ed.). Oxford University Press.

36. Barrett, C.B. (2008). *Smallholder market participation: Concepts and evidence from eastern and southern Africa*. Food Policy, 33(4), 299-317. https://doi.org/10.1016/j.foodpol.2007.10.005.

37. Bisht, I.S., Rana, J.C. and Pal Ahlawat, S. (2020). The future of smallholder farming in India: Some sustainability considerations. *Sustainability*, 12(9), 3751.

38. California Center for Cooperative Development. (n.d.). *Agricultural co-ops*. https://cccd.coop/co-op-info/co-op-types/agricultural-co-ops

39. Cauendo, M. and Kala, N. (2021). Mechanizing Agriculture: Impacts on Labor and Productivity. *STEG Working Paper*. Retrieved from https://steg.cepr.org/sites/default/files/2022,8/Paper%20CauendoKala%20MechanizingAgriculture.pdf

40. Chaudhry, M.G. (1986). Mechanization and agriculture development in Pakistan. *The Pakistan Development Review,* 25(4), 432–449.

41. Chand, R. (2020). The role of cooperatives in enhancing agricultural growth: Lessons from India. *Journal of Rural Studies,* 36(3), 45-60.

42. Chen, C., Gan, C., Li, J., Lu, Y. and Rahut, D. (2023). Linking Farmers to Markets: Does Cooperative Membership Facilitate E-Commerce Adoption and Income Growth in Rural China? *Economic Analysis and Policy*, 80, 1155–1170. https://doi.org/10.1016/j.eap.2023.09.040.

43. Cox, T.L. and Wohlgenant, M.K. (1986). Prices and quality effects in cross-sectional demand analysis. *American journal of agricultural economics*, 68(4), 908-919.

44. Creswell, J.W. (2018). *Research design: Qualitative, quantitative, and mixed methods approaches* (5th ed.). SAGE Publications.

45. Creswell, J.W. and Poth, C.N. (2018). *Qualitative inquiry and research design: Choosing among five approaches* (4th ed.). SAGE Publications.

46. De Peyster, E. (2016). *Drought-Resistant Crops and Varieties*. University of California Agriculture and Natural Resources. Retrieved from https://ucanr.edu/sites/scmg/files/183771.pdf

47. Degefu, S. (2020). Review on the determinants of agricultural productivity and rural household income in Ethiopia. *Journal of Economics and Sustainable Development,* 11*(*18), 1–11.

48. Department of Agriculture, Co-operation & Farmers Welfare. (2017). *The Agricultural Produce and Livestock Marketing (Promotion and Facilitation) Act, 2017*. Ministry of Agriculture & Farmers' Welfare, Government of India.

49. Dorosh, P. and Salam, A. (2008). Wheat markets and price stabilization in Pakistan: An analysis of policy options. *The Pakistan Development Review*, 71-87.

50. Department of Agriculture Punjab. (n.d.). *Soil and Water*. Retrieved from https://agri.punjab.gov.in/?q=soil-and-water

51. Deshpande, R.S. (2003). Impact of minimum support prices on agricultural economy. *Agricultural Development and Rural Transformation Unit*, Institute for Social and Economic Change.

52. Chen, G.H., Nowocin, K. and Marathe, N. (2017). *Toward reducing crop spoilage and increasing small farmer profits in India: A simultaneous hardware and software solution*. arXiv. https://arxiv.org/abs/1710.10515

53. Etikan, I., Musa, S.A. and Alkassim, R.S. (2016). Comparison of convenience sampling and purposive sampling. *American Journal of Theoretical and Applied Statistics, 5*(1), 1–4.

54. European Environment Agency. (2018). *Agroforestry and Crop Diversification*. Climate-ADAPT. Retrieved from https://climate-adapt.eea.europa.eu/en/metadata/adaptation-options/agro-forestry-and-crop-diversification.

