PUNJAB AGRICULTURE SECTOR PLAN 2015

September, 2015

Agriculture Department
Government of Punjab

Table of Contents

List of Tables

List of Figures

List of Abbreviations

ADP	Annual Development Porgramme
FSC&RD	Federal Seed Certification and Registration Department
FY	Financial Year
GDP	Gross Domestic Product
ICT	Information & Communication Technology
Kg	Kilogram
MFB	Micro-finance Bank
MMS	Multimedia Messaging Service
MTDF	Medium Term Development Framework
PEEP	Punjab Enabling Environment Project
PIPIP	Punjab Agriculture Productivity Improvement Project
PKR	Pakistani Rupee
PPCBL	Punjab Provincial Cooperative Bank Ltd.
PPP	Public Private Partnerships
R&D	Research & Development
SMS	Short Messaging Service
UC	Union Council
USD	United States Dollar
ZTBL	Zarrai Taraqqiati Bank Ltd

Foreword

There is no disputing that within agriculture lies the key to Punjab's prosperity. The sector employs the bulk of the province's labour force, providing direct livelihood to farmers and their families and indirect livelihood to those in allied industry. Yet this clarity has not translated into the sort of action that such potential warrants.

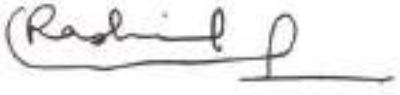
Instead, there has been a widening gap in the effectiveness of our policy responses to a complex and rapidly evolving environment. As a consequence, agricultural productivity has not kept up to par with global trends, leaving farmers highly vulnerable, production limited to a narrow range of products, poverty rates high and food security compromised. Any resources committed in the sector have mostly gone towards fulfilling basic food demands, rather than developing the modern agricultural products, manufacturing and services that could have catalysed growth.

The thrust of our efforts in developing this sector plan therefore has been towards deciphering how and why our recent efforts have not yielded the results that were originally envisioned. And the answer, it seems, is a relatively simple one. Over time, the Department has come to matter more than the sector; the organogram more than the objectives; and the employees more than the work. Instead of defining structures that could optimally achieve our policy objectives, we have restricted ourselves to envisioning only those policies that can be implemented through existing structures.

Once the flaw in our thinking became apparent, the Department committed itself to a massive rethink underpinned by intensive stakeholder consultations: the University of Agriculture Faisalabad (UAF) was consulted, manufacturers and suppliers were heard, farmers and industry experts were invited, and last but not the least, the Department's own field officers were made integral to the exercise.

This resulting sector plan is a plan thought afresh with some immediate interventions that manifest themselves in the form of approved and funded schemes, and some medium-term ones that require careful thinking and piloting before a rollout. It is the result of the hard work of all those involved. But it could not have existed without the trust and support of my director generals and directors – officers, who placed enough faith in me to allow their long held beliefs to be questioned and instead of being defensive, challenged themselves to seek the right answers.

In particular, I would like to thank Dr. Iqrar A. Khan, Vice Chancellor UAF, Dr. Anjum Ali, DG (Extension), Dr. Abid Mehmood, DG (Research) and Ch. Muhammad Ashraf, DG (Water Management) for their invaluable input, Mr. Gulzar Shah, Special Secretary for steering the work, Mr. Bilal Kidwai for structuring the plan, and Mr. Hasaan Khawar for preparing the report and other documentation.



Rashid Mahmood Langrial
Secretary to the Government,
Agriculture Department,
Government of the Punjab

1. Introduction and Background

Agriculture Department Punjab is re-positioning itself to transform the agriculture sector in the province of Punjab to increase the crop productivity, bring additional uncultivated area under cultivation and improve the crop mix to create maximum value addition in the province to contribute towards inclusive economic growth. This would be done through transforming the farmers of Punjab into progressive farmers, by equipping them with state-of-the-art support and knowledge and providing them with quality and timely inputs as well as through creating an enabling environment. This sector plan lays down the strategic approach of the Agriculture Department to achieve these goals.

This sector plan[1] provides a clear direction for government's plan to transform agriculture sector's future in Punjab in the medium term and would be used as the foundation document for formulating medium term development framework.

2. Agriculture Sector Snapshot[2]

Agriculture is central to economic growth and development in Punjab as its contribution to national agricultural economy is overwhelming. It grows 83% of national cotton, 80% of wheat, 97% of fine aromatic rice, 63% of sugarcane, 95% of potato and 78% of maize. Amongst fruits, Punjab has 66% share of national mango production, 95% of citrus and 82% of guava.[3] The agriculture sector (including livestock) contributes 27% to Punjab's GDP and employs 40% of its labor force.[4] It also contributes a large share to national export earnings due to manufactured products derived from agriculture, such as textiles. Agriculture's overall contribution to the economy is even larger because of downstream services activities such as transport, processing etc. Therefore, agriculture in Punjab has a pivotal role for economic growth and development. More importantly, the surplus generated in Punjab is critical for food security of the national population.

---

[1] The Punjab Agriculture Sector Plan 2015 has been developed by Hasaan Khawar, based on a very detailed sector plan presentation developed by Agriculture Department, after extensive consultations, brainstorming and diagnostics, under the supervision of Secretary Agriculture, with support from Special Secretary and various directorates of the department. . Other sources have also been consulted.

[2] Last financial year data used in this section pertain to FY 2014-15 and is based on Jul-Mar data, extracted from Economic Survey of Pakistan 2013-14, unless mentioned otherwise

[3] <http://www.agripunjab.gov.pk/index.php?agri=detail&r=0>

[4] Khalid Ikram (2013), "Provincial Economic Development: Performance, Challenges, and Way Forward". Mimeo.

Furthermore, Punjab has the largest integrated gravity flow irrigation system in the world with 27.2 million acres of irrigated land, abundant and cheap skilled and unskilled labor, a favorable environment blessed with the right climate conditions, high potential in value addition and strong potential of private sector participation in agriculture development. These drivers for growth in agriculture have steadily resulted in increase in cropped area for all major crops since 1947.

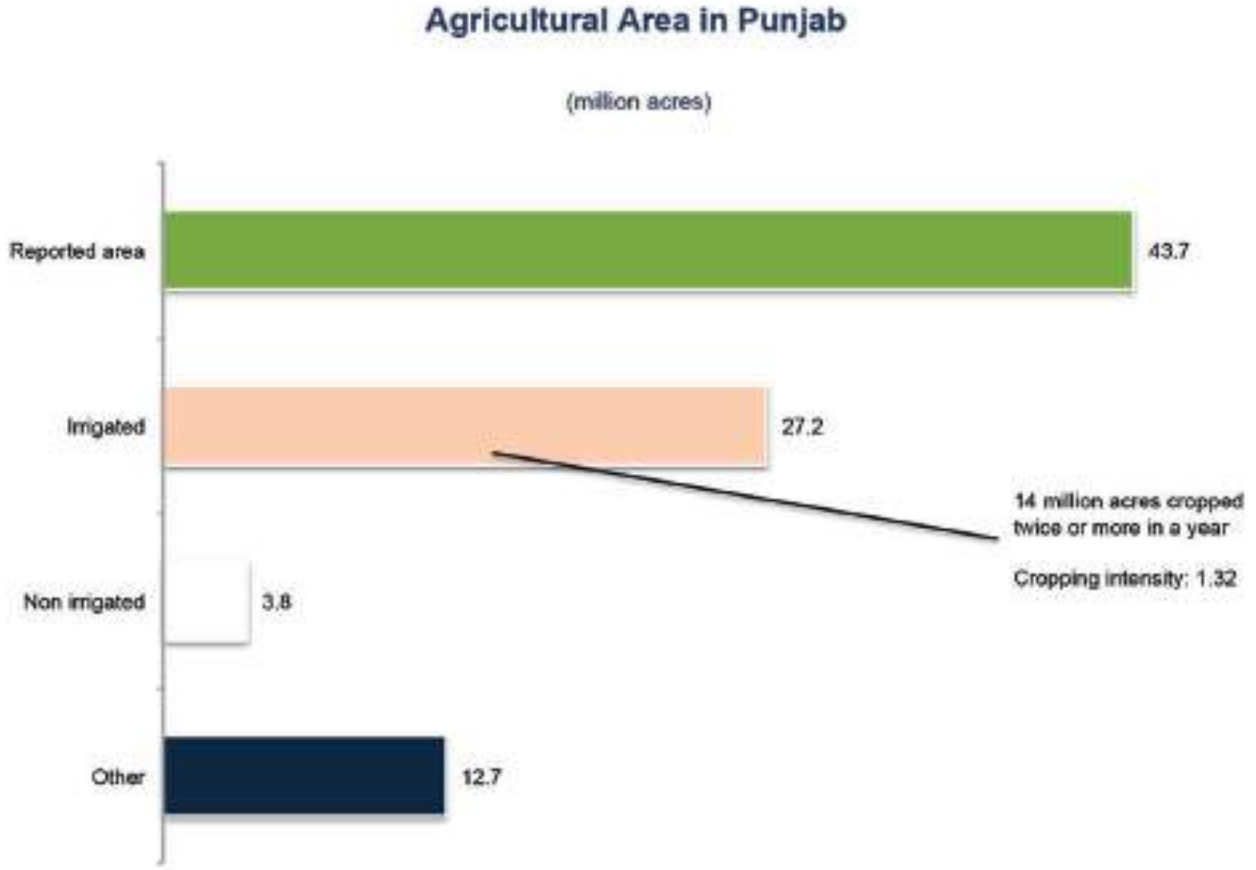


Figure 1: Agricultural Area in Punjab (Million Acres)

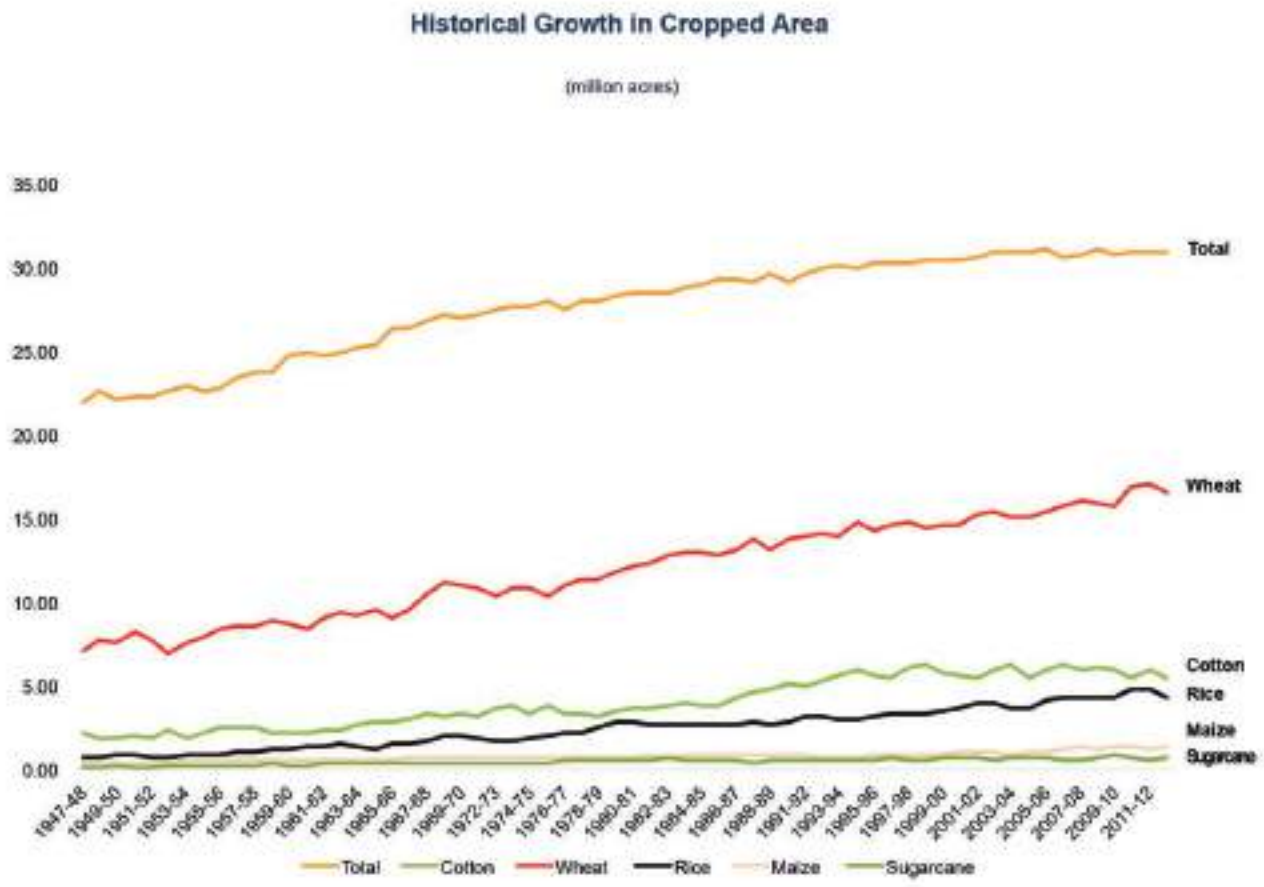


Figure 2: Historical Growth in Cropped Area (Million Acres)

2.1. Main Crops

Punjab has two cropping seasons including *Kharif*, which starts from April-June and is harvested during October-December; and *Rabi* that begins in October-December and is harvested in April-May. Important *kharif* crops include rice, sugarcane, cotton and maize, whereas key *rabi* crops include wheat, gram, lentil and tobacco.

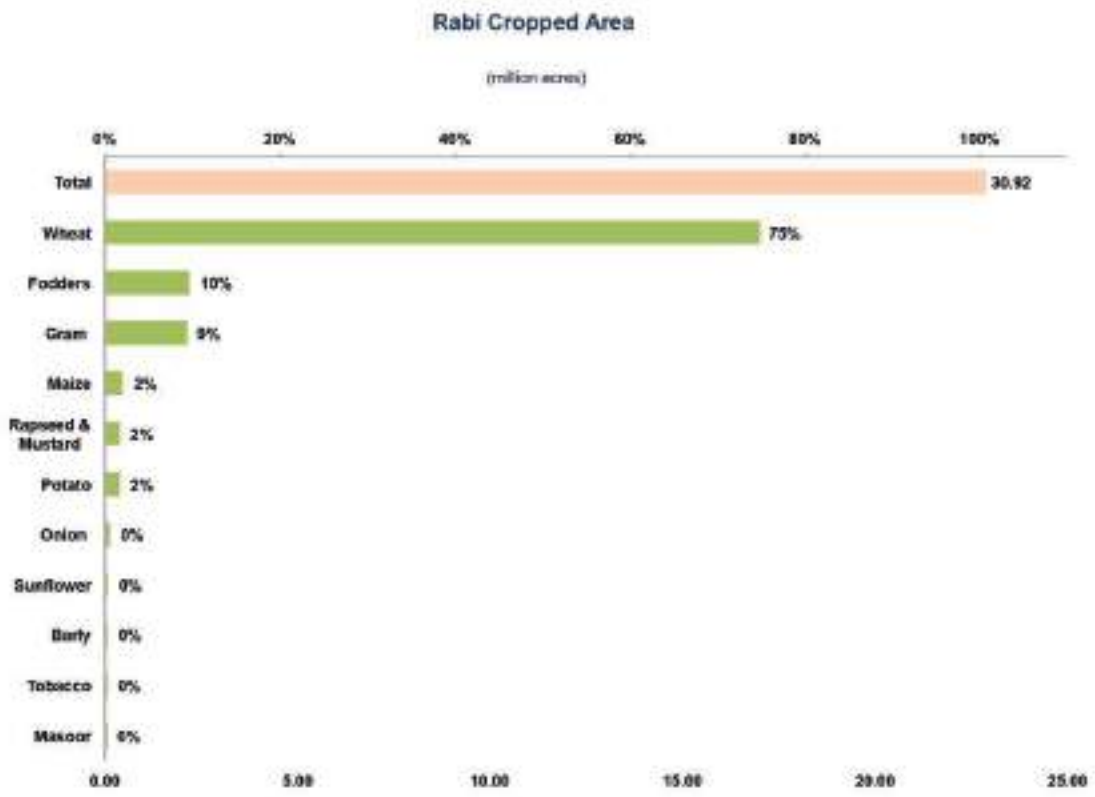


Figure 3: Rabi Cropped Area (Million Acres)

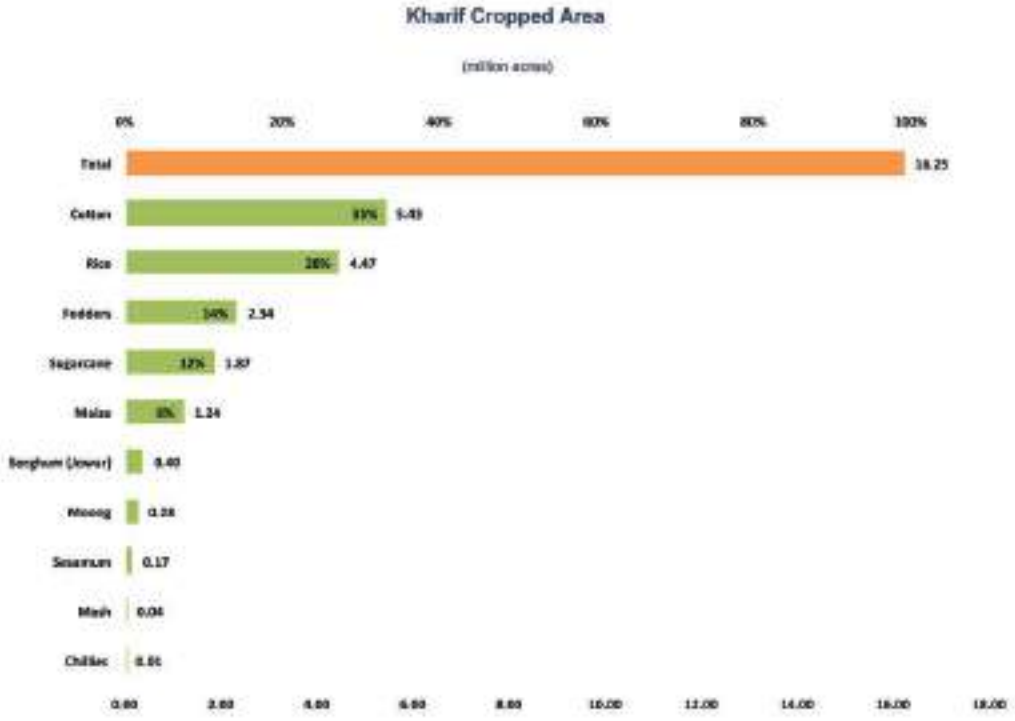


Figure 4: Kahrif Cropped Area (Million Acres)

Overall, important crops such as wheat, rice, sugarcane maize and cotton account for 25.6% of the value added in overall agriculture and 5.4% to GDP, while the other crops account for 11.6% of the value added in overall agriculture. During fiscal year 2013-14, at national level, the overall performance of agriculture sector witnessed a growth of 2.1%, owing to positive growth in almost all major sub-sectors including crops (growth - 1.2%); livestock (2.9%); forestry (1.5%); and fishing (1%). In particular, the crop subsector grew by 3.7% as opposed to merely 1.2% growth the previous year. This significant growth was achieved at the back of healthy production for major crops such as rice, maize, wheat and sugarcane, whose production grew by 22.8%, 7.3%, 4.4% and 4.3% respectively and can be attributed to better water availability, more fertilizer off take and timely availability of agriculture credit. As opposed to these, only for cotton, the production actually declined by 2%.

