

**STRENGTHENING MARKETS FOR AGRICULTURE AND RURAL  
TRANSFORMATION IN PUNJAB  
(SMART Punjab – PforR)**

**TECHNICAL ASSESSMENT**

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**Strengthening Markets for Agriculture and Rural Transformation in Punjab**  
(SMART Punjab – PforR)

## **TECHNICAL ASSESSMENT**

### **I. Strategic Relevance and Technical Soundness of the Government Program supported by the PforR**

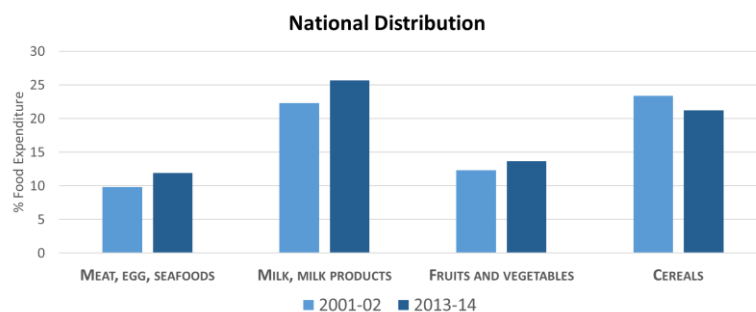
#### **I.1 Current Situation in Punjab’s Agriculture Sector**

**1. Punjab is Pakistan’s most important agricultural province but sector growth has been lackluster.** Due to its good soils combined with the world’s largest contiguous irrigation system (the Indus based surface irrigation system), Punjab has traditionally been Pakistan’s breadbasket. However, growth in agriculture (mainly comprising crops and livestock) in Punjab has been lagging for the better part of the past three decades. To a large extent, this can be attributed to government policies and strategies that were put in place in the 1960s to support farmers and achieve staple food security (mainly wheat) - such as minimum support prices and government procurement combined with large blanket input subsidies on fertilizer, water and power. Now that the food security objective has been achieved, public policies, investments and institutional arrangements have to adjust to changing circumstances such as significant changes in consumer demand away from traditional staple crops towards high value commodities, especially horticulture and livestock (Figure 1). These changing consumption trends are evident

not only among higher income households but also in poorer ones (Figure 2). The significant intervention by the Government of Punjab (GoPunjab) in agricultural output markets including government procurement, price caps on meat and raw milk, restrictions on private agricultural markets, trade barriers etc., discourage private investment and limit competition in the increasingly important markets for high-value commodities including

horticulture and livestock products (meat and milk). Combined with the prevailing input subsidy system they also encourage excessive production of low value commodities through unsustainable agricultural practices. Agriculture growth in Punjab is also held back by a pattern of public spending on agriculture characterized by domination of subsidies, rather than on investments geared at lowering unit production costs which remain high for virtually all crops and livestock commodities, thus seriously undermining the competitiveness of the agriculture sector as a whole.

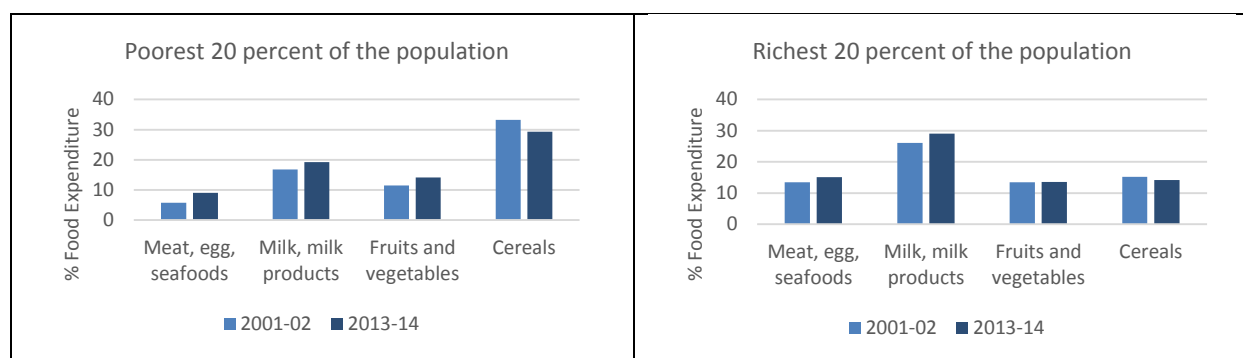
**Figure 1: Shift of domestic consumption away from cereals towards high-value commodities**



Source: Bank staff calculations based on HIES (Household Integrated Economic Survey) data 2013-14.



**Figure 2: Trends in budget shares, by major food groups**



Source: Bank staff calculations based on HIES data 2013-14.