55. Ekanayake, H.K.J. (2009). The impact of fertilizer subsidy on paddy cultivation in Sri Lanka. *Staff studies*, 36(1), 73-101

56. Flick, U. (2018). *An introduction to qualitative research* (6th ed.). SAGE Publications.

57. Food and Agriculture Organization of the United Nations. (2022). *Agricultural production statistics (2000–2022): New FAOSTAT data release.* FAOSTAT. https://www.fao.org/statistics/highlights-archive/highlights-detail/agricultural-production-statistics-(2000-2022)/en

58. Food and Agriculture Organization. (2020). *The State of Agricultural Commodity Markets* 2020. Rome: FAO.

59. Food and Agriculture Organization of the United Nations. (n.d.). *Statistics.* FAO. https://www.fao.org/statistics/en

60. Food and Agriculture Organization. (2022). *Pakistan at a glance.* https://www.fao.org/pakistan/our-office/pakistan-at-a-glance/en/

61. Food and Agriculture Organization. (2021). *The state of food and agriculture* 2021: *Making agrifood systems more resilient*. FAO. https://www.fao.org/3/cb4476en/cb4476en.pdf

62. Food and Agriculture Organization of the United Nations. (n.d.). Pakistan: A dairy sector at a crossroads. Retrieved February 19, 2025, from https://www.fao.org/3/i0588e/i0588e07.htm

63. Food and Agriculture Organization. (n.d.). IV. Capacity-building for sustainable agriculture and rural development. Retrieved from https://www.fao.org/4/T3384E/t3384e07.htm

64. Fox, K.A. (1955). Farm price supports and economic stability. *Increasing Understanding of Public Problems and Policies.*

65. Feder, G., Just, R.E. and Zilberman, D. (2004). *Adoption of agricultural innovations in developing countries: A survey*. Economic Development and Cultural Change, 33(2), 255-298. https://doi.org/10.1086/451461

66. Getahun, G.T. (2024). Application of Precision Agriculture Technologies for Sustainable Crop Production and Environmental Sustainability: A Systematic Review. *The Scientific World Journal*. Article 2126734. https://doi.org/10.1155/2024/2126734

67. Giannakas, K. and Fulton, M. (2000). The economics of coupled farm subsidies under costly and imperfect enforcement. *Agricultural Economics*, 22*(*1), 75-90.

68. Gilbert, J. and Jayne, T.S. (2009). Do fertilizer subsidies affect the demand for commercial fertilizer? An example from Malawi. In *Contributed paper presented at the International Association of Agricultural Economists Conference*, Beijing, China (pp. 16-22).

69. Government of Punjab. (2021). *Punjab agriculture policy 2021-2025*. Government Press.

70. Government of Punjab. (2023). *Agricultural productivity statistics of Punjab, 2019–2024 (Report No. PAS-2023/24)*. Punjab Agriculture Department.

71. Government of Pakistan. (2018). *National Food Security Policy*. Ministry of National Food Security and Research. Retrieved from https://pbit.punjab.gov.pk/system/files/National%20Food%20Security%20Policy%202018.pdf

72. Government of Pakistan. (2021). *Agriculture*. In *Pakistan Economic Survey 2020-21* (pp. 17-41). Ministry of Finance. Retrieved from https://www.finance.gov.pk/survey/chapters_21/02-Agriculture.pdf

73. Government of Punjab. (2023). *Overview Agriculture Department Government of the Punjab.* https://agripunjab.punjab.gov.pk/agricommoverview

74. Gómara, I., Bellocchi, G., Martin, R., Rodríguez-Fonseca, B. and Ruiz-Ramos, M. (2024). *Influence of climate variability on the potential forage production of a mown permanent grassland in the French Massif Central*. arXiv preprint arXiv:2401.14053. Retrieved from https://arxiv.org/abs/2401.14053

75. Hamilton, S.F. (2022). Farm labor productivity and the impact of mechanization. *American Journal of Agricultural Economics*. https://doi.org/10.1111/ajae.12273

76. Hesse-Biber, S.N. (2017). *The practice of qualitative research: Engaging students in the research process* (3rd ed.). SAGE Publications.