Crop	Production (Million Bales/Tons)			Value Addition Overall GDP%		Value Addition Agriculture %	
	Punjab	Pakistan	Punjab Share in PAK	Pakistan	Punjab	Pakistan	Punjab
Wheat	19.116	25.037	77%	2.1	1.62	10	7.70
Cotton	10.277	14.026	73%	1.5	1.1	7.1	5.18
Sugarcane	41.074	65.28	63%	0.7	0.44	3.1	1.95
Rice (Basmati)	3.65	6.999	52%	0.7	0.36	3.2	1.66
Maize	3.881	5.044	78%	0.4	0.31	2.1	1.63

Table 1: Share of Punjab in GDP and Value Addition in Agriculture 2014-15[5]

2.1.1. Wheat

Wheat is the staple diet for the country and is the most important crop, contributing 10% to the value added in agriculture and 2.1% in GDP at the national level, while the wheat produced in Punjab contributes 1.62% to the national GDP and 7.7% to the national value-added. During the last financial year, the wheat production in Punjab was estimated at 19.1 million tons, showing a decline of 3.16% over the

[5] Estimated analysis based on Economic Survey of Pakistan 2014-15

previous year's production[6]. Historical figures for wheat production and area sown are shown in the graph below:

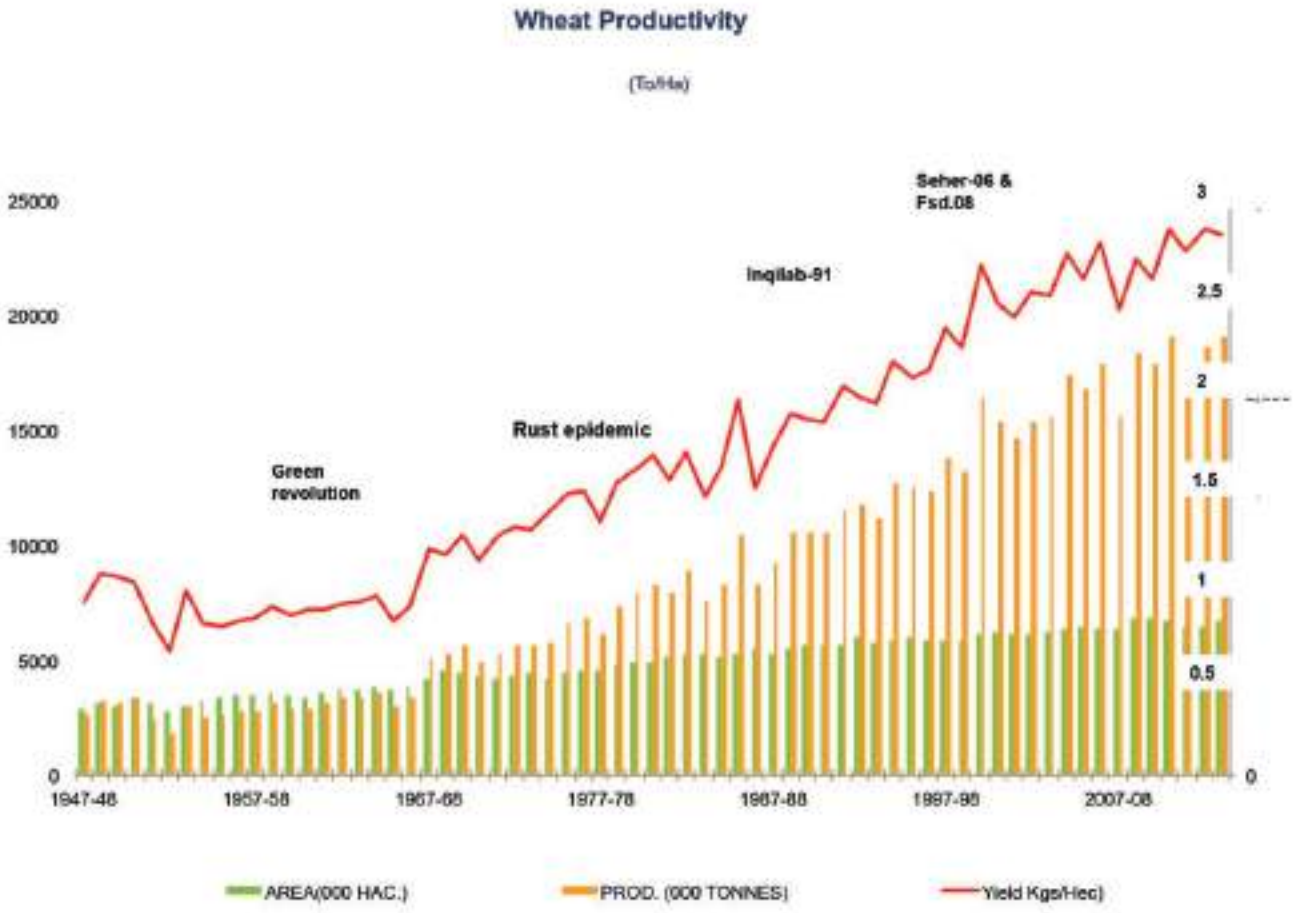


Figure 5: Historical Trends in Wheat Productivity

2.1.2. Cotton

Cotton is a highly important source of raw material for the textile industry and contributes about 1.5% to GDP and 7.1% in agriculture value added at the national level, while the cotton produced in Punjab contributes 1.1% to the national GDP and 5.18% to the national value-added. During last financial year, cotton production in Punjab stood at 10.2 million bales depicting a healthy increase of 12% as compared to the previous year[7]. Historical figures for cotton production and area sown are shown in the graph below:

[6] Economic Survey of Pakistan 2014-15; Estimates
[7] Economic Survey of Pakistan 2014-15; Estimates

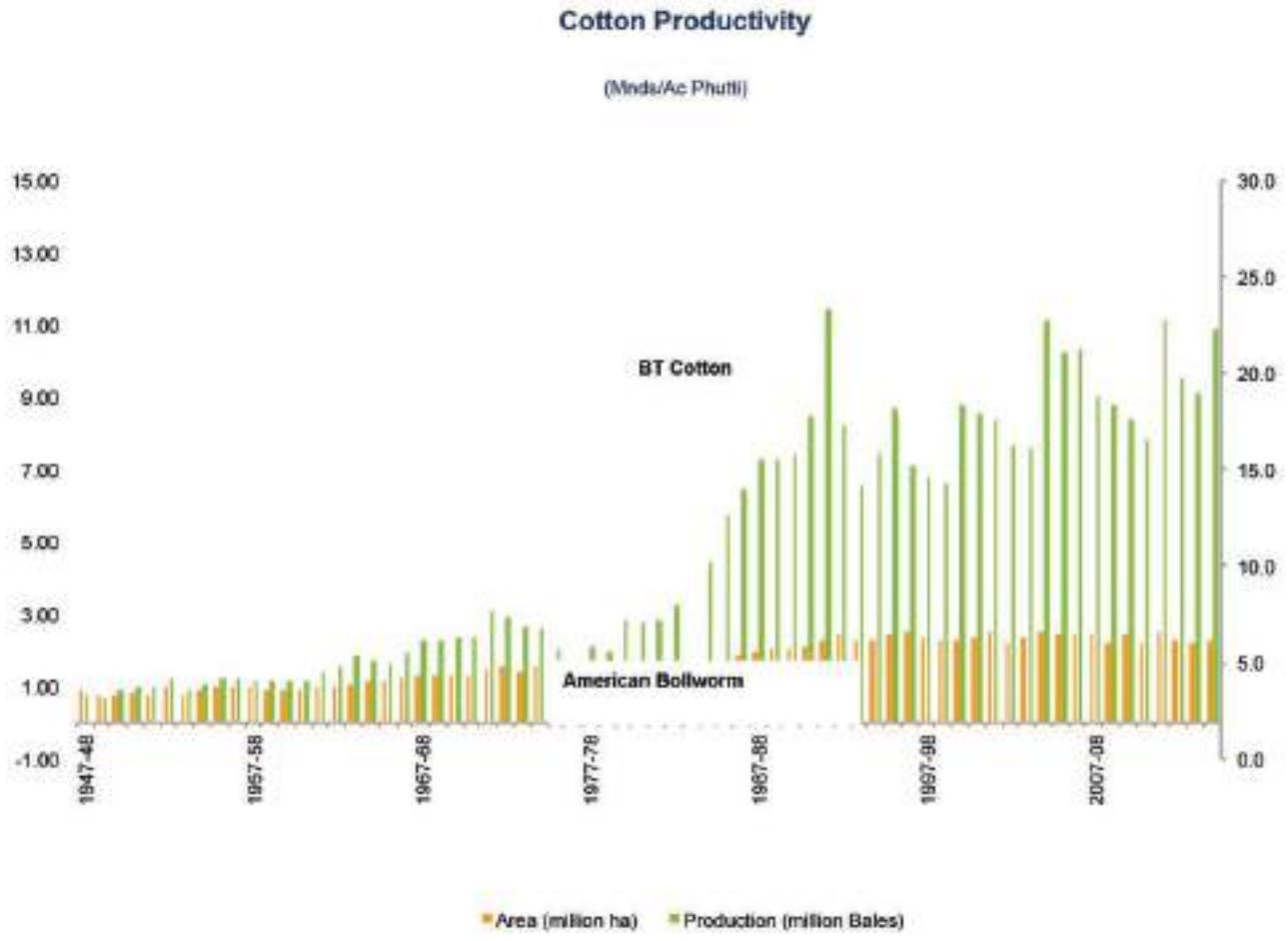


Figure 6: Historical Trends in Cotton Productivity

2.1.3. Sugarcane

Sugarcane is a high value cash crop for farmers and provides raw material for sugar and sugar related production. The crop contributes 3.1% in agriculture value added and 0.7% in GDP at the national level, while the sugarcane produced in Punjab contributes 0.44% to the national GDP and 1.95% to the national value-added. During the last financial year, sugarcane production in Punjab stood at 41.07 million tons, depicting a decline of 6% over the same period last year[8]. Historical figures for sugarcane production and area sown are shown in the graph below:

[8] Economic Survey of Pakistan 2014-15; Estimates

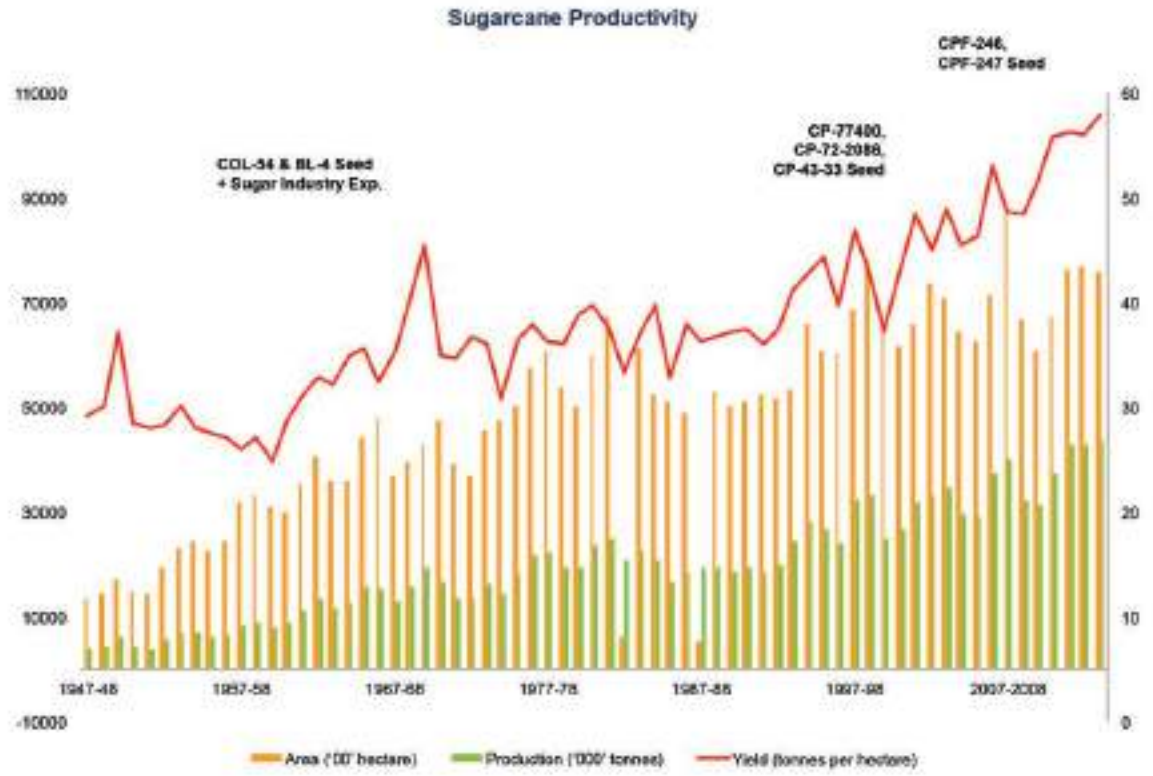


Figure 7: Historical Trends in Sugarcane Productivity

2.1.4. Rice

Rice is an important food and cash crop; second staple food grain crop for the country after wheat and a major source of foreign exchange earnings. Rice accounts for 3.2% of the value added in agriculture and 0.7% of GDP at the national level, while the rice produced in Punjab contributes 0.36% to the national GDP and 1.66% to the national value-added. During last financial year, basmati rice production in Punjab stood at 2.3 million tons, depicting a staggering increase of 13.6% over previous year's production, however the irri rice production was estimated at 1.3 million tons, showing a decline of 7.93%[9].

2.1.5. Maize

Maize is considered an enriched food grain and has become extremely popular for farmers over the last few years. It contributes 2.1% of the value added in agriculture and 0.4% to GDP at the national level, while the maize produced in Punjab contributes 0.31% to the national GDP and 1.63% to the national value-added.

[9] Economic Survey of Pakistan 2014-15; Estimates

During the last financial year, maize production stood at 3.68 million tons, depicting a slight decline of 0.82% over previous year[10]. Historical figures for maize production and area sown are shown in the graph below:

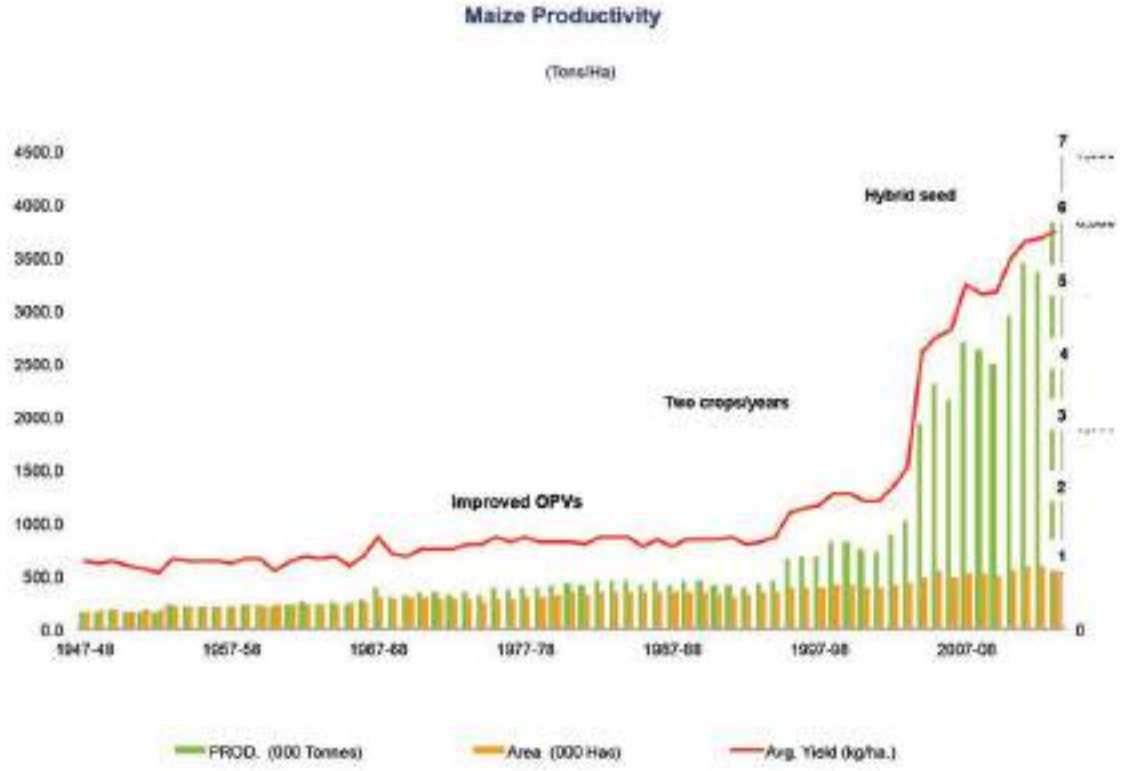


Figure 8: Historical Trends in Maize Productivity

2.2. Crop Productivity

The agriculture sector in the province suffers from low productivity due to poor quality and inadequate agriculture inputs, poor farm management practices, limited availability of key agriculture inputs to the subsistence farmers due to limited knowledge, high cost and limited accessibility. Small farmers are unable to make use of modern machinery due to their poor economic conditions and high cost of technology. Although large farmers do use machinery and equipment, yet they are unable to match international productivity standards. The productivity gap can be seen across the spectrum of major crops from the following graphs:

[10] Economic Survey of Pakistan 2014-15; Estimates

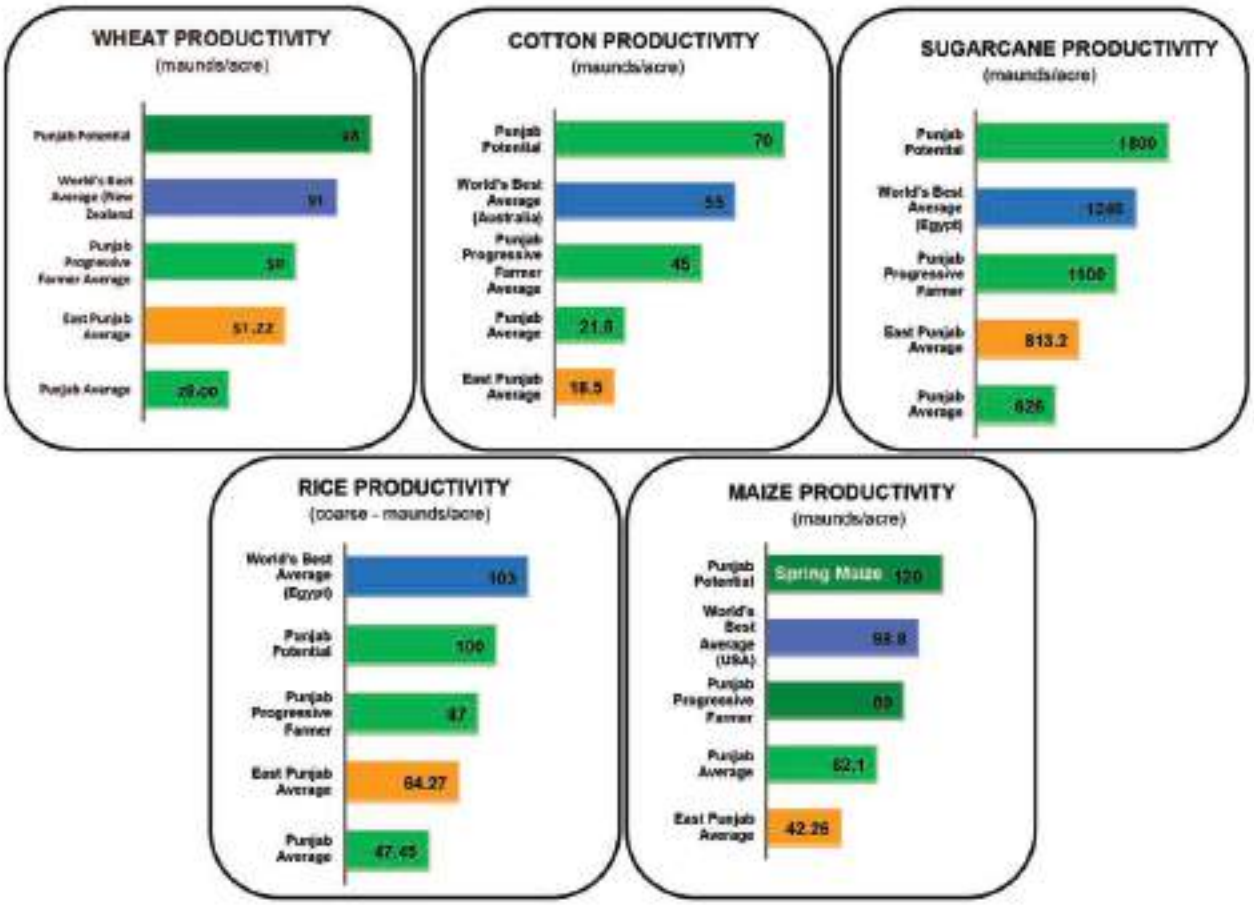


Figure 9: Productivity Gaps in Key Crops

2.3. Drivers of Productivity

Agricultural productivity is directly dependent on availability and quality of agricultural inputs such as fertilizers, seeds, water, mechanization and agriculture credit. These drivers have an enormous potential to leverage the efforts of farmers and boost crop productivity.

2.3.1. Fertilizers

Fertilizers are one of the most critical agricultural inputs, which yield high and quick returns and can potentially enhance the crop yield from 30-50% for different crops. Fertilizer essentially provides required nutrients (nitrogen, phosphorous and potassium) and micronutrients. The soil in Pakistan is nitrogen-deficient all across the country, while 80-90% soil is deficient in phosphorous and 30% soil in potassium. Soil fertility is also continuously depleting due to mining of the essential plant nutrients from the soils under intensive cultivation. Considering the high

prices of fertilizers and limited budget of small and subsistence farmers, its evident why huge gaps in fertilizer usage is witnessed across Punjab.

Crop (Usage in Kg/Acre)	N	P	K
Wheat			
Recommended	65	46	24
Existing	62	15	1
Rice			
Recommended Basmati	73	40	24
Recommended Coarse	55	36	24
Existing	59	12	1
Sugarcane			
Recommended	101	51	51
Existing	103	25	1
Cotton			
Recommended May Sown	101	51	40
Existing	127	26	1

Table 2: Fertilizer Use in Punjab – Existing vs. Recommended[11]

During the last financial year, the domestic production of fertilizers increased by 18.2% over last year, whereas the availability of imported fertilizer grew by a staggering 52.2%. Resultantly, the total off-take of fertilizer nutrients also increased by 20.6%, with 20.1% increase in nitrogen off-take and 22.8% increase for phosphate off-take.

2.3.2. Seed

Quality seed is the most important input for improving crop productivity and yields and effective use of quality certified seed can significantly enhance farmers' returns. Seed is a high technology product and is an innovation most readily adapted. Improving access to good quality seed is a critical requirement for sustainable agricultural growth and food security. During last financial year, about 372,000 tons of improved seeds of various crops was procured to provide quality seeds to farmers. At national level, the Federal Seed Certification and Registration Department (FSC&RD) is working to provide seed certification coverage to public and private sector seed companies of the country but it is also suffering from

[11] Source: Soil Fertility Research Institute, Lahore Reports

institutional weaknesses and inefficiencies. At provincial level Punjab Seed Corporation is engaged in seed production farming, seed processing and export and seed quality testing.

Crop	Total Seed Requirement	Public Sector	Private Sector	Total Seed Provided	Percentage Requirement Met
Cotton	31,000	18,336	696	19,033	61.39%
Paddy Seed	24,640	22,175	3,519	25,695	104%
Maize/Corn	15,768	0	997	4,730	6.32%

Table 3: Seed Requirement in Punjab for Different Crops and Seed Availability [12]

Limited Availability of Certified Seeds - The seed market is claimed by multiple sources in the formal and the informal sector. The formal sector includes seed companies and public sector organizations (e.g. Punjab Seed Corporation); the informal sector includes farmer-to-farmer exchange and seed obtained from small-scale seed providers who multiply seed obtained from various sources. Unfortunately, however, this informal seed market is mostly unregulated. There is neither a database nor a system of regular collection of data that estimates the precise share of various seed providers in the market. Limited availability of certified seeds is therefore another constraining factor for agriculture sector.

2.3.3. Mechanization

Besides fertilizers and seeds, agricultural output is also dependent on on-farm labor productivity, which in turn is dependent on whether the farmers have access to tools, equipment and machinery to carry out farm operations efficiently. Therefore mechanization plays an important part in improving agriculture productivity. Government has been working to improve farm mechanization and during the last financial year, a total of 25,000+ tractors were produced in the country.

2.3.4. Irrigation

Water is essential to meet the food need for the country's growing population and the efficient use of water is an important requirement for sustainable agriculture growth. Pakistan has been naturally bestowed with good irrigation canal network complemented with suitable temperatures and rainfalls during sowing and harvesting season. However, out of the total 43.7 million acres cultivable land of Punjab, only 27.2 million acres are irrigated (Figure 1). The following figures presents the mode of irrigation for Punjab's cultivable land. Canal irrigation is the

[12] Agriculture Department Punjab

preferred and most economical mode of irrigation for farmers, as their costs go up significantly with the use of tube well. On average, a farmer in Punjab spends PKR 135 per acre on canal irrigation including PKR 85/acre for *Kharif*, and PKR 50/acre for *Rabi*, whereas for tube well irrigation he has to spend as much as PKR 1,000 per acre[13].

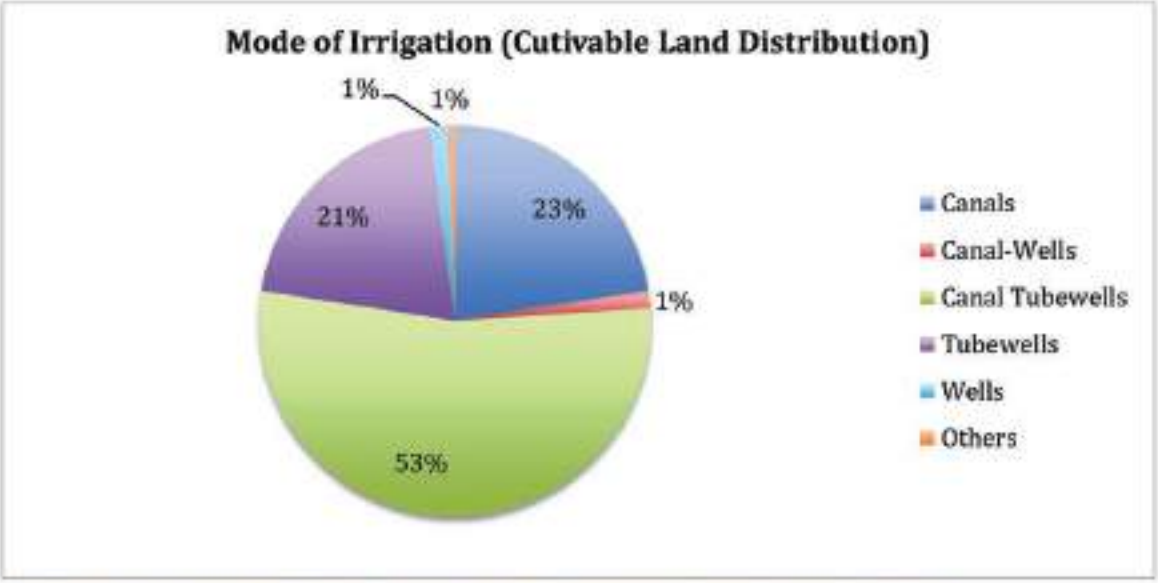


Figure 10: Distribution of Cultivable Land in Punjab Across Different Irrigation Modes [14]

In order to further improve water availability, government has been working for augmentation of surface water resources by construction of water storage small/medium dams as well as conservation measures such as lining of irrigation channels, modernization/rehabilitation of irrigation system and efficiency enhancement by rehabilitation & better operation of existing system.

2.3.5. Agricultural Credit

Agricultural credit is a vital input for leveraging the financial growth and ultimately leads to economic growth on sustainable basis. At present 31 commercial, microfinance banks and Islamic banks, with around 3,950 agriculture designated branches, are facilitating farmers by extending agriculture credit throughout the country. The agriculture lending banks comprising of 19 commercial banks, 2

[13] 3 Hrs @ PKR 333/Hr; Source: Director General Water Management, Punjab
[14] Source: Punjab Development Statistics 2014

specialized banks, 7 microfinance banks and 3 Islamic banks, which are engaged in providing development loans to farming community for agriculture activities including growing of crops, livestock, poultry, fisheries, orchards, forestry, nurseries, apiculture and sericulture. During the last financial year, the banks disbursed PKR 250+ billion nationally for agriculture credit.

Limited Access to Credit - Sub-optimal performance of agriculture sector is also the result of low spending by the government. Agriculture sector has been facing restricted access to credit. Evidence suggests that while significant flow of credit is there for agriculture sector, formal access to credit still remain limited for small farmers. Poor subsistence farmers have to rely on expensive informal credit sources, in the absence of any collateral-free credit mechanism. Government is already trying to extend agricultural credit and ensure increased flow. While on demand side, farmers suffer from poor, insufficient collateral and non enforceability of security; low affordability for expensive financial products; non-alignment between farers' return patterns and repayment schedules; on supply side, the financial institutions also face numerous challenges such as higher loan servicing costs due to limited volumes and high information costs; lack of collateral or adequate security; no or limited specialized products offered by the financial intermediaries to better meet the financing need of the agricultural sector, etc.

Despite these constraints, the supply of agriculture credit target for FY 2013-14 is 20% higher than the last year.

(Rs in billion)

Banks	Target (2013-14)	2013-14*			Target (2012-13)	2012-13*		
		Flow	% Achieved	% Share in Total		Flow	% Achieved	% Share in Total
5 Big Commercial Banks	188	133.5	71	52.2	153.5	123.67	80.6	53.5
ZTBL	69.5	45.9	66	17.9	72	37.95	52.7	16.4
PPCBL	10	5.4	54.4	2.1	9	5.43	60.3	2.4
14 DPBs	90.4	54.2	59.9	21.2	66.7	51.02	76.5	22.1
7 MFBs	21.6	16.2	75.1	6.3	13.8	12.96	93.9	5.6
3 Islamic Banks	0.5	0.5	94.6	0.2	-	-	-	-
Total	**380.0**	**255.7**	**67.3**	**100.0**	**315.0**	**231.0**	**73.3**	**100.0**

Table 4: Supply of Agricultural Credit by Institutions[15]

[15] Source: State Bank of Pakistan / Economic Survey of Pakistan (*Based on nine months data)

2.4. Institutional Structure

A number of field establishments are working under the Agriculture Department to provide services to farmers. The list of these organizations and the services they provide are given below[16]:

Directorate General Agriculture (Field)	Directorate General Agriculture (Water Management)	Directorate General Agriculture (Extension & AR)
• Land Leveling • Water Resources Development • Soil and Water Conservation • Research and Development • Renewable Energy Technology • Repair & Maintenance	• Water Users' Associations • Watercourse Improvement • Irrigation Schemes • Precision Land Leveling • High Efficiency Irrigation Systems • Training and Capacity Building	• Pre-Service & In-Service Trainings • Village Level Farmer's Training Programme • Farmer Field Schools (FFS) • Production Technology Development • Plant Clinics (Plantwise) • Supply of Seed Kits • Monitoring of Inputs
Directorate General Agriculture (Pest Warning & Quality Control of Pesticides)	**Directorate General Agriculture (Economics & Marketing)**	**Directorate of Agriculture (Crop Reporting Services)**
• Pest Scouting/Pest Surveys • Forecasting of Pests and Crop Diseases • Training of Farmers, Extension Workers and Pesticides Dealers • Quality Control of Pesticides and Registration of Pesticides Distributors • Screening/ Standardization of Pesticides	• Agriculture Marketing Information Service • Prices • Ramadan Plan • Price Control Mechanism • Good Governance Initiatives • SOP for Establishment of Private Market • Punjab Institute of Agriculture Marketing	• Crop Estimates • Agricultural Machinery • Land Use • Cost of Production • Harvest Prices
Directorate of Agricultural (Information)		
• Technology Transfer through Print Media • Technology Transfer through Electronic Media		

[16] A complete list of attached departments of Agriculture Department is annexed at the end.

Despite having an expansive institutional infrastructure and a large extension workforce, limited affordability, high cost of inputs, lack of appropriate soil testing and similar other factors prevent small farmers to fully benefit from the extension support, which is often generic and is not evidence-based. Moreover, there is no robust monitoring system in place to ensure effective service delivery by the extension workers. The use of technology is limited and due to large farmer base in the province, it is virtually impossible to reach out to them without a strong technological backbone.

2.4.1. Agriculture Marketing

The agriculture marketing system is dominated with several market intermediaries who play a critical role in transferring the produce from farmers to consumers, while claiming a significant portion of the margin. By some estimates, on an average an agricultural produce changes six to seven different hands on an average before reaching the end consumer. Farmers' share is further squeezed in case of perishable goods, as he is often hard pressed to dispose off his produce quickly. Besides these intermediaries, the existing market infrastructure is quite primitive and in need of serious upgrade. This sup-optimal marketing system also creates a major constraining factor on agriculture sector growth.

"Agriculture markets in Punjab have been working with a lot of inefficiencies with virtual absence of private sector in the establishment, operation and management of markets due to exclusive public sector control of marketing in notified wholesale markets. As the market committee is created through a political process, there is an inherent lack of accountability in the system, and no proper regulation of the markets. This is evidenced by the absence of appropriate standards such as for health and hygiene, grading, optimal space utilization. There is no quality control exercised with relation to food safety, grading, packing and labeling. There is a monopoly exercised by the marketing committee over marketing of agriculture produce through licensing system. Marketing is done through a limited number of dealers who are licensed by the market committee, restricting the growers' choice and creating price distortions. Fees charged by the market committee have no nexus with the services provided in the market with the result that fees are collected without providing commensurate services. Owing to a limited number of dealers in the market, the scope for trading is extremely limited which results in serious price distortions."[17]

3. Case for Change

The need to address these impediments is imperative for boosting productivity in agriculture sector and ushering in economic growth into rural areas and improving the lives of the vast majority of poor citizens of the country. The growing demand for agriculture products, food security concerns and the productivity gap providing an opportunity for growth are the key reasons, why government is committed to transform the agriculture sector and stimulate private sector led growth in the sector.

3.1. Growing Demand

Rapid population growth, urbanization and income growth in developing countries have resulted in profound increase in global demand for food. On the local front, population of Pakistan is estimated to be 186 million with a population growth rate of 1.49, highlighting the future food requirements of this growing population. The resulting demand both at national and global level could provide income growth opportunities for many rural poor and for Pakistan considering its wide agriculture base. Government and private sector, however must prepare to capitalize on this global demand opportunity through continuing transformation with long-run policies and investments that will satisfy consumer demand, improve nutrition, direct income growth opportunities to those who need them most and alleviate environmental and public health stress. Punjab Agriculture Sector Plan 2015 is an attempt to prepare the private sector and government in Punjab to take benefit of this immense national and global opportunity and ensure that its dividends are reaped by the poor rural farmers.

3.2. Food security

Food security requires achieving self-sufficient quantity of nutritious food for the population and one of the key objectives of agriculture sector is to ensure adequate production and availability of food for the population and provide livelihoods to people directly involved in the sector. For Pakistan, agriculture and food security concerns remain high on the policy agenda at both the national and provincial level.