**2. Subsidies to agriculture in the Punjab amount to nearly US\$1.25 billion/year** (Table 1). These subsidies are mainly on account of wheat, fertilizers, electricity, credit, and irrigation M&R (maintenance and repair). About 40 percent (US\$515 million) is paid by the GoPunjab, representing approximately 2.5 times the regular annual investment allocation for agriculture in the provincial Annual Development Program (ADP). Given Punjab's demography (about 14.6 million total households, of which 60 percent or 8.7 million are rural), this means an effective expenditure of US\$65 per household. It is clear that not all of this reaches the farmer (e.g., a substantial share of fertilizer subsidies benefits fertilizer companies and the larger share of wheat subsidy expenditure benefits banks). The bulk of these subsidies are not targeted at smallholders and are largely regressive in nature. Importantly, since most subsidies are embodied in inputs or input prices, they promote excessive or imbalanced input use (e.g., water and fertilizers), and as such entail huge negative externalities and have significant implications for sustainability. Approximately 25 percent of once fertile land of Punjab is now degraded (salinity, sodicity and water logging due to pumping or overuse of water). Wheat subsidies are embodied in the wheat price which is basically governed by the procurement price set way above import parity, thus hurting the majority of both urban and rural households which are net wheat buyers.

**3. The lack of progress of Punjab agriculture has numerous causes** but primarily reflects low farm-level productivity growth, resulting in high unit production costs and lack of competitiveness; distorted cropping patterns with limited diversification to high value crops; and large herds of low-producing animals. It also reflects poor transport, storage and processing resulting in high losses and limited value added; and antiquated marketing systems that distort prices and incentives. Finally, agricultural production is negatively affected by unsustainable use of key natural resources – particularly water.

**4. The legal framework governing crop marketing is outdated.** While a regulatory framework for markets and marketing is essential to move toward higher value added agricultural activities, outdated marketing laws (such as the Punjab Agricultural Produce Markets Act, 1939, re-enacted with a few changes as the Punjab Agricultural Produce Markets Ordinance (PAPMO), 1978) provide for strict control over the marketing of agricultural produce via market committees which hinders private investment in market and storage infrastructure, and provide excessive opportunities for government intervention and rent seeking. There are about 150 licensed fruit and vegetable markets (*mandis*) in the Punjab, but services are poor and the setting

of fees is opaque. With a limit on the membership of dealers and traders, there are allegations of collusion in the market which affects the fresh produce supply chain, and excessive commissions and other rent seeking behaviors reduce the return to the farmer and raise retail prices to the consumer. Evidence exists of exploitation of farmers in the markets which fail to transmit consumer demand for specific products and qualities to producers, rendering production supply-driven rather than demand-driven while creating large deficits and surpluses. Thus, the mandatory sale of fresh produce in licensed markets with a limited number of licensed traders has over time created an imbalance in market power, impaired transparency, limited direct purchase and contracting between agro-processors and farmers (contract farming), and prevented the establishment of private markets. Investment in higher-value food products is further discouraged by price caps on items such as raw milk and meat. In addition, inadequate food safety control and certification systems lead to public health issues and negatively affect exports. The overall result of current agricultural policies is low incomes for farmers, limited value addition and employment in the off-farm rural sector, and high prices and poor quality produce for consumers.

**Table 1: Agriculture subsidies in Punjab (FY17, US\$ million)**

Item	Subsidies paid by the Federal Government in Punjab	Subsidies paid by the Government of Punjab	Total Subsidies
Fertilizer Gas Subsidy	300 <sup>1</sup>	0	300
Reducing General Sales Tax (GST) on DAP from Pakistan Rupees (PKR) 400 to 100/bag	92 <sup>2</sup>	0	92
Reducing General Sales Tax (GST) on Urea from PKR400 to 100/bag	78 <sup>3</sup>	0	78
Reduction in electricity tariff for tubewells from PKR8.85 to 5.35/kwh	219 <sup>4</sup>	41	260
Subsidy on imported fertilizer	34 <sup>5</sup>	0	34
E-voucher based subsidy for Potash fertilizer		19	19
Wheat procurement scheme		333	333
Wheat export subsidies	10 <sup>6</sup>	0	10
Interest-free loans to farmers		57	57
Irrigation M&R		60	60
Cotton and wheat seed		3	3
Crop insurance through CLIS <sup>6</sup>		2	2
<b>TOTAL</b>	<b>733</b>	<b>515</b>	<b>1248</b>

Source: Federal and Provincial Budget Speech 2017-18, and Agriculture Department.

<sup>1</sup>Total gas subsidy to fertilizer manufacturers is US\$425 million while Punjab accounts for approximately 70 percent of total fertilizer use in Pakistan.

<sup>2</sup>Total subsidy is US\$131.5 million of which 70 percent is in Punjab.

<sup>3</sup>Total subsidy is US\$112 million of which 70 percent is in Punjab.

<sup>4</sup>Total subsidy on electricity for tubewells is US\$257 million and 85 percent of tubewells are located in Punjab.

<sup>5</sup>Total subsidy for imported fertilizer is budgeted