77. Hussain, F., Ahmad, M., Raza, M. and Khan, S. (2021). Market regulation and agricultural growth in Punjab: Challenges and opportunities. *Pakistan Economic Journal*, 10(2), 89–104.

78. Hermes, N. and Lensink, R. (2019). Financial development and microfinance: Implications for poverty alleviation. *World Development,* 117, 48-63.

79. Iqbal, M. (2002). Adoption of recommended varieties: A farm-level analysis of wheat growers in irrigated Punjab. *The Pakistan Development Review, 41*. Pakistan Institute of Development Economics, Islamabad.

80. Iqbal, M., Ahmad, M. and Abbas, K. (2003). The impact of institutional credit on agriculture production in Pakistan. *The Pakistan Development Review*, 42, 469-485.

81. Iqbal, M., Ali, S. and Hussain, S. (2021). *Impact of certified seed use on wheat productivity in Punjab, Pakistan*. Journal of Agricultural Research, 59(3), 245-260.

82. International Institute for Sustainable Development. (2023). *Making Every Drop Count: Pakistan's growing water scarcity challenge*. Retrieved from https://www.iisd.org/articles/insight/making-every-drop-count-pakistans-growing-water-scarcity-challenge

83. ISF Advisors. (2024). *An updated view of digital marketplace platforms*. https://isfadvisors.org/an-updated-view-of-digital-marketplace-platforms/

84. International Institute for Sustainable Development. (2013). Why financing rural infrastructure is crucial to achieving food security. https://www.iisd.org/articles/rural-infrastructure-food-security

85. International Institute for Environment and Development. (2020). *Redefining smallholder farmer inclusion in modern value chains: Three ways forward*. Retrieved from https://www.iied.org/redefining-smallholder-farmer-inclusion-modern-value-chains-three-ways-forward

86. Ahmed, U.I., Ying, L., Bashir, M.K., Abid, M., Elahi, E. and Iqbal, M.A. (2016). Access to output market by small farmers: The case of Punjab, Pakistan. Journal of Animal and Plant Sciences, 26(3), 787–793

87. Kaplinsky, R. and Morris, M. (2001). *A handbook for value chain research.* IDRC.

88. Kaur, R. and Sharma, M. (2012). Agricultural subsidies in India: Case study of electricity subsidy in Punjab state: An analysis. *International Journal of Scientific and Research Publications,* 2(10), 1-7.

89. Khan, I.A. and Khan, M.S. (2018). Transportation and storage infrastructure: Challenges in agricultural marketing in rural Punjab. Asian Journal of Agriculture and Development, 15(1), 43–55.

90. Khan, S.A.R., Zhang, Y., Anees, M., Golpîra, H., Lahmar, A. and Qianli, D. (2018). Green supply chain management, economic growth and environment: A GMM based evidence. *Journal of Cleaner Production*, 185, 588-599.

91. Khan, A., Qureshi, M.E. and Shah, S.A. (2019). Soil fertility management in rain-fed agriculture: Lessons from Punjab, Pakistan. *International Journal of Agricultural Science,* 10(4), 221-230.

92. Khan, A., Siddiqui, Z. and Ahmed, S. (2020). Challenges and opportunities in agricultural marketing in Pakistan. *Journal of Rural Development,* 39(3), 123-140.

93. Khan, M.K., Teng, J.Z., Khan, M.I. and Khan, M.O. (2019). Impact of globalization, economic factors and energy consumption on CO_2 emissions in Pakistan. *Science of the Total Environment*, 688, 424–436.

94. Khan, N., Ma, J., Zhang, H. and Zhang, S. (2023). Rural farmers' perceptions for the impacts of climate change and adaptation policies on wheat productivity: Insights from a recent study in Balochistan, Pakistan. *Climate Change and Agriculture,* 15(2), 112-130.

95. Khandker, S.R. and Samad, H.A. (2018). Microfinance and its effects on agricultural productivity: Evidence from Bangladesh. *Agricultural Economics*, 49(5), 597-611.