[17] Analysis of the Agriculture Marketing Legal Framework in Punjab and Sindh – USAID FIRMS Project

According to National Nutrition Survey about 60% of Pakistani population is facing food insecurity, with nearly 50% of the women and children being malnourished. Presently Pakistan ranks at 76th position out of 107 countries compared in the Global Food Security Index, primarily owing to inefficiencies in food distribution, low spending on agricultural R&D and inadequate food safety nets for the extremely poor. These challenges are expected to worsen further, with rapidly growing population and imminent water shortage in the years to come. With this impending food security threat, there is a need to focus on enhancing agricultural productivity through a coherent well thought out approach, capitalizing on the immense agricultural potential of the country and the vast irrigation system in a sustainable manner. The Punjab Agriculture Sector Plan 2015 Food is aimed at providing such coherent approach and is based on the principle that food security requires achieving self-sufficient quantity of nutritious grains/staple food. The prosperity of a large fragment of community revolves around agriculture that requires timely and adequate inputs, ensures better environment for sustainable economic growth.

Pakistan Vision 2025 seeks a Pakistan where "all people, at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life". Pakistan Vision 2025 envisages food security in the context of the entire supply-chain-from production, processing, storage and distribution to consumption.

Vision 2025 envisages following key objectives for achieving food security:

1. Protect the most food-insecure segments of the population through effective relief measures, including long-term arrangements and adaptation mechanisms.
2. Create a modern, efficient and diversified agricultural sector – aligned with associated water and energy infrastructure –that can ensure a stable and adequate provision of basic food supplies for the country's population, and provide high quality products to its industries and for export.
3. Optimize production and supply mix in line with current and projected needs by leveraging our unique strengths.
4. Ensure that the entire supply-chain related to food security is geared towards provision of stable and affordable access to adequate, nutritious and safe food for a healthy life.
5. Use the resource base in an efficient and sustainable manner–with outcome-based benchmarks agreed in line with regional and global standards.

3.3. Economic significance and Opportunity to Make an Impact

Agriculture sector is the most important source of income for the rural poor in Pakistan in general and in Punjab in particular. Not only the agriculture sector enjoys immense economic significance, but also its full potential has not yet tapped and offers room for improvement. Therefore coherent and targeted strategy can yield significant dividends in the years to come and Punjab Agriculture Sector Plan 2015 is precisely aimed at providing such a strategy.

Over the years, the structure of the agricultural sector GDP has steadily been changing, with the share of crops, both major and minor, decreasing For instance, the share of crops fell from 61.4% in 1999-2000 to 59.9% in 2006-2007.
Agriculture Department believes that increasing incomes in the agriculture sector will have wide-ranging positive impacts. Enhancing agricultural growth results in more-than-proportionate increases in household income compared to growth in

other sectors. Most importantly, fast agriculture growth improves the incomes of poor household groups substantially. According to a World Bank study of 42 countries from 1981 to 2003, "GDP growth originating in agriculture benefits the poorest half of the population substantially more," compared to the more well-off population.[18]

Another study pertaining to Pakistan has shown that increasing the productivity of agriculture (major crops) causes a substantial rise in real incomes of poor households, in rural areas as well as urban areas – the urban poor benefitting from lower real food prices. The study shows that agricultural growth also increases non-farm income in rural areas.[19] Growth in productivity of agriculture is also expected to provide a large boost to industry value added (GDP) due to strong linkages between the two sectors in Pakistan.[20]

According to Agriculture Department estimates, with a carefully crafted approach, agriculture sector growth can result in at least PKR 1.57 trillion impact in overall GDP by bridging the productivity gap and by transforming the existing farmer base into progressive farmers.

	Progressive Farmer	Average Farmer	Gap
Wheat	55	31	44%
Cotton	45	18.5	59%
Sugarcane	1,100	626	43%
Rice (Basmati)	45	32	29%
Rice (Coarse)	75	47.5	37%
Maize	77	62.1	19%
Sunflower	30	18	40%
Potato	250	228	9%

Table 5: Productivity Gap (Maunds/Acre)

Progressive Farmer	Cultivated Area	Share

[18] World Bank (2008), "World Development Report 2008: Agriculture for Development". Available at: < http://go.worldbank.org/J2B95EUJS0>

[19] Debowicz, Dorosh, Haider and Robinson (2012), "Implications of Productivity in Pakistan: An Economy-Wide Analysis", International Food Policy Research Institute (IFPRI). Available at: < http://www.ifpri.org/publication/implications-productivity-growth-pakistan>

[20] ibid.

Wheat	55	17,054	74.5%
Cotton	45	5,434	33.4%
Sugarcane	1,100	1,870	11.5%
Rice (Basmati)	45	4,470	27.5%
Rice (Coarse)	75		
Maize (autumn)	70	1,237	7.6%%
Sunflower	30	67	0.3%
Potato	250	367	1.6%

Table 6: Productivity Gap (000 Acres)

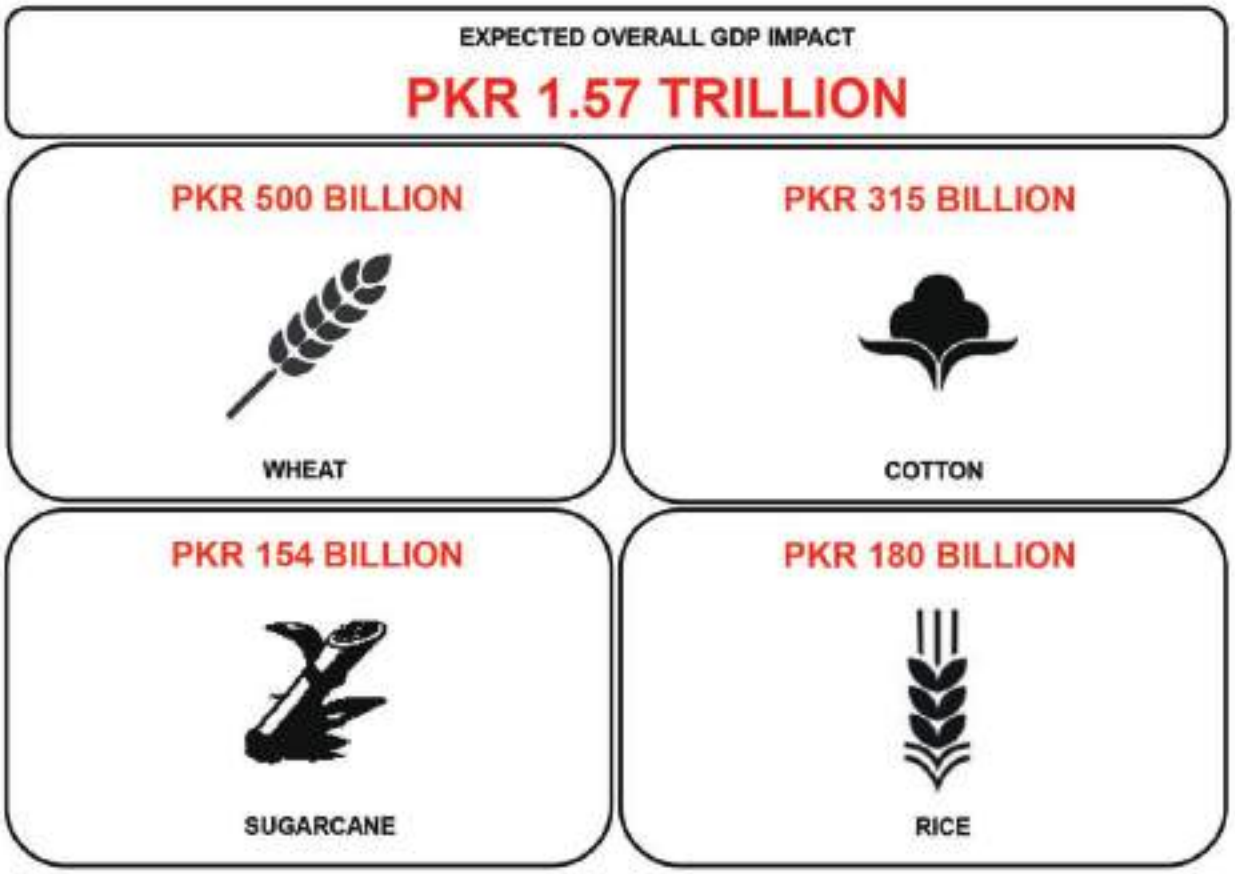


Figure 11: Potential Economic Impact – Agriculture Sector Plan

4. Punjab Agriculture Sector Plan 2015 – Vision, Goals and Strategic Pillars

4.1. Vision Statement

The Agriculture Department's Vision as stated in the Medium Term Development Framework 2014 is:

> ***"Self-reliance, food security and promotion of high value crops in agriculture and transforming agriculture sector into a diversified, sustainable, and market-driven sector through improved practices, efficient use of resources and limiting losses due to insects, pests, salinity, alkalinity, and revamping existing marketing system."***

The Agriculture Sector Plan is about creating a strong foundation in the next five (5) years for transforming the existing farmers into progressive farmers through ensuring provision of evidence-based advice and support and facilitating access to resources to capitalize on this advice. The sector plan also encompasses creating an enabling environment to ensure maximum returns for the farmers and contributing towards economic development.

Figure 12: Punjab Agriculture Sector Plan – Vision and Goals for Year 2025

4.2. Objectives and Goals of Agriculture Sector Plan

The overall objective of the agriculture sector plan is to ensure adequate production and availability of food for the population of Punjab and to improve livelihoods to people directly involved in the sector along with the value adding chain.

The specific objectives of the sector plan are to:

- Increase the supply and quality of agriculture crops and products for local consumption as well as for export;
- Improve living standards of small and subsistence farmers through increased income generation from agriculture;
- Contribute towards national food security through increased production, processing and marketing of agriculture products to meet national nutritional requirements;
- Promote integrated and sustainable use and management of natural resources to achieve environmental sustainability;

The Agriculture Sector Plan aims at achieving these objectives through strengthening the institutional base of Agriculture Department and defining the roles and responsibilities of all stakeholders and facilitating coordination, monitoring and evaluation of the agriculture sector development interventions. The sector plan also provides a framework for further coordinated initiatives in the sector.

Under Agriculture Sector Plan, the key goals to be achieved by year 2020 are to:

- Raise the growth rate of agriculture sector from existing 2.1% to 5% (7% by 2025)
- Improve service delivery to farmers with 75% farmer access (100% by 2025) to evidence-based and diagnostic-driven extension services
- Improve crop productivity by 20% for wheat and sugarcane; 25% for cotton; 15% for rice; and 10% for maize (40% - wheat & sugarcane; 50% - cotton; 30% - rice; 20% - maize; by 2025)
- Transforming Agriculture Department into a strong ICT-led farmer-centric institution
- Mobilize private investment of PKR 75 billion in the sector (PKR 150 billion by 2025)

These ambitious targets will be achieved through multiple means – including improving agriculture extension services and developing robust communication systems using modern ICT tools; educating and incentivizing farmers to make efficient use of inputs, adopt progressive farming techniques, use better quality certified seeds and maximize their yields; creating an enabling environment by removing the regulatory bottlenecks; upgrading agriculture value chain infrastructure; subscribing to higher quality standards; and promoting public and private investments in the sector.

4.3. Key Enablers for Agriculture Sector Plan

In order to implement the Agriculture Sector Plan and achieve the desired goals, Government has identified five key enablers. The key enablers include the following:

- ***Wider Access to Requisite Inputs and Knowledge*** - The first key enabler to realize the goals set under Punjab Agriculture Sector Plan and to stimulate investment is to ensure that farmers have access to requisite inputs in terms of resources such as seed, fertilizers, etc. as well as diagnostic-based knowledge such as technical advice requisite skills, modern farming techniques, etc. The provision of these resources would mean that any farmer willing to grow and improve quality of his enterprise has the technical means and capacity to do that.

- ***Efficient Access to Market*** - The second enabler is that farmers have efficient access to downstream infrastructure such as markets and value addition apparatus. This would also mean timely access to market information. This enabler would mean that farmers are able to claim greater value from the value chain and the value chain is well positioned to promote value addition. Equally important is the forward market linkages where farmers can sell their produce with a reasonable profit margin which ultimately encourage input flow in the system for enhancing productivity.

- ***Promoting New Investment and Access to Finance*** - The third enabler is to make sure that while existing players in the value chain grow, new investment is stimulated in the sector not only to induce new investment but also to bring additional area under cultivation. This would on one hand mean ensuring access to finance for farmers and other value chain partners and on

the other that more formal large-scale national and global investors are interested to invest in the sector.

- ***Improving Quality Standards*** - The fourth enabler is to improve the quality of the value chain and gradually move towards international benchmarks for quality standards. This would on one hand ensure that value chain partners comply with high quality standards and on the other are also incentivized in a market, where high quality is rewarded.

4.4. Conceptual Framework and Key Pillars

As discussed earlier, the key objective of the Punjab Agriculture Sector Plan 2015 is to ensure adequate production and availability of food for the population and improve livelihoods to people directly involved in the sector to contribute towards inclusive economic growth. This would in turn mean catalyzing a major transformation of the sector in the province. The transformation of agriculture from traditional to modern farming techniques is based on adequate availability of inputs like certified seeds, balanced use of fertilizers, mechanization, agricultural credit and opportunities of investment in agricultural research. The achievement of better productivity requires efficient utilization of water resources while optimizing the crop mix. Furthermore, the adverse impact of uncertain climatic change on productivity needs to be countered through adaptation and mitigating measures based on innovations and diversifications by inculcating farming community to adopt advanced techniques.

The way forward is to raise the yield of crops along with improving the agro-based industrial value addition. The has to be complemented through improved road and communication infrastructure in rural areas to facilitate the farmers to tap more income from production cycle of crops and perishable items (vegetables and fruits) through improved supply chain. This could be done through a well-coordinated effort, where all relevant government agencies are striving for the same goals. More specifically, within the Agriculture Department, this should be undertaken through comprehensive diagnostics on cultivable land across the province, with results linked into a strong ICT-led extension system. This whole institutional apparatus should then be linked with research to enhance productivity, while paying greater attention to nutrient-dense foods such as fruits and vegetables and to more sustainable production systems. This would ensure gradually transforming existing farmer base into a generation of progressive farmers. Through an enabling environment and ensuring access to finance, the private investment has to be stimulated to complement the increased productivity by these farmers through up-

gradation of agriculture value chain providing new market opportunities for the agriculture produce and products. This in turn would ensure greater returns for the farmers, feeding back into a better crop and more resources to support modern farming techniques and quality inputs.

Figure 13: Conceptual Framework – Transforming Farmers into Progressive Farmers

In order to work with the farmers and to transform them into a progressive farmer is a daunting task, considering the large base of farmers in Punjab. However, before even going for scale, it is important to look for the total intervention space. The farmer basically has three primary drivers to work with including land, crop and inputs and with these three drivers, three categories of interventions can be designed – vertical interventions; horizontal interventions and 'mix' interventions. Vertical interventions would include improving productivity of farmers through improved yields and better labor productivity. Horizontal interventions would include increasing the area/land under cultivation, while mix interventions would aim at optimizing crop mix and patterns. Once the farmer has better crop and improved yields, the next step is to link him to efficient markets, where he can take informed decisions and claim a better margin for himself. All of this has to be supported through an enabling environment. This in summary provides the conceptual action framework for the agriculture sector plan.

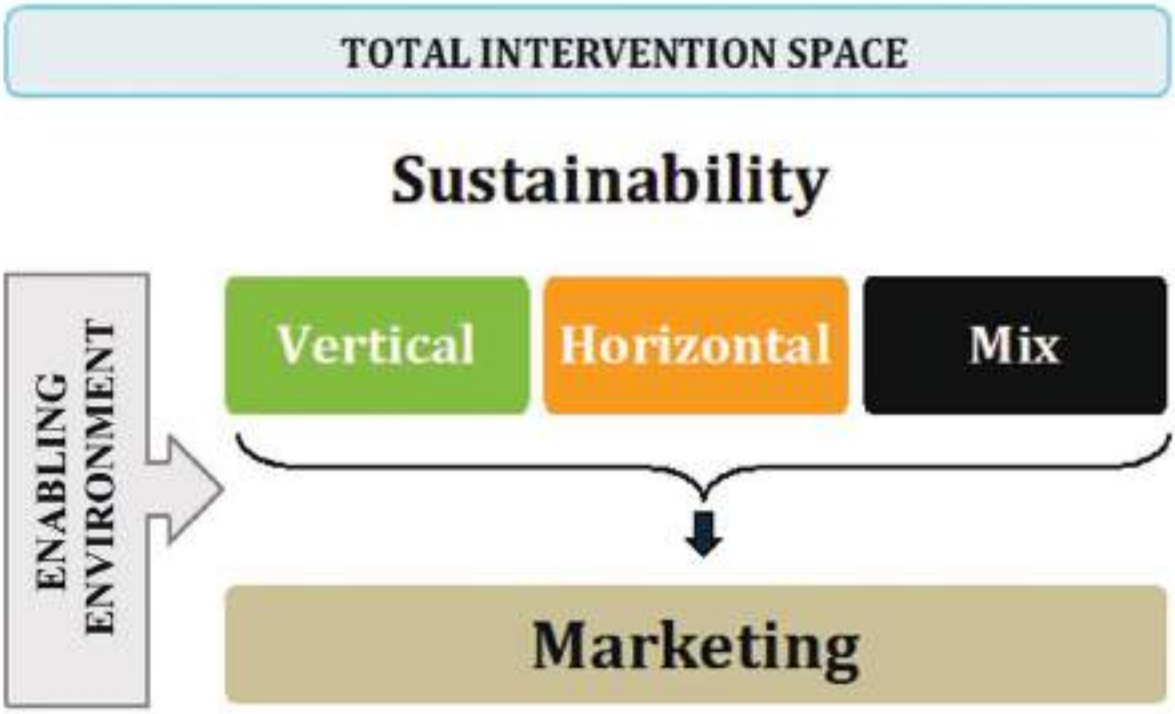


Figure 14: Total Intervention Space – Punjab Agriculture Sector Plan 2015

Based on the conceptual framework, the agriculture sector plan rests on the following key pillars:

- Vertical Interventions
- Horizontal Interventions
- Optimizing Crop Mix and Patterns
- Sustainability

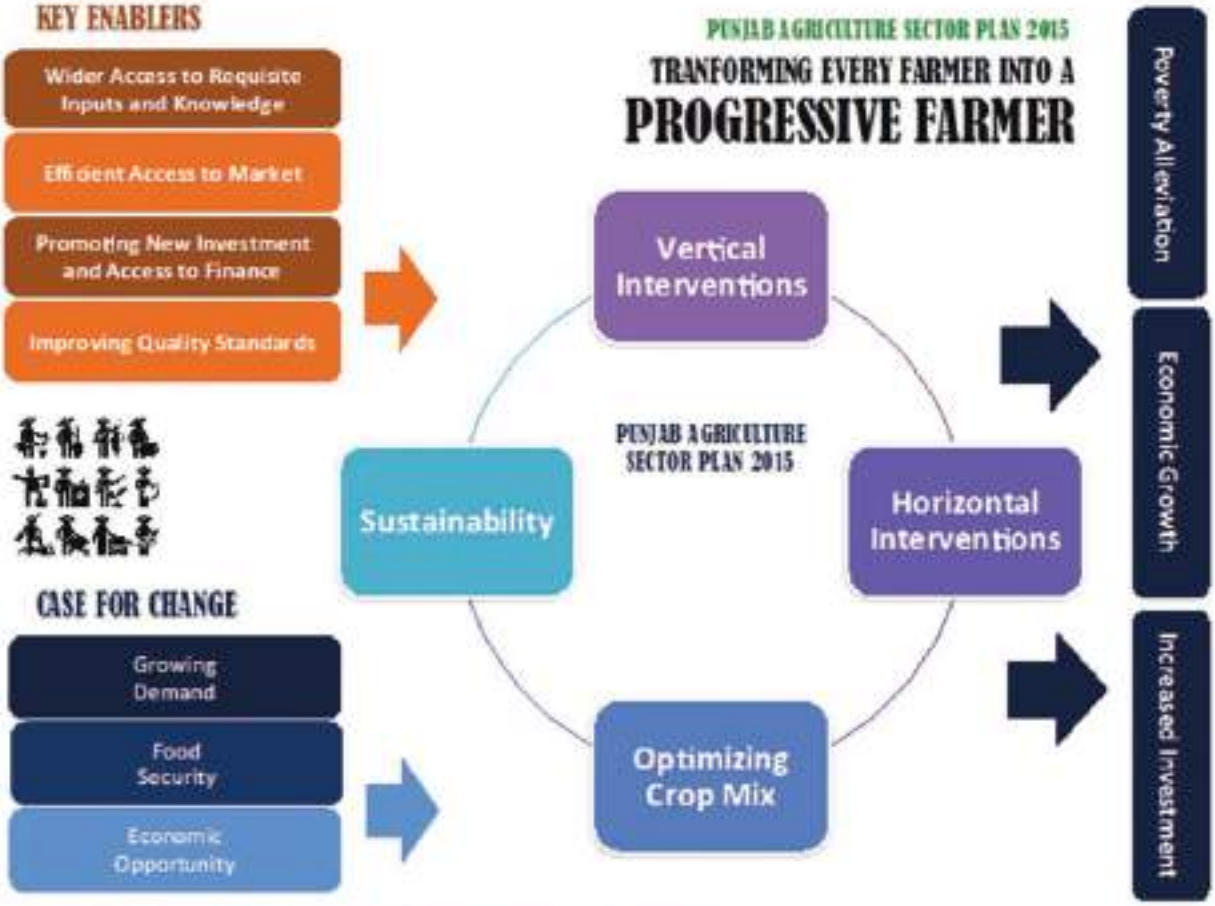


Figure 15: Strategic Pillars of Punjab Agriculture Sector Plan 2015

The following strategy grid lays down the planned projects and initiatives and demonstrates how they support specific strategic pillars of the Agriculture Sector Plan.[21]

	Vertical	Horizontal	Crop Mix	Sustainability
KEY ONGOING PROJECTS				
Punjab Irrigated Agriculture Productivity Improvement Project (PIPIP)	•	•		•
Enhancing Vegetable Production in Punjab		•	•	
Introduction and Adaptation of Advanced Technologies to	•			•

[21] A complete list of ongoing and new projects is annexed at Appendix A.

Mechanize Various Farm Operations for Enhancing Crop Production				
Promotion of Pulses Cultivation in Punjab		•	•	
KEY PROJECTS (SHORT TERM)				
Seed Dissemination	•		•	
Seed Certification & Authentication	•			•
Mechanization in Punjab	•	•		
Extension Services 2.0	•		•	
Improving Water Efficiency & Irrigation Scheduling	•	•		•
Establishment of Policy & Strategy Unit				•
Olive Cultivation Project		•	•	
KEY INITIATIVES (MEDIUM TERM)				
Use of M-Governance for Effective Monitoring				•
Financial Inclusion for Farmers				•
Promoting Micro-finance Linkages and Credit for Small Farmers	•	•	•	•
Grain Collateralization & Warehouse Receipt Model				•
Agriculture Market Reforms				•
Strengthening Agriculture Research and Academia-Industry Linkages				•
Upgrading Agriculture Market Information System				•
Rural Infrastructure Development				•
Agriculture Investment Policy	•	•	•	•
Mobilizing Private Investments in Agriculture Sector	•	•	•	

Table 7: Strategy Grid – Punjab Agriculture Sector Plan 2015

5. Key Projects & Initiatives

Agriculture Department has divided the proposed interventions and projects into two distinct phases. In the first phase (short term), besides existing ongoing projects, a number of new well-needed projects have been added to the development portfolio. These projects have been worked out in great detail, after thorough deliberations and are scheduled to start from the beginning of FY 2015-16. However, there are a number of other areas, where Department feels that it needs to intervene after the first phase. These have been included in the second phase (medium term), where a broad sketch of proposed intervention is given but the details of the projects have to be worked out, either through extensive stakeholder consultations or through rigorous diagnostics. Some of the medium term projects will be designed in detail in FY 2015-16 and will be implemented in the subsequent financial year, while other would be piloted first and would then be scaled up.

The phasing plan is given below:

	2015-16	2016-17	2017-18	2018-19	2019-20
Punjab Irrigated Agriculture Productivity Improvement Project (PIPIP)	*Ongoing*				
Enhancing Vegetable Production in Punjab	*Ongoing*				
Introduction and Adaptation of Advanced Technologies to Mechanize Various Farm Operations	*Ongoing*				
Promotion of Pulses Cultivation in Punjab	*Ongoing*				
Seed Dissemination	Roll-Out				
Seed Certification & Authentication	Roll-Out				
Mechanization in Punjab	Roll-Out				
Extension Services 2.0	Roll-Out				
Improving Water Efficiency & Irrigation Scheduling	Roll-Out				
Olive Cultivation Project	Roll-Out				
Establishment of Policy & Strategy Unit	Roll-Out				
Use of M-Governance for Effective Monitoring	Planning	Full-Scale Roll-Out			
Financial Inclusion for Farmers	Strategy Dev.	Implementation			
Micro-finance Linkages and Credit for Small Farmers	Planning	Pilot		Full-Scale Roll-Out	
Grain Collateralization & Warehouse Receipt Model	Planning	Pilot		Full-Scale Roll-Out	
Agriculture Market Reforms	Planning	Pilot			Full Roll-Out
Strengthening Agriculture Research and Academia-Industry Linkages	Project Development	Implementation			
Upgrading Agriculture Market Information System	Project Development	Full-Scale Roll-Out			
Rural Infrastructure Development	Planning	Planning	Roll-Out		
Agriculture Investment Policy	Policy Develop.	Implementation			
Agriculture Products Processing & Value Addition Investments	Planning	Pilot			
Agriculture Enterprise Fund and Enterprise Development	Planning		Pilot		
PPPs in Agriculture Sector and Basket of Model PPPs	Planning	Pilot			

Table 8: Phasing Grid – Punjab Agriculture Sector Plan 2015

5.1. Key Projects – Short Term

5.1.1. Seed Dissemination

One of the key projects by Agriculture Department would be to upgrade and improve the propagation of certified current technology seed as an annual exercise to ensure that farmers have timely access to them and can improve their crop productivity. Currently seed is distributed to farmers on a limited scale with wheat seeds distributed to registered farmers and sugarcane seeds through sugar mills. However, there is a need to calibrate this initiative to optimize productivity.

Wheat Seed - Existing usage of wheat seed is given in the table below, however, this distribution pattern would be gradually shifted towards varieties like Galaxy-13; Punjab-11; Faisalabad-08; and Durabi-08. This alone is expected to increase the yield by about 5% by producing us much as 60 Kg per acre.

Seed	*Usage*
Sehr	50.26%
Faisalabad	12.04%
Inqlab-91	5.97%
Wattan	5.57%
Lasani	4.42%
Shafaq	4.27%
Bhakkar-2002	4.04%
Others	13.43%

Table 9: Wheat Seed Variety & Usage

Under the modified seed dissemination initiative, wheat seed would be provided to registered progressive farmers each year for 4 acres per village on average. These farmers would be changed annually through open advertisement and this better quality seed is expected to propagate through farmer acquisition of seed from registered farmers in subsequent years through market forces. This initiative would require annual supply of 5,000 tons (100,000 bags of 50kg) and a recurrent expenditure of PKR 300m (including extension). The initiative is expected to result in an annual impact of PKR 7+ billion after 4th year.

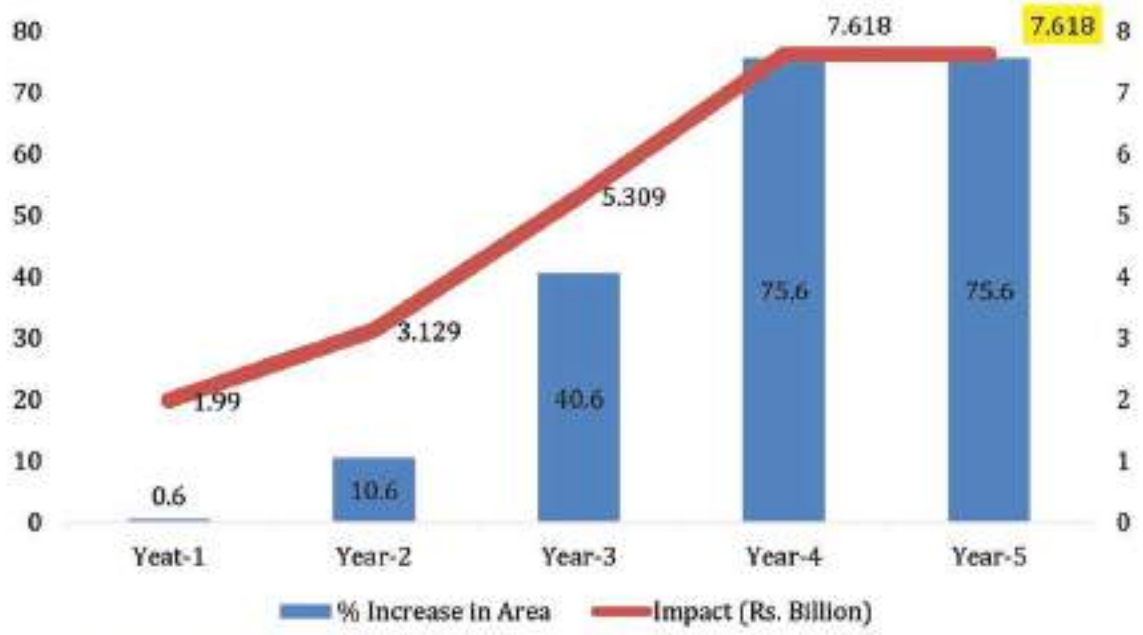


Figure 16: Expected Impact of Wheat Seed Dissemination

Sugarcane Seed - Sugarcane seed will be provided to 45 sugar mills of Punjab from SRI, Faisalabad on payment from these mills[22]. Currently, the annual production capacity of seed is at 10 acres, whereas each Sugar mill has on average 42,000 acres gate area. In order to further enhance the capacity, sugarcane R&DB shall identify proactive mills for provision of basic seed (1 to 5 acre each). The seed is expected to propagate from subsequent cuts - 60% coverage targeted in 6th year.

[22] PKR 240/- per maund including harvesting, loading and transportation charges

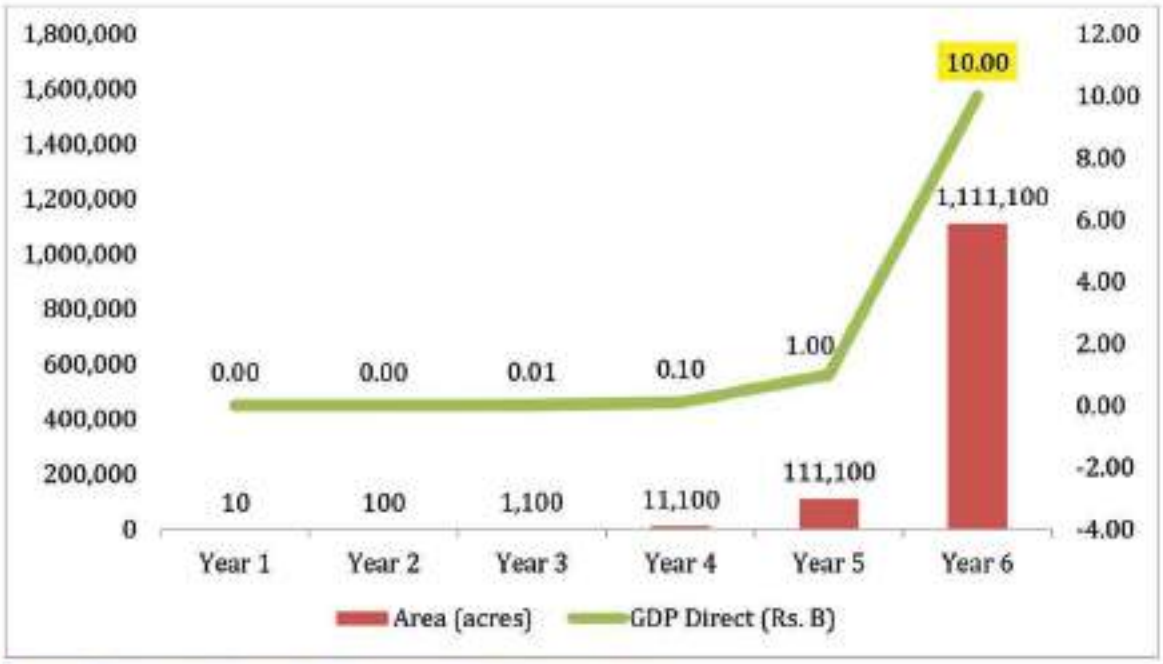


Figure 17: Expected Impact of Sugarcane Seed Dissemination

5.1.2. Seed Certification & Authentication

The proposed seed certification and authentication initiative revolves around empowering farmers to certify genuineness with a security seal with three levels of authentication. Such a seal will be visible immediately with naked eye but can also be authenticated through polarized filter as well as through verification by mobile phone. Such an approach will have to be supplemented through an extension campaign to educate farmers to only use products with non-counterfeit seals. These labels will be issued centrally to manufacturer/importer and if product with official seal is found to be substandard during random testing, issuance of labels to manufacture/importer shall be stopped. It is proposed to initially provide 250 million labels, which will have to be provided by manufacturer/importer directly from the security label provider.

The requirements for the proposed initiative are given below:

Number of Labels	250 Million
Cost of Label	PKR 3.5 Per Label
Farmer Enablement	Included in Cost
Validated Card (Filter)	20,000
Security Guard Detector (Android)	150

Table 10: Seed Authentication Proposal

5.1.3. Mechanization in Punjab

Under the Punjab Agriculture Sector Plan, the Agriculture Department will expand tractor use through physical availability of all basic implements in every union council and enabling market forces to create rental market for implements as it has done for tractors. Government will distribute implements on 50% cost-sharing basis and complete sets will be made available in each UC.

The following table shows the mechanization gap in Punjab versus the neighboring Punjab province in India.

Implement	Applicability	Punjab (per 10,000 acres)	East Punjab (per 10,000 acres)	Existing Coverage As % of E.Punjab
Tractors	All Crops	140	295	47%
Chisel Plow	Cotton Sugarcane	2	28	**8%**
Cultivator	All Crops	102	224	46%
Disc Harrow	All Crops	5	118	**4%**
Rotavator	All Crops	14	155	**9%**
Seed Drill	Wheat	21	124	**17%**
Ridger cum Fertilizer	Sugarcane Cotton	22	56	38%

Table 11: Mechanization Gap in Punjab

As part of mechanization initiative, following packages will be offered:

General (5,000 sets)	Sugarcane
Cultivator *Rs. 60,000* **Disc Harrow** *Rs. 195,000* **Seed Drill** *Rs. 70,000* **Rotavator** *Rs. 105,000*	**Chisel** (3 tines) (4400 sets) *Rs. 55,000* **Ridger cum Fertilizer Box** (2200 sets) *Rs. 95,000* **Knives** (165000) *Rs. 1,000* *100% subsidy*
50% subsidy cost: PKR 1.08b	**50% subsidy cost: PKR 391 m**

Table 12: Mechanization Packages

Dissemination of Efficient Nozzles – Other than the mechanization packages, Agriculture Department would also disseminate efficient spray nozzles for cotton with distribution of full sets for each village. Since the cost of one set is only PKR 130[23], this would cost merely PKR 3.6 million, however, the potential annual impact of these nozzles could be as high as PKR 12 billion by fourth year.