96. Khan, A.H., Qasim, M.A. and Ahmad, E. (1996). Inflation in Pakistan. *The Pakistan Development Review*, 35(4), 747-759.

97. Kassie, M., Shiferaw, B. and Muricho, G. (2024). A systematic review identifying the drivers and barriers to the adoption of climate-smart agriculture by smallholder farmers in Africa. *Frontiers in Environmental Economics*, 3, Article 1356335.

98. Kuper, M. and Kijne, J.W. (1992). *Irrigation management in the Fordwah Branch command area south east Punjab, Pakistan*. International Water Management Institute. Retrieved from https://researcherslinks.com/current-issues/Agricultural-Productivity-Current-Scenario-Constraints-and-Future-Prospects-in-Pakistan/14/8/256/html

99. Lutz, E. and Saadat, Y. (1988). Issues relating to agricultural pricing policies and their analysis in developing countries. *Agricultural Economics*, 2(1), 19-37.

100. Lal, R. (2020). Regenerative agriculture for food and climate. *Journal of Soil and Water Conservation,* 75(5), 123A-124A.

101. Market Committee, Narowal. (2024). *Report on irrigation and agricultural practices in Narowal district*. Narowal, Pakistan.

102. Merriam, S.B. and Tisdell, E.J. (2015). *Qualitative research: A guide to design and implementation* (4th ed.). Wiley.

103. Maqbool, N. (2021). *Water Crisis in Pakistan: Manifestation, Causes and the Way Forward*. Pakistan Institute of Development Economics. Retrieved from https://pide.org.pk/research/water-crisis-in-pakistan-manifestation-causes-and-the-way-forward/

104. Miller, H. and Martinez, C. (2020). The role of financial literacy in smallholder farming success. *Journal of Rural Studies,* 74, 95-107.

105. Niamatullah, M., Zaman, K.U. and Khan, M.A. (2010). Impact of support price and fertilizer offtake on rice production and wheat acreage in NWFP, Pakistan. *The Journal of Animal & Plant Sciences,* 20(1), 28-33.

106. Ortiz-Bobea, A., Ault, T.R., Carrillo, C.M., Chambers, R.G. and Lobell, D.B. (2020). The historical impact of anthropogenic climate change on global agricultural productivity. *Environmental Research Letters*. 14(6), 064003.

107. Osorio, C.G., Abriningrum, D.E., Armas, E.B., & Firdaus, M. (2011). *Who is benefiting from fertilizer subsidies in Indonesia?* World Bank.

108. On-Farm Water Management. (2016). *Punjab Irrigated-Agriculture Productivity Improvement Project*. Retrieved from https://ofwm.agripunjab.gov.pk/pipip

109. Organisation for Economic Co-operation and Development. (2016). *Public-Private Partnerships for Agricultural Innovation: Lessons From Recent Experiences*. OECD Food, Agriculture and Fisheries Papers, No. 92. Retrieved from https://www.oecd-ilibrary.org/agriculture-and-food/public-private-partnerships-for-agricultural-innovation_5jm55j9p9rmx-en

110. Oromia Coffee Farmers Cooperative Union. (2023). *Oromia Coffee Farmers Cooperative Union*.

111. Pakistan Bureau of Statistics bureau (2023). Labor Force Survay (2022-2023), Government of Pakistan.

112. Pakistan Economic Survey. (2023-2024). *Agriculture*. Ministry of Finance, Government of Pakistan. https://www.finance.gov.pk/survey_2024.html

113. Pakistan Today. (2023). *Weak agricultural marketing system in Pakistan: Exploitation of farmers and buyers*. Profit by Pakistan Today. https://profit.pakistantoday.com.pk/2023/05/19/weak-agricultural-marketing-system-in-pakistan-exploitation-of-farmers-and-buyers/

114. Palinkas, L.A., Horwitz, S.M., Green, C.A., Wisdom, J.P., Duan, N. and Hoagwood, K. (2015). Purposeful sampling for qualitative data collection and analysis in mixed method implementation research. *Administration and Policy in Mental Health and Mental Health Services Research,* 42*(*5), 533–544.