- Cotton

Efficient spray nozzles (full set) provided in each village

Rs. 130

@ 100% subsidy

- **Cost: Rs. 3.6m**

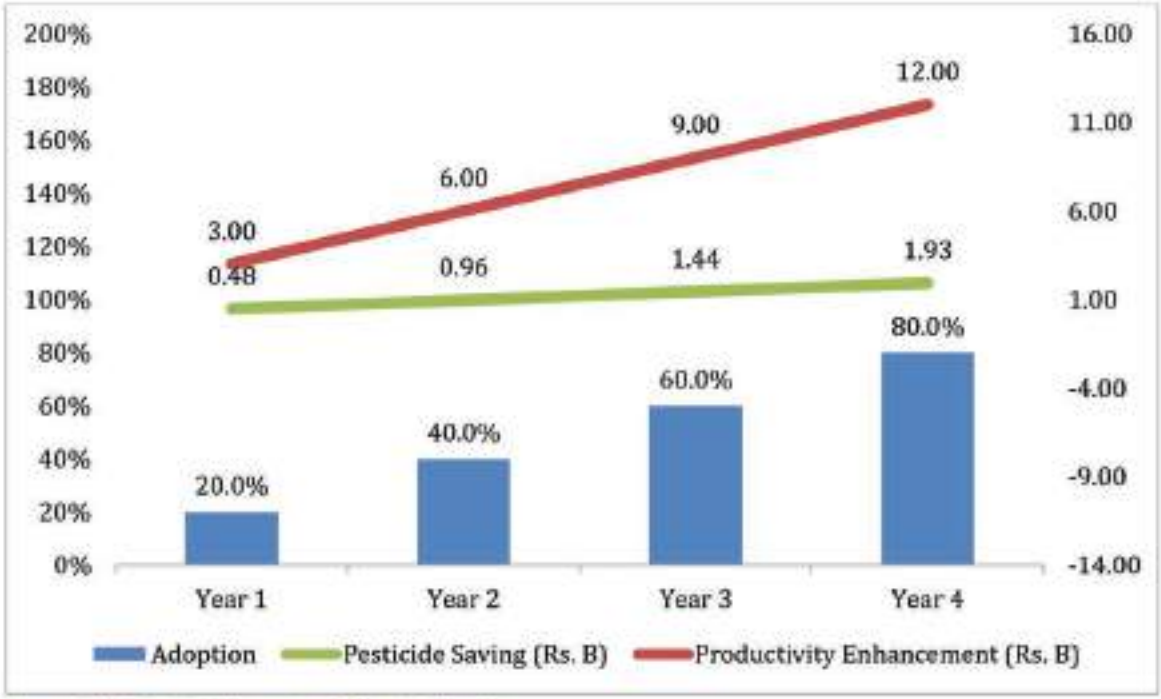


Figure 18: Potential Impact of Efficient Nozzles

5.1.4. Extension Services 2.0

Extension Services 2.0 is the flagship project under the Punjab Agriculture Sector Plan 2015, whereby the entire institutional base of Agriculture Department would be transformed and would change the way in which government interacts with farmers. The project includes comprehensive soil testing plan in the province and linking that information with ICT-enabled extension staff and system to provide

[23] Hollow-Cone (insecticides/fungicides); T-jet (weedicide post-emergence); Flat-Fan (weedicide pre-emergence)

diagnostic-fed informed extension advice to the farmers. The project has been developed based on the notion that economic yields can only be achieved if crops are grown in the environment that is optimum for specific plants. Therefore improving awareness level about given soil and environmental conditions can be of great help to improve crop production. This idea can be easily achieved by using recent IT innovations and by making information public through available tools. The use of GIS in agriculture as a tool for spatial data integrated with actual soil data to produce soil fertility / crop suitability maps will be helpful for progressive farmers, landowners, policy makers, planners, researchers & extension workers.

In particular, the project is aimed at development of soil attributes database and GIS mapping; strengthening of existing capacity of soil laboratories; identification of crop specialists from universities, research and extension organizations for online advice to the extension agents; improvement in service delivery of the extension service; provision of missing facilities to the extension agents for field working and to respond to the queries of the farmers through dedicated visits and establishment of dedicated monitoring system at each nodal point; registration of four farms from each village with regular expansion program to reach every farm within life of project; adoption of latest extension approaches and tools for regular interaction with registered and other farmers field visits, plant clinics, farmer's trainings and through inbound/outbound calls, helpline/complaint line with IVR facilities; provide outbound survey call facility SMS/MMS query and SMS/MMS Broad casting service, pre-recorded calls/ Robot calls with response capture facility etc. and other mechanisms/technologies to connect with agriculture farmers; helpline with complaint management systems and it also include provision of application/ portal management system for sending out the customized SMS messages and / or Robot calls to agriculture farmers; and redress of farmer issues relating to agriculture technology and input management.

The conceptual schematic of how Extension Services 2.0 would work is given below. The project would include comprehensive soil testing with as small a sample size as one sample per farm (10 acres). The sampling exercise would complete in five years. The project is estimated to cost PKR 4.4 billion for the 5-year project, including PKR 2.1 billion for soil testing; PKR 1.42 billion for precision analytics and strengthening laboratory testing infrastructure; and PKR 0.9 billion for data consolidation, storage and information dissemination. The project is expected to reach out to 8 million farmers in the first year of implementation across 24,000 villages in rural Punjab. In a period of five years, the project will reach out to 5.2 million farmers and would provide advice on issues like time of sowing; promotion of correct & certified seed; balanced use of fertilizers; soil health & conservation agriculture; promotion of

horticulture crops; agriculture mechanization; mechanical spray and techniques; crop intensification; harvesting & post-harvesting techniques; plant protection; pest forecasting & alerts, etc. The major impact of the project is expected to be achieved through adoption of balanced use of fertilizers (N:P:K) and will fetch additional benefits through adoption of better agriculture practices.

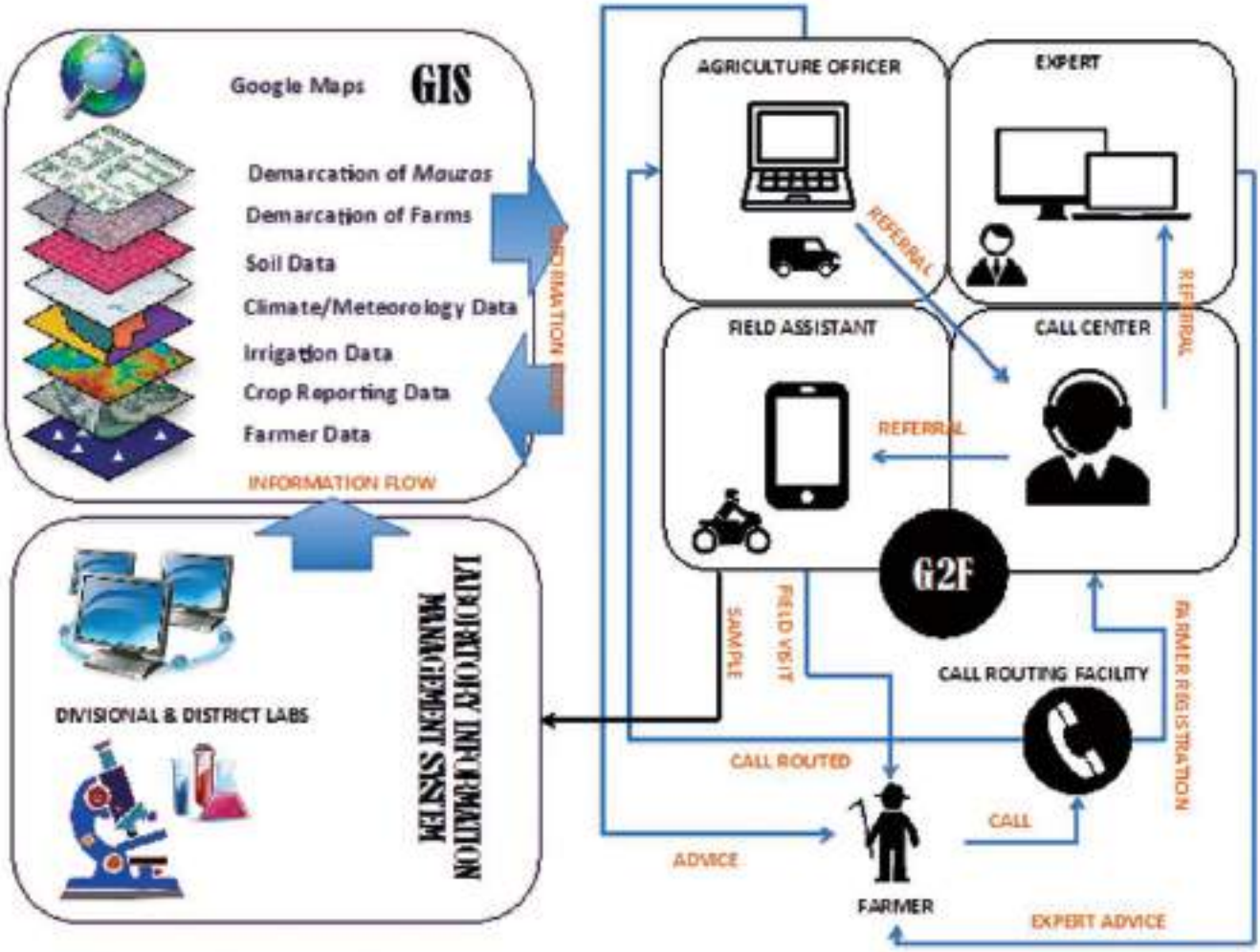


Figure 19: Conceptual Schematic of Extension Services 2.0

5.1.5. Improving Water Efficiency & Irrigation Scheduling

There are serious gaps in water productivity in Punjab, when compared with international benchmarks. Therefore, improving water efficiency is going to be a critical initiative to drive agriculture sector growth in Punjab.

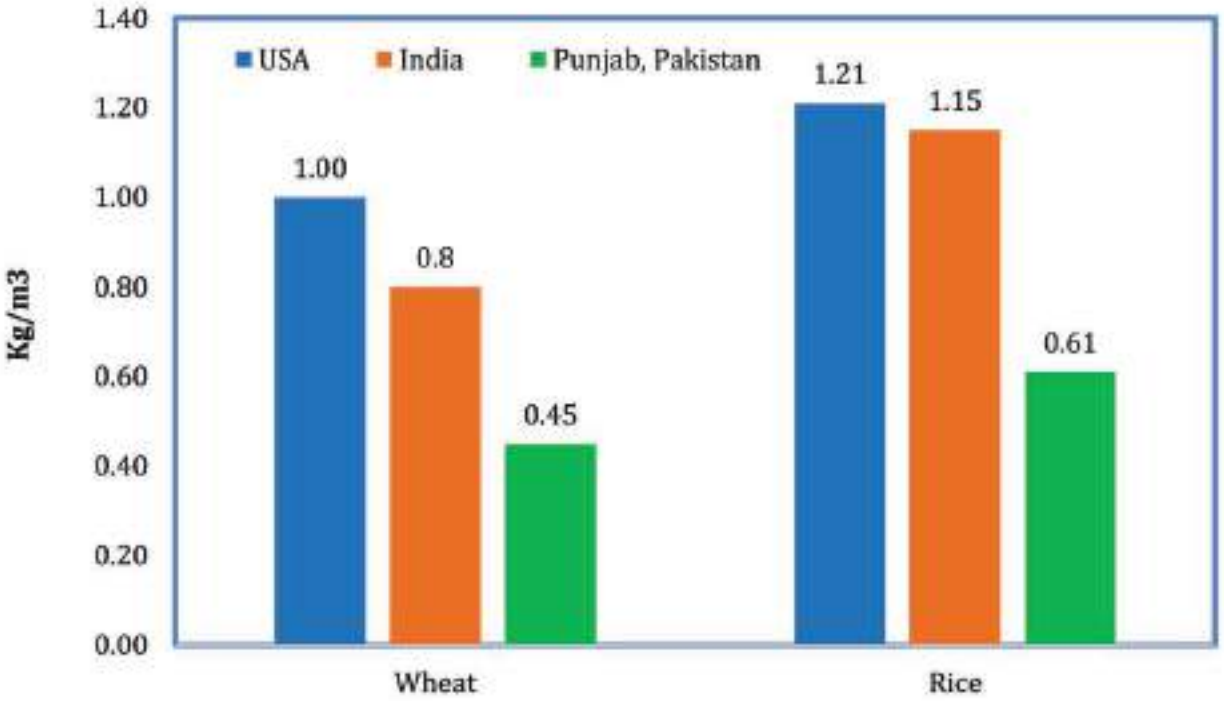


Figure 20: Global Water Productivity

For this, the Agriculture Department intends to adopt a holistic approach focusing on all three key elements of improving water efficiency, including conveyance efficiency; application efficiency and water use efficiency.

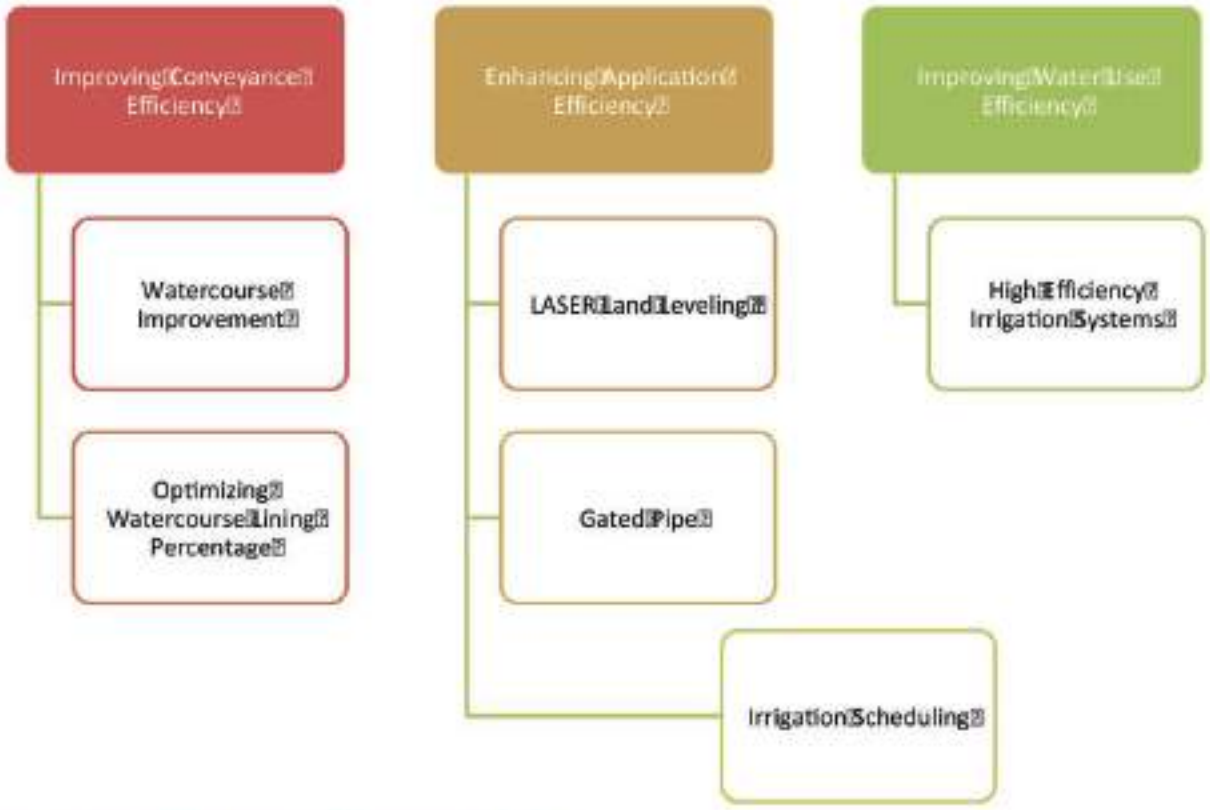


Figure 21: Improving Water Efficiency in Punjab

Water Course Improvement – Watercourse improvement initiative will greatly enhance conveyance efficiency. Currently over 45,000 watercourses are lined up to 30% length, whereas optimal lining is generally 50-55%. Presently around 45,000 watercourses require lining extension/ re-construction with an estimated investment requirement of PKR 130 billion. While this would take approximately 15 years to complete, it is also expected to result in annual water saving of 4.5 MAF. In the short term, the plan is to improve 2,500 watercourses in the next three years, with an investment of PKR 7 billion (PKR 2.3 billion per annum).

	30% Lining PIPIP	50% Lining New Project
Annual water saving per watercourse	119 AF	207 AF
Reduction in conveyance losses	39%	75%
Increase in irrigated area	8.3%	12%
Increase in cropping intensity	3.39%	12%
ERR	28.1%	32%

Table 13: Proposed 50% Lining Project

Laser Land Leveling – In order to enhance application efficiency, laser land-leveling can play a key role. At present, the optimal laser set requirement for the whole province is 15,000 sets, whereas 9,000 sets are already available, including 7,500 subsidized sets. This results into a gap of 6,000 sets, which must be bridged in the next three years and would require additional subsidy, essential to induce the requisite appetite. For this initiative, the recommended subsidy is estimated at PKR 450,000[24] and would require an estimated funding of PKR 1,350 million from Government of Punjab.

Irrigation Scheduling – Presently on-farm crop-watering regime is unscientific and is therefore resulting in crop-stress due to overwatering or under-watering. There is a need for scientific application of water and can only be achieved through moisture meters checking specific root zones. For this government intends to introduce a water metering initiative.

[24] WB Share 225000; Govt of Punjab Share 225000

Water Meter Service

- Introduce 3-4 moisture meters per village under a Service Provider model in which moisture measurement service is provided by private entrepreneurs
- 60,000 moisture meters over 3 years at a cost of PKR 1.5b

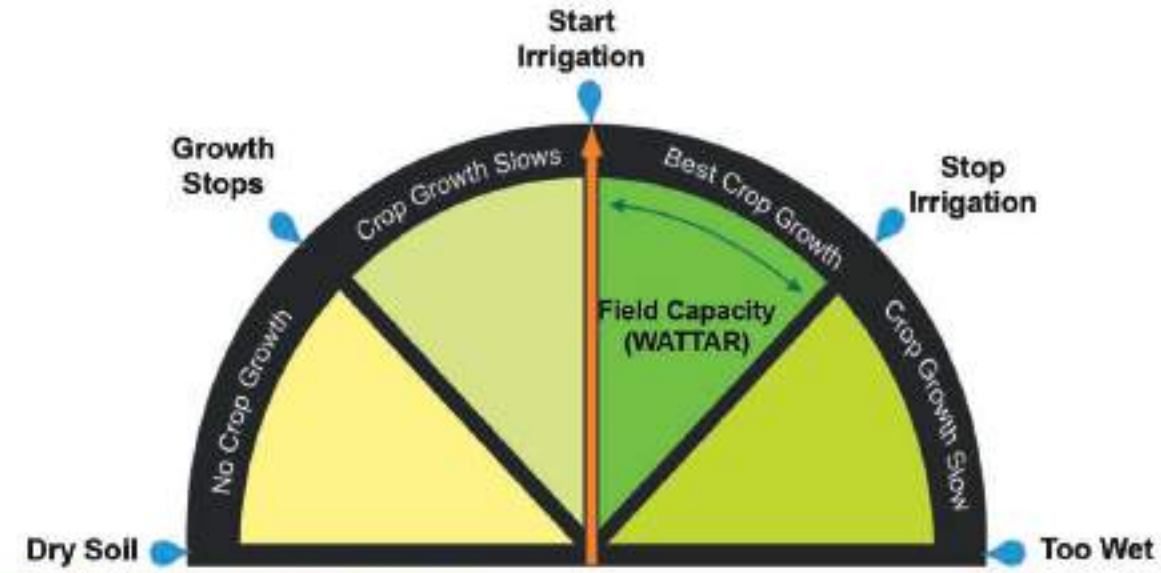


Figure 22: Water Meter Illustration

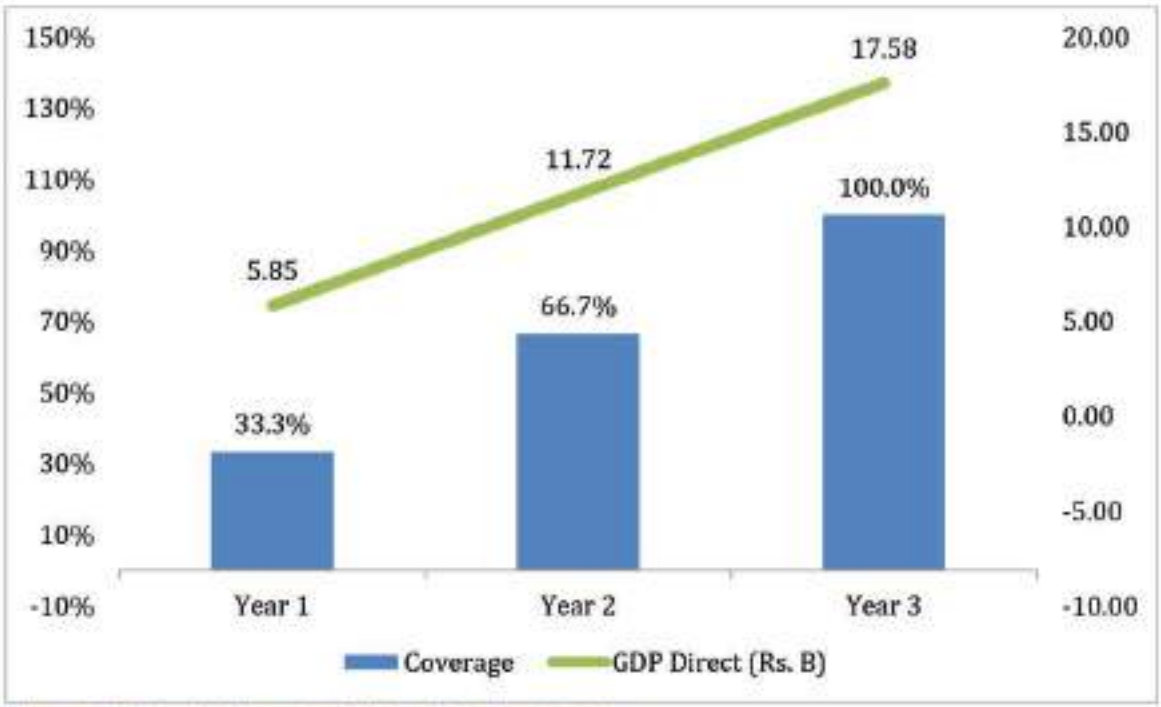


Figure 23: Potential Impact of Water Metering Service

Ground Water Exploration – Government of Punjab is also planning to undertake ground water exploration project, with 1,000+ ERM surveys per month, resulting saving of PKR 73+ million on cost of test bores. The initiative would cost approximately PKR 166 Million.

ERM Surveys per annum	1056 Nos.
Beneficiaries per annum	1056 Farmers
Saving on cost of test bores per annum	Rs. 73.92 million
ERR	28.19%

Table 14: Ground Water Exploration

5.1.6. Olive Cultivation Project

This is one of the key initiatives of Agriculture Department for developing Potohar into an olive valley. This project has been developed on the premise that initial cost for planting about 135 plants is PKR 201,100, whereas it requires an annual recurrent cost of PKR 25,900 to do upkeep. After 5th year, this would result in approx. PKR 85,000 in revenues per year and would increase to PKR 285,000 by 10th year, making the whole business proposition highly attractive. This initiative would require PKR 26b injection in 15 years and would generate PKR 151b of product and create industry that produces PKR 66b annually (by 19th year).

Olive Introduction Model

Provide subsidy on plants
100% for first 5 years
50% after 5 years

Provide subsidy on irrigation
60% on drip irrigation for above 10 acres farms
100% on hose irrigation to small farmers

Target 100% coverage in 15 years

District	Uncultivated Area	Water Available (%)	Water Source Can Be Developed (%)	Cultivated Area
Attock	75,755	14,527	50,325	56,575
		19%	*66%*	
Chakwal	266,122	6,980	196,423	24,511
		3%	*74%*	

Jhelum	105,144	6,735 *6%*	74,014 *70%*	+	101,182
Rawalpindi	197,613	22,755 *12%*	108,729 *55%*		26,145
			480,488 Acres		208,413 Acres
TOTAL 688,901 Acres					

Table 15: Potential Area for Olive Cultivation

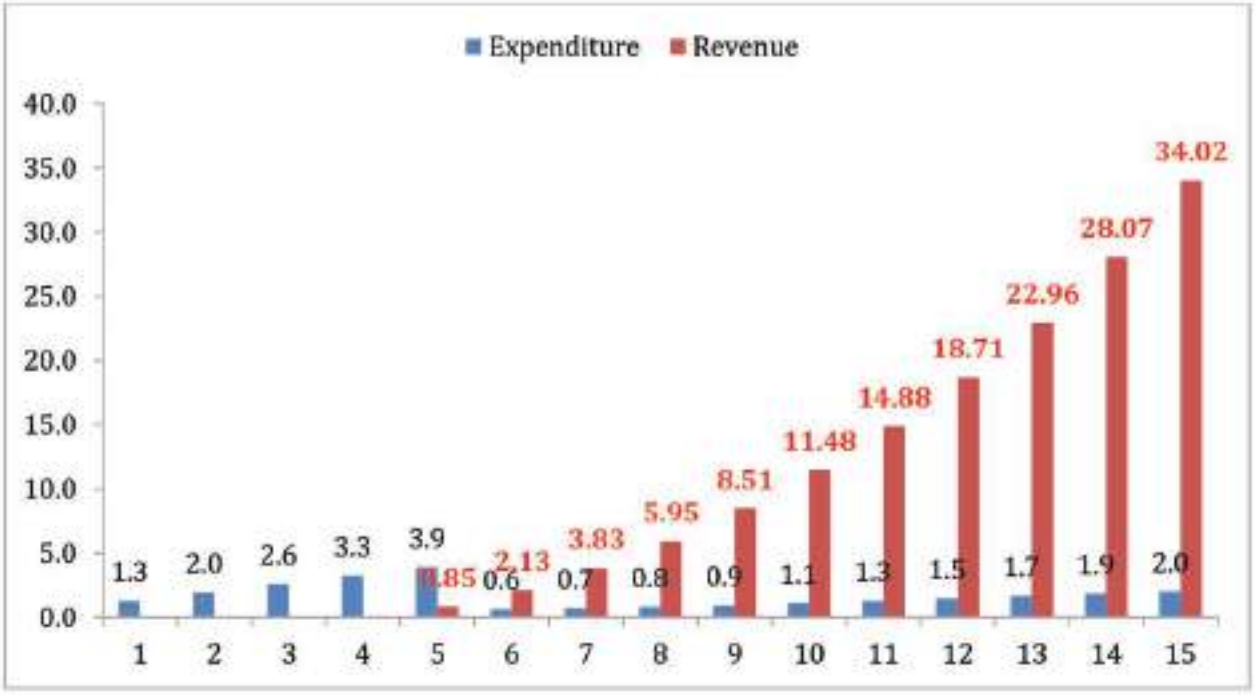


Figure 24: Cost Benefit Analysis of Olive Plantation Initiative

5.2. Key Initiatives – Medium Term

While the Agriculture Department has already developed a robust portfolio of short term projects, as discussed earlier, it also recognizes that there are other important impediments that need to be addressed in medium terms as well. Some of these key areas include the following. Based on these key thematic areas, Agriculture Department would be developing new projects on these areas in 2015-16 and would be part of the existing portfolio over the next two years either through a pilot approach or through a full-scale project launch.

5.2.1. Use of M-Governance for Effective Monitoring

Punjab Government already introduced the use of mobile governance (m-governance) to implement an effective monitoring regime in different departments, to check staff absenteeism and provide insights into delivery of different services. A similar smart monitoring regime, making use of 'smart phones', will be introduced to manage performance of Agriculture field staff, providing real time data abut staff's availability and field visits to senior officials. The concept behind smart monitoring is to ensure staff presence and track their visits through GPS-tagged data and pictures, sent through their smart phones. The data will be collated through a centralized dashboard, which will not only generate insightful reports but also provide visualization of this data over a map. This would ensure real time collection and collation of data as well as it's plotting on a map, eliminating any information lags.

5.2.2. Financial Inclusion for Farmers

Agriculture Department believes that key to promoting rural finance is to ensure financial inclusion of farmers. For this, the Department is planning to take a holistic approach and develop a financial inclusion strategy for the farmers of Punjab. The strategy would touch upon a number of issues and policy options such as: supporting financial institutions to innovate and adopt delivery models that reduce transaction costs (such as mobile banking units, facilitate mobile phone banking, subsidies provided through a smart card solution, etc.); designing innovative financial products to meet demand in rural and remote areas and extending a range of financial services that are customized for farmers addressing their needs in various parts of the value chain; promoting savings and insurance culture amongst farmers; pilot index-based insurance products like weather-based crop insurance; etc. Based on the strategy, the Department would then undertake selected pilot projects and would scale them up.

5.2.3. Promoting Micro-finance Linkages and Credit for Small Farmers

Agricultural credit is an integral part of the process of modernization of agriculture and commercialization of the rural economy. The introduction of easy and cheap credit is critical to promote agriculture sector for transformation of subsistence farmers to progressive and commercial farming. Provision of credit can stimulate growth and can provide a foundation to these farmers for scaling up their enterprises. Considering the structure of agriculture farming with a number of small farmers involved and lack of corporate farming, for any private investment or investor especially in the downstream value chain, it would be critical to form linkages with these smaller farmers. In order to ensure that these farmers can be

well integrated in these modernization efforts and can respond with complementing investments and improvements, Agriculture Department would work closely with micro-finance organizations to ensure that these farmers have adequate access to small loans. Such an approach would not only take the burden off the investors to support these farmers but would also assure a smooth value chain and would align the agriculture sector investments with government's poverty alleviation agenda. State Bank of Pakistan in consultation with stakeholder has already developed a group based financing scheme for the small farmers. The scheme will target farming community involved in small agri-related activities and do not have any tangible security to offer to banks as collateral. The scheme has been structured on group based lending approach wherein banks can finance to individuals through small farmer groups. Agriculture Department would further extend and expand this scheme and would lend support for smooth credit disbursal.

5.2.4. Grain Collateralization & Warehouse Receipt Model

Warehouse receipt financing and other related collateralized lending mechanisms can provide an alternative to traditional lending requirements of banks and other financiers and are particularly relevant in the context of Punjab. Agriculture Department believes that warehouse receipts financing has the potential to improve the supply of rural finance by easing collateral constraints and provide an avenue for working capital provision to the farmers. Initially the Agriculture Department would pilot the model in 1-2 areas for selected crops and would then scale it up.

Warehouse Receipt Model[25]

In warehouse receipt financing in the agricultural sector, the underlying collateral is a soft commodity such as grain or cotton. After harvest, the commodities are stored in a licensed warehouse that issues a receipt proving that the commodities are received and physically in the warehouse. This receipt forms the basis of the financing. Ideally, the warehouse receipt consists of two parts: a certificate of pledge and a certificate of title. When issuing the certificate of pledge to a lender, the farmer, trader, or agricultural company is able to take out a loan: he borrows against the collateral, hence the commodities and hereby covers his working capital needs. Lenders usually advance funds as a specified percentage of the value of the underlying commodities. This percentage needs to account for the costs that lenders have to incur when selling the commodities in case of a loan default, as well as the potential value decrease caused by price volatility in the respective commodity

[25] Rural Finance Innovations – Topics and Case Studies; The World Bank 2005

market. Subsequently the farmer sells his commodities either to a trader or a primary processor; to validate this sale he transfers the certificate of title. The buyer eventually pays back the loan plus interest directly to the lender and receives in exchange the certificate of pledge that had been deposited with the lender when the loan was issued. Once the buyer has both, the certificate of title and the certificate of pledge, he can release the commodities from the warehouse. Because of the easy recourse and the ability to sell a liquid collateral asset in case of default, warehouse receipts-based lending lowers the risk and reduces typical transaction costs of commodity transactions, such as high loan servicing costs due to limited volumes, high information costs, and high supervision costs.

5.2.5. Agriculture Market Reforms

Agriculture Department Punjab would undertake a comprehensive review of the existing marketing regulatory regime as well as infrastructure needs assessment of the key wholesale markets in Punjab. Based on this, the regulatory regime would be refined and calibrated to promote efficiency and ensure grater margins for the famers. The Department would also explore using public-private partnership in market up-gradation, establishment, management and operation to put in place a performance-based system, where government acquires the role of a regulator.

5.2.6. Strengthening Agriculture Research and Academia-Industry Linkages

The public sector already has a number of research institutes working in different areas. There are 25 research organizations working under the umbrella of the Agriculture Department and Directorate General of Agriculture Research. Similar to other public sector institutions, not only these are poorly resourced but are also being managed like traditional public sector organizations, without any incentives to produce quality research. Moreover most of these facilities are stand-alone without any inter-linkages or support from other national or international institutions. Agriculture Department would explore establishing an agriculture research network by linking all these research facilities with each other to enable them to share ideas research and work in unison and produce meaningful and applicable results through forming research consortia. Punjab Agriculture Research Board (PARB) would be transformed into a research hub for this network. This would allow development of an integrated research agenda without any duplication and redundancy. The network would not only include agriculture institutions but would also link with other domains such as IT institutions and economic policy institutes to ensue broad-based research and enable technology and economic policy integrated within the research network. This network would be supported by

a web-based digital platform to support virtual discussions and online availability of research materials. Moreover, government would ensure provision of substantial funding to these research institutions to ensure up-gradation of infrastructure, laboratory and equipment facilities and trainings of laboratory and technical staff, in addition to researchers themselves. This up gradation would be undertaken in a phased approach, with five research organizations every year, for a period of five years. The research agenda would be closely aligned with the needs of the private sector and would be expected to enable improved diagnosis and eradication of diseases and pests, greater availability of better quality seeds, etc. These research facilities would also develop close liaison with farmers and with extension services for developing their research agenda, as well as testing their research interventions.

Technology Transfer Offices at Agriculture Universities - Subsequent to improvements in agriculture research infrastructure, technology transfer framework would be critical to support any ideas coming out of the research portfolio. Agriculture Department would support establishing technology transfer offices in selected universities to ensure greater coordination and synergy between research and technology development. Considering that this is a new area for Pakistan, international donor assistance would be particularly sought for this to ensure that these offices are well functioning and to ensure a smooth process for transferring skills, knowledge, technologies, practices coming out of these research institutes to a wider range of users who can then further develop and exploit the technology into new processes and methods and improving production, productivity and value-addition.

The complete list of research organizations under Agriculture Department is given below:

No.	Name of Institute
1.	Agricultural Biotechnology Research Institute, Faisalabad.
2.	Agronomic Research Institute, Faisalabad.
3.	Arid Zone Research Institute, Bhakkar.
4.	Barani Agricultural Research Institute, Chakwal.
5.	Citrus Research Institute, Sargodha.
6.	Cotton Research Institute, Faisalabad.
7.	Entomological Research Institute, Faisalabad.
8.	Fodder Research Institute, Sargodha.
9.	Horticultural Research Institute, Faisalabad.
10	Institute of Soil Chemistry and Environmental Sciences, Faisalabad.

11	Maize and Millets Research Institute, Yusafwala, Sahiwal.
12	Mango Research Institute, Multan
13	Oilseed Research Institute, Faisalabad.
14	Plant Pathology Research Institute, Faisalabad.
15	Post Harvest Research Centre, Faisalabad.
16	Potato Research Institute, Sahiwal.
17	Pulses Research Institute, Faisalabad.
18	Rapid Soil Fertility Research Institute, Lahore.
19	Regional Agricultural Research Institute, Bahawalpur.
20	Rice Research Institute, Kala Shah Kaku.
21	Soil and Water Conservation Research Institute, Chakwal.
22	Soil Salinity Research Institute, Pindi Bhattian.
23	Sugarcane Research Institute, Faisalabad.
24	Vegetable Research Institute, Faisalabad.
25	Wheat Research Institute, Faisalabad.

5.2.7. Upgrading Agriculture Market Information System

Agriculture Department will upgrade the existing agriculture market information systems, possibly through private sector participation, to provide real-time market information to farmers through SMS, radio and in-market digital displays. The proposed systems will collect information from various markets across the province and will analyze, store and disseminate agriculture produce prices and market information. This would include complete price and volume data to ensure that farmers and traders are making informed decisions.

5.2.8. Rural Infrastructure Development

A well-developed and maintained rural infrastructure is essential for agriculture sector development. Investments in rural roads, water supply, transportation, storage, rural markets, electrification, communication, water management schemes, wholesale markets, etc. are critical to stimulating increased agriculture production. Presently, rural infrastructure in many areas is in poor condition and inadequate for the development of the rural economy, it is also unevenly distributed, leaving some high agriculture potential areas with inadequate infrastructure. This area would be given due consideration and Agriculture Department will ensure provision of adequate resources for priority areas to bridge the infrastructure gaps including farm-to-market roads and market infrastructure. Government of Punjab has already initiated a program for upgrading rural farm-to-market roads with an allocation of PKR 150 billion. Agriculture Department would now develop further infrastructure improvement projects to supplement this initiative.

5.2.9. Agriculture Investment Policy

Despite being an agrarian country, Pakistan does not have any agriculture investment policy. As a follow on to this sector plan, Agriculture Department would develop a provincial agriculture investment policy to lay out incentive structure provided to future investments in priority sub-sectors and strategic parts of the agriculture value chain.

5.2.10. Mobilizing Private Investments in Agriculture Sector

Agriculture Products Processing and Value Addition Investments - Government will encourage private sector and international investors to invest in agriculture and horticulture products and establish processing plants in Punjab and capitalize on other investment opportunities that exist in the sector value chain. These investments would specially be targeted for high value products, oriented for export markets.