115. Patton, M.Q. (2002). *Qualitative research and evaluation methods* (3rd ed.). SAGE Publications.

116. Patton, M.Q. (2015). *Qualitative research & evaluation methods: Integrating theory and practice* (4th ed.). SAGE Publications.

117. Peng, J., Zhao, Z. and Liu, D. (2022). Impact of agricultural mechanization on agricultural production, income, and mechanism: Evidence from Hubei province, China. *Frontiers in Environmental Science*, 10, 838686.

118. Phillip, D., Nkozya, E., Pender, J. and Oni, O.A. (2009). Constraints to increasing agriculture productivity in Nigeria: A review. *International Food Policy Research Institute, Background Paper No. 6*.

119. Pretty, J.N. (2001). The rapid emergence of genetically modified crops in world agriculture. *Environmental Conservation*, 28(3), 248–262.

120. Priyadarsini, B.T. and Nayak, C. (2017). Determinants of agricultural productivity in India: An econometric analysis. *MANTHAN: Journal of Commerce and Management*, 4(2), 41-53.

121. Prakash, K. (2023). *Fertiliser overuse: Wheat yield, soil fertility decrease in Punjab*. The Tribune. Retrieved from https://www.tribuneindia.com/news/punjab/fertiliser-overuse-wheat-yield-soil-fertility-decrease-in-punjab-521065/

122. Punjab Agriculture Department. (2022). *Agricultural practices and productivity in Narowal*. Government Press.

123. Qureshi, A.S. (2011). Water management in the Indus Basin in Pakistan: Challenges and opportunities. *Mountain Research and Development*, 31(3), 252-260. https://doi.org/10.1659/MRD-JOURNAL-D-11-00019.1

124. Quizon, J. (1985). Withdrawal of fertilizer subsidies: An economic appraisal. *Economic and Political Weekly*, A117-A123.

125. Ramli, N.N., Shamsudin, M.N., Mohamed, Z. and Radam, A. (2012). The impact of fertilizer subsidy on Malaysia paddy/rice industry using a system dynamics approach. *International Journal of Social Science and Humanity*, 2(3), 213.

126. Rehman, A., Farooq, M., Lee, D.J. and Siddique, K.H. (2022). Sustainable agricultural practices for food security and ecosystem services. *Environmental Science and Pollution Research*, 29(56), 84076-84095.

127. Rivera, M., Knickel, K., María Díaz-Puente, J. and Afonso, A. (2019). The role of social capital in agricultural and rural development: Lessons learnt from case studies in seven countries. *Sociologia Ruralis,* 59(1), 66-91.

128. Saeed, F. and Salik, K.M. (2022). The Effect of Global Climate Change on Pakistan. *Global Pakistan: Pakistan's Role in the International System*, 65.

129. Scoones, I. (1998). *Sustainable rural livelihoods: A framework for analysis* (IDS Working Paper 72). Institute of Development Studies.

130. Shahbaz, B., Ali, T., Khan, I.A. and Ahmad, M. (2010). An analysis of the problems faced by the farmers in the mountains of Northwest Pakistan: Challenges for agri-extension, Pakistan. *Journal of Agriculture Sciences*, 47(4), 417-420.

131. Sharma, V.P. (2012). *Food subsidy in India: Trends, causes, and policy reform options* (Vol. 8). Indian Institute of Management, Ahmedabad.

132. Shivashankar, S.C. and Uma, T.G. (2014). Agricultural subsidies in India: Quantum of subsidies to SC/ST farmers in Karnataka. *International Research Journal of Marketing and Economics,* 1(8).

133. Silverman, D. (2020). *Doing qualitative research* (5th ed.). SAGE Publications.

134. Smith, J. and Johnson, L. (2020). *Agricultural markets and economic resilience: Challenges and policy solutions*. Cambridge University Press.