Agriculture Enterprise Fund and Enterprise Development - Provision of adequate resources and investments flow is critical for the promotion of agriculture sector and Government of Punjab would assume the role of a facilitator and catalyst through creation of an enabling environment conducive for effective and competitive private sector participation in production, processing and marketing of agriculture products locally, regionally and globally, while private sector would make strategic investments capitalizing on such enabling conditions. Government would also create an enterprise fund to promote entrepreneurship amongst agriculture graduates so that they can look into forming their own enterprises. The proposed enterprise fund can provide seed funding on selected students.

PPPs in Agriculture Sector and Basket of Model PPPs - Agriculture Department would develop a repository of selected bankable projects, and will be then offered to market for private investments and are carefully executed as pilot projects so as to demonstrate the effectiveness of the model and providing replicable examples.

Risk Guarantee Fund for Agriculture Investors - Many a times, investors look for guarantees to make investments in undertaking conditions. Such guarantees are critical to provide comfort and confidence to incoming investors so as to limit their risk in case of a downside. The best possible approach to managing such risks is that government should only guarantee those risks, which it is best capable to handle. Punjab being a provincial government cannot provide any sovereign guarantees. In

order to address these issues, government through donor support would create a guarantee fund to specifically provide risk cover, in selected areas, for investment in agriculture sector.

6. Implementation Approach

In order to support the implementation of this sector plan as well as to supplement and bolster the existing institutional capacity of the Agriculture Department, a Policy and Strategy Unit (PSU) will be set up in the department to directly support the Secretary in the following tasks:

- Establishing a monitoring, evaluation and reporting mechanism for the sector plan including developing performance dashboards for key projects and tracking progress
- Providing technical and policy support in implementing projects
- Developing new projects under the Agriculture Sector Plan
- Giving policy direction for the implementation of the department-wide initiatives and developing and prioritizing the implementation plan
- Developing and implementing a comprehensive change management and communication program including both G2G and G2C communications
- Developing a knowledge management strategy for the Agriculture Department by developing a repository of information and ensuring access by various stakeholders including field formations of the department

Figure 25: PSU - Key Functions

The PSU will have the following key experts, apart from other staff[26]:

- 1 PSU head
- 1 Agri. Economist
- 1 Policy and Institutional Specialist
- 1 ICT Specialist
- 1 Agri. Sector Specialist
- 4 Research Associates
- Other Experts (demand based)

Some of the key milestones for the proposed implementation plan are given below:

[26] The total cost of the project for establishing PSU is estimated at PKR.40 Million for 5 Years.

7. Conclusion

The Sector Plan identifies various impediments faced by the agriculture sector in general and the institutional constraints faced by the Agriculture Department in particular. Based on these bottlenecks, the sector plan also puts forward a conceptual framework on how to address these and has given summary of key projects in short, medium and long term. Going forward, the sector plan will guide the resource allocation priories of the department. However, Agriculture Department considers this an organic document, which will be evolved over the next 2-3 years, by calibrating the approach based on lessons learned.

Appendix A-List of Attached Departments

1. Director General Agriculture (Extension & Adaptive Research), Punjab, Lahore
2. Director General Agriculture (Field), Punjab, Lahore
3. Director General Agriculture (Water Management), Punjab, Lahore
4. Director General Agriculture (Research), AARI, Faisalabad
5. Director General (Pest Warning), Punjab, Lahore
6. Director General (Soil Survey), Punjab, Lahore
7. Punjab Agricultural Research Board, Lahore
8. Punjab Seed Corporation, Lahore
9. Pir Mehr Ali Shah Arid Agriculture University of Agriculture, Rawalpindi
10. University of Agriculture, Faisalabad
11. Muhammad Nawaz Sharif University of Agriculture, Multan
12. Regional Agricultural Economic Development Center, Vehari
13. Director of Floriculture (T&R), Punjab, Lahore
14. Director of Agriculture, Information, Punjab, Lahore
15. Director of Agriculture, Crop Reporting Service, Punjab, Lahore
16. Director of Agriculture, (Economics & Marketing), Punjab, Lahore
17. Chief, Planning & Evaluation Cell, Agriculture Department

APPENDIX B-LIST OF ALL ONGOING & NEW PROJECTS

No.	Name of Scheme	Total Cost (PKR Million)	Major Targets
1	Strengthening of Research Facilities at Fodder Research Sub-station, AARI, Faisalabad for the Development of Silage type Corn Varieties (2013-14 to 2015-16)	18.581	• Breeding and development of corn varieties for silage with high biomass production. • Popularization of silage use in dairy farmers of the Punjab to overcome scarcity periods of green fodder and improve nutritional imbalance
2	Strengthening of Food Technology & PHRC, Ayub Agricultural Research Institute, Faisalabad (2013-14 to 2015-16)	62.695	• Develop and standardized protocols for indigenous fruit and vegetable varieties for export through CA containers by sea shipment. • To study the effect of internal and external biochemical & physiological changes on the exportable quality of produce during CA storage. • To conduct the trainings for traders & exporters on storage technology of fruits and vegetables based on adoptive research achievements. • To conduct research and development work on the current Food-based national issues with more emphasis on fruit & vegetables. • To upgrade analytical and processing activities. • To produce various innovative food products at pilot scale level & afterward selling among the masses with the purpose to motivate them and help establishing their own micro, small and medium levels food processing units. • To arrange training and demonstrations, exhibitions, seminars, in order to publicize new technologies.
3	Development of Genetic Engineering Facilities at Agri. Biotechnology Research Institute, AARI, Faisalabad (2013-14 to 2015-16)	69.500	• Optimization of genetic transformation protocols for model systems like Tobacco and establishment of efficient plant regeneration and genetic transformation procedures for economic crops like Brassica, Sugarcane, Wheat, Cotton etc. • Synthesis of EPSPS (GT) and BT genes after codon optimization and cloning of these genes along with FAE1, MAX1 and other potentially useful genes for their transformation
			• Integration of EPSPS (GT), BT, FAE1, MAX1 and other potentially useful genes and their use in major crops like Brassica, Sugarcane, Wheat, Cotton etc. • Transfer of EPSPS (GT) gene in Cotton through pollen tube pathway. • Generation and characterization of transgenic plants with improved desirable characteristics utilizing Agro-bacterium /in planta and Biolistics micro-projectile techniques.

22	Provision of Additional Research Facilities for Development of Heat Resilient Maize Hybrids at Maize & Millets Research Institute. (2015-16 to 2019-20)	64.160	Screening of new hybrids against heat stress and disease (Stalk Rot) tolerance in station yield trials. Evaluation of promising hybrids against multinational hybrids in research cum demonstration trials Standardization of maize hybrid seed production technology. Purchase of computers (12), Chilling unit (01) portable digital balance (04), Tunnels (04), Cultivator (02), Disk Plough (01) Tractor (01) Seed cum fertilizer drill (01), Maize seed sheller (01)
23	Evolution of Sorghum and Corn genotypes for the production of conserved fodders. (2015-16 to 2019-20)	54.558	• Evaluation and development of better sorghum and corn genotypes with desirable characteristics for conserved fodders, of sorghum with corn (Silage). • Determination of impact of feeding silage on milk production and quality in animals. • Feeding trials for determination of palatability and digestibility of screened BMR sorghum for animal performance. • Quality characteristics determination of BMR sorghum and maize. • Development of fodder conservation technology
24	Construction of Agricultural Engineering offices and Workshop at Toba Tek Singh(2015-16 to 2016-17).	7.853	Construction of Office Building.
25	Land Stabilization and Erosion Control Through Soil Conservation Measures in Allot Area	15.750	Construction of retaining walls, diversion channels and plantation of fruit and forest plants.
26	Promotion of Agriculture Mechanization in Punjab	1184.000	Provision of tillage implements, seed drills and mechanized harvesting at each union council.
27	Management of Groundwater Resources with Electric Resistivity Meter Services in Punjab (2015-16 to 2016-17)	166.000	Electric Resistivity Meters (ERM) will be used for collection of information on soil strata, potential of groundwater and its quality as well as thickness of water bearing formations to assist the farmers to select suitable location/site for tube well installation. Procurement of 20 sets of Electric Resistivity Meters with carrying vehicles.
28	Extension Service 2.0 - Farmer Facilitation Through Modernized Extension (2015-16 to 2019-20)	4400.546	Development of soil attributes data base and GIS mapping. Redressal of farmer issues regarding Agriculture Technology and input management etc by providing expert linkage through Agriculture Officers with the help of Information Technology. Development of helpline and complaint management system through SMS/MMS and Robot Calls. Client empowerment: incentive linkage with farmer satisfaction surveys for Field Assistants, Agriculture Officers and their Research Associates. Provision of vehicles for the mobility of extension staff, laptops and Tabs for staff, ICT equipment and plant clinics.

10	Management of fruit fly with special reference to non-conventional methods (2014-15 to 2017-18)	227.610	•To maintain ecological balance reduction in management cost and increase in income through conservation of plant defence controller in natural eco system •To introduce and promote integrated plant protection management •To address the health issue by controlling all types of meiosis disease •To establish fruit fly exclusion zone and establishment bio lab for raring of predator of fruit fly •To establish demonstration block of fruit fly by integrated management •To provide methyl eugenol to the orchids grower on subsidized cost. • Collection and identification of citrus fruit fly spp. and their natural enemies. • Dissemination and popularization of IPM module. • Evaluation of cultural practices (Sanitation/ hoeing in selected orchard).
11	Promotion of Pulses Cultivation in Punjab (2014-15 to 2015-16)	148.790	• Development of pre-basic / basic seed of high yielding varieties of pulses. • Promotion of certified seed of Lentil, Moong & Mash by its distribution among farmers at subsidized rates. • Demonstration of modern production technology for pulses at farmers' field. • Promotion of pulses in association of other crops in irrigated areas. • Holding of farmers days and use of other extension tools to lure farmers on adoption of pulses cultivation.
12	Punjab Irrigated Agriculture Productivity Improvement Project (PIPIP)-World Bank Assisted(2011-12 to 2016-17)	21249.997	HEIS = 120,000 acres Watercourse Improvement = 7,000 Irrigation schemes = 2,000 iii) LASER units = 3,000 iv) Training Courses for the farmers including LASER tractor operation, LASER equipment maintenance, HEIS operation & maintenance, efficient irrigation methods, soil moisture measuring/ monitoring, gender for improvement in irrigation efficiency and water productivity.
13	Establishment Of Export Oriented Floriculture Centre At Pattoki(2014-15 to 2016-17)	15.000	Conduction of workshops/Seminars, renovation of building and structures, Production of saplings of Carnation and Gerbra through tissue culture, Provision of Gruss-an-Teplitz rose plants to farmers free of cos, construction of drying hall(20'×40') for flowers, purchase of flower dehydrator.
14	Establishment of Sub-Campus of PMAS-Arid Agriculture University Rawalpindi at Attock (2014-15 to 2015-16)	188.260	To admit and produce 50- 100 students for F.Sc (Pre Agriculture) degree, 100-200 students having B.Sc (Hons.) degree and 20-30 students for M.Sc.(Hons.) Agriculture Promote a sustainable development of agriculture products Faculty capable of providing consultancy to enhance agriculture growth around attock and throughout Pakistan to develop and transfer region based crop related technologies to the local farming community. To train about 50-100 local farmers per year through short term trainings.

15	Establishment of Punjab Bio-Energy Institute (PBI) at UAF(2014-15 to 2016-17).	499.231	To establish Bio-Energy Res. System for facilitating the development of energy scarce sector of the country in general and Agri. In particular. To launch degree courses and programme in Energy Systems. To strength R&D in Energy & environment sectors and nexus of energy with Agri.
16	Establishment of Sub-Campus of University of Agriculture Faisalabad at Depalpur, District Okara	454.960	To have the latest developments in agriculture curriculum, teaching methodology and lab standards as well as promoting effective R&D. § To provide a platform for strengthening linkages between researchers and farmers and its broader stakeholder community. § To have the latest developments in agriculture by promoting effective regional R&D
17	Construction of Girls Hostel for 1000 Students at UAF.(2014-15 to 2015-16)	491.803	To accommodate the 1000 Girls students
	New Schemes		
18	Up-gradation of Main Library, Ayub Agriculture Research Institute, Faisalabad through IT Interventions.	19.760	To provide the convenient and equitable access to the library and information resources to all researchers of AARI. Preserve library collections, sensitive agriculture resources through digitization and security system. Build a sustainable and scalable library infrastructure for capacity building. Provision of Computers (27), Server machines (02), Digitization Scanner (01), Solar system (01).
19	Provision of lab and field equipment for Development of Basmati Rice Hybrid Resistant to Bacterial Leaf Blight, Flood and Salinity in Punjab.(2015-16 to 2019-20)	45.160	To develop Basmati rice hybrids resistant to bacterial leaf blight, flood and salinity in Punjab. To develop basmati hybrid rice seed production technology. To enhance per hectare yield of basmati rice in Punjab. Procurement of Fume hood with accessories (02) Nano-drop spectrophotometer with laptop & printer (01) Thermal cycler 96-wells (02) Rain-out shelter (01) Tractor (01).
20	Developing Pothwar into an Olive Valley	11043.000	To increase local production of edible oil and to improve balance of payments through export of olive oil. To utilize 100,000 acres culture able marginal lands & sub-mountainous areas in Pothwar and adjoining areas. Provision of Vehicles (04), Post hole diggers (20), Drip Irrigation Systems and Tunnels (05) and olive plants (13.5 million).
21	Introduction and adaptation of high value crops and fruits in climatic conditions of Punjab.	250.000	To introduce high value crops and fruits such as Pistachio, Avacado, Coffee beans, Peach, Nectarine, Pear and Fig. To evaluate the adaptability of high value crops and fruits in climatic conditions of Punjab.

22	Provision of Additional Research Facilities for Development of Heat Resilient Maize Hybrids at Maize & Millets Research Institute. (2015-16 to 2019-20)	64.160	Screening of new hybrids against heat stress and disease (Stalk Rot) tolerance in station yield trials. Evaluation of promising hybrids against multinational hybrids in research cum demonstration trials Standardization of maize hybrid seed production technology. Purchase of computers (12), Chilling unit (01) portable digital balance (04), Tunnels (04), Cultivator (02), Disk Plough (01) Tractor (01) Seed cum fertilizer drill (01), Maize seed sheller (01)
23	Evolution of Sorghum and Corn genotypes for the production of conserved fodders. (2015-16 to 2019-20)	54.558	• Evaluation and development of better sorghum and corn genotypes with desirable characteristics for conserved fodders, of sorghum with corn (Silage). • Determination of impact of feeding silage on milk production and quality in animals. • Feeding trials for determination of palatability and digestibility of screened BMR sorghum for animal performance. • Quality characteristics determination of BMR sorghum and maize. • Development of fodder conservation technology
24	Construction of Agricultural Engineering offices and Workshop at Toba Tek Singh(2015-16 to 2016-17).	7.853	Construction of Office Building.
25	Land Stabilization and Erosion Control Through Soil Conservation Measures in Allot Area	15.750	Construction of retaining walls, diversion channels and plantation of fruit and forest plants.
26	Promotion of Agriculture Mechanization in Punjab	1184.000	Provision of tillage implements, seed drills and mechanized harvesting at each union council.
27	Management of Groundwater Resources with Electric Resistivity Meter Services in Punjab (2015-16 to 2016-17)	166.000	Electric Resistivity Meters (ERM) will be used for collection of information on soil strata, potential of groundwater and its quality as well as thickness of water bearing formations to assist the farmers to select suitable location/site for tube well installation. Procurement of 20 sets of Electric Resistivity Meters with carrying vehicles.
28	Extension Service 2.0 - Farmer Facilitation Through Modernized Extension (2015-16 to 2019-20)	4400.546	Development of soil attributes data base and GIS mapping. Redressal of farmer issues regarding Agriculture Technology and input management etc by providing expert linkage through Agriculture Officers with the help of Information Technology. Development of helpline and complaint management system through SMS/MMS and Robot Calls. Client empowerment: incentive linkage with farmer satisfaction surveys for Field Assistants, Agriculture Officers and their Research Associates. Provision of vehicles for the mobility of extension staff, laptops and Tabs for staff, ICT equipment and plant clinics.

29	Optimizing watercourse conveyance efficiency through enhancing lining length (2015-16 to 2019-20)	6896.437	Increasing agriculture production by enhanced availability of irrigation water through extension of lining on canal command watercourses. Strengthening farmers' participation to improve their capabilities for better water management at farm level. Promoting increased employment opportunities in rural sector by utilizing local resources. Extension of lining of 2000 already improved watercourses, Re-building / renovation of 500 already improved watercourses and construction of 100 watercourses at Govt. farms.
30	Provision of Laser Land Levellers to the farmers / service providers on subsidized costs (2015-16 to 2017-18)	1350.000	Provision of 6000 Laser units
31	Scheme for 50 overseas Ph.D. Scholarships for University of Agriculture, Faisalabad. (2015-16 to 2019-20)	724.031	Recognizing the importance of Human Resource Development for the country, the objective is to send 50 scholars to technologically advanced countries for Ph.D. studies in emerging areas.
32	Establishment of Muhammad Nawaz Shareef University of Agriculture, Multan (Phase II) (2015-16 to 2017-18)	1352.848	Imparting high quality agricultural and science education to students in identified disciplines at accredited international standards. To have the latest developments in agricultural curriculum, teaching methodology and lab standards as well as promoting effective R & D activities in agriculture sector. To produce a trained and skilled workforce capable of employing knowledge inputs for the rapid and sustainable agriculture development in Pakistan. Establishment of University labs, equipment etc
33	Testing Indigenous Hydroponic Greenhouses for Vegetable Growing at various Locations in Punjab (2015-16)	105.570	Establishing and testing indigenous hydroponic greenhouses for raising vegetables under suitable climatic conditions of Punjab. Pooling information relating to construction, crop growth, yield and socioeconomic issues of the low cost Hydroponic Technology. Information dissemination for popularization of hydroponic agriculture to harvest manifold dividends from the soilless agriculture. Construction of hydroponic units (05) and provision of double cabin truck (01)
34	Rehabilitation & Improvement of Khadija-tul-kubra Female Hostel Complex alongwith Construction of Sports Facility at UAF (2015-16)	155.000	To promote women empowerment through better on campus living & sports facilities for female students of the University. Rehabilitation of Khadija-tul-kubra Female Hostel Complex, Provision of Sports Facility to said hostel, Repair of Furniture Fixture, Equipment for Sports Facility

Published by
Directorate of Agricultural Information, Punjab
21- Sir Agha Khan-III Road, Lahore

September 2015 Copies: 200