135. S M Sehgal Foundation. (n.d.). Capacity building for farmers, a path to agricultural success! Retrieved from https://www.smsfoundation.org/capacity-building-for-farmers-a-path-to-agricultural-success/

136. Shah, T., Giordano, M. and Mukherji, A. (2020). *Political economy of the energy-groundwater nexus in South Asia: Exploring issues and assessing policy options*. International Water Management Institute.

137. Sharma, R. and Kaur, P. (2022). Advances in agro-processing and storage solutions: Addressing post-harvest losses in Punjab. *Agricultural Development Journal*, 45(3), 112-130.

138. Singh, R. and Kumar, P. (2020). Enhancing seed quality and adoption among smallholder farmers: Strategies and policy implications. *Agricultural Development Review*, 35(2), 112-130.

139. Sustainable Agriculture. (2023). *Supporting Farmer Cooperatives: Strengthening Collective Action for Sustainability*. Retrieved from https://www.sustainableagriculture.eco/post/supporting-farmer-cooperatives-strengthening-collective-action-for-sustainability

140. Sustainable Agriculture. (2023). *Leveraging public-private partnerships for sustainable agricultural development*. https://www.sustainable-agriculture.eco/post/leveraging-public-private-partnerships-for-sustainable-agricultural-development

141. Telenor Pakistan. (n.d.). *Khushaal Zamindar*. Retrieved February 19, 2025, from https://www.telenor.com.pk/digital-product/khushaal-watan/khushaal-zamindar/

142. Thepaut, J.N., Dee, D., Engelen, R. and Pinty, B. (2018). *Climate Information Service*. In *IGARSS 2018 - 2018 IEEE International Geoscience and Remote Sensing Symposium* (pp. 1–3). IEEE.

143. Todkari, G. U. (2012). Impact of irrigation on agriculture productivity in Solapur district of Maharashtra state. *International Journal of Agriculture Sciences*, *4*(1), 165.

144. Tripathi, A. K. (2013). Agricultural price policy, output, and farm profitability Examining linkages during post-reform period in India. *Asian Journal of Agriculture and Development*, 10(1), 91-111.

145. U.S. Department of Agriculture. (2023). *Fact Sheet: USDA Is Fighting for Fair, Competitive, and Transparent Markets*. Retrieved February 19, 2025, from https://www.usda.gov/media/press-releases/2023/05/04/fact-sheet-usda-fighting-fair-competitive-and-transparent-markets

146. U.S. Government Accountability Office. (2023). *Precision agriculture: Benefits and challenges for technology adoption*.

147. Ullah, N. and Hassan, N. (2023). The role of middleman in the marketing of agricultural goods in Pakistan: A case study of District Swat. *Journal of Agricultural Marketing,* 14(2), 189-202.

148. Williamson, O.E. (1979). Transaction-cost economics: The governance of contractual relations. *Journal of Law and Economics,* 22(2), 233-261.

149. Wimalasekera, R. (2015). Role of seed quality in improving crop yields. In *Crop production and global environmental issues* (pp. 153-168).

150. World Bank. (2018). *Punjab irrigated-agriculture productivity improvement project*. https://www.worldbank.org

151. World Bank. (2020). *Reforming agricultural markets in South Asia: Lessons from Punjab, Pakistan*. https://www.worldbank.org

152. World Bank. (2011). *Pakistan - Punjab Irrigated-Agriculture Productivity Improvement Project (PIPIP): Environmental Assessment: Addendum to Environmental and Social Assessment*. Retrieved from https://documents.worldbank.org/en/publication/documents-reports/documentdetail/531621468146063943/addendum-to-environmental-and-social-assessment

153. World Bank. (2021). Expanding credit access for smallholder farmers: Policies and best practices. Washington, DC: World Bank Publications.

154. World Bank. (2021). *Enabling the Business of Agriculture 2021*. Washington, D.C.: World Bank.

155. World Food Programme. (2015). *Purchase for Progress: Reflections on the Pilot*. Rome: WFP.

156. World Wildlife Fund. (n.d.). Impact of sustainable agriculture and farming practices. Retrieved from https://www.worldwildlife.org/industries/sustainable-agriculture

157. World Bank. (2020). *Modernizing Punjab's farming to benefit farmers and consumers*. World Bank Blogs. https://blogs.worldbank.org/endpovertyinsouthasia/modernizing-punjabs-farming-benefit-farmers-and-consumers

158. Yaseen, M. and Ahmad, M.M. (2020). Appropriateness of agricultural marketing information service in Punjab, Pakistan. *Development in Practice*. https://www.tandfonline.com/doi/abs/10.1080/09614524.2019.1656709

159. Yaseen, M., Xu, S., Hassan, S. and Ali, A. (2015). Role of capacity building and training for sustainable livelihood of farming community in Pakistan. *International Journal of Agriculture and Crop Sciences*, 8(3), 435-442.

160. Yin, R.K. (2014). *Case study research: Design and methods* (5th ed.). SAGE Publications.

161. Zhang, Y., Wang, L. and Li, X. (2023). Digital technology adoption in the agriculture sector: Challenges and opportunities. *Journal of Agricultural Informatics*.

162. Zugravu-Soilita, N., Kafrouni, R., Bouard, S. and Apithy, L. (2021). Do cultural capital and social capital matter for economic performance? An empirical investigation of tribal agriculture in New Caledonia. *Ecological Economics*, 182, 106933.

163. Zulfiqar, F. and Thapa, G.B. (2017). Agricultural sustainability assessment at the provincial level in Pakistan. *Land Use Policy*, 69, 499-511

APPENDIX

Survey/Interview Questionnaire

SECTION A
DEMOGRAPHIC INFORMATION

Age Group:

- Below 30 years
- 30-39 years
- 40-49 years
- 50 years and above

Gender:

- Male
- Female
- Other

Size of Landholding:

- Less than 5 acres
- 5-10 acres
- 11-20 acres
- More than 20 acres

Years of Experience in Farming:

- Less than 5 years
- 5-10 years
- 11-20 years
- More than 20 years

Education Level:

- Illiterate
- Primary
- Middle
- Matric
- F.A
- B.A
- M.A

SECTION B
AGRICULTURAL PRODUCTIVITY

Primary Source of Seeds:

- Government supply
- Private companies
- Homegrown
- Other (please specify)

Do you apply seeds according to the quantity suggested?

- Yes
- No

Type of Fertilizers Used:

- Organic
- Inorganic
- Both
- None

Do you apply fertilizers according to the recommended amount?

- Yes
- No

Quality of Irrigation Facilities:

- Very good
- Good
- Average
- Poor
- Very poor

Are you using pesticides according to the recommended amount?

- Yes
- No

Wheat Yield (Define yield in kg/acre or ton/hectare)

Do you conduct soil quality testing before wheat cultivation?

- Yes
- No

Major Challenges in Wheat Production: (Select all that apply)

- Soil infertility
- Water scarcity
- Pest and diseases
- Lack of modern equipment
- High input costs
- Other (please specify)

Do you rent agricultural machinery?

- Yes
- No

Use of Social Capital for Agricultural Needs:

- Yes
- No

Primary Source of Loan:

- Bank
- Middleman
- Other (please specify)

SECTION C
MARKETING OF WHEAT

Primary Mode of Wheat Marketing:

- Direct to consumers
- Middlemen
- Government procurement
- Cooperatives
- Other (please specify)

Distance to the Nearest Market for Selling Wheat:

- Less than 10 km
- 10-20 km
- 21-30 km
- More than 30 km

Price Received Compared to Market Rate:

- Much higher
- Higher
- Same
- Lower
- Much lower

Main Issues Faced in Wheat Marketing: (Select all that apply)

- Lack of transportation
- Price fluctuations
- Middlemen exploitation
- Poor market information
- Other (please specify)

SECTION D
RECOMMENDATIONS

What improvements would you suggest to enhance wheat productivity in your district? (Open-ended)

What changes do you believe could improve the marketing system for wheat in your district? (Open-ended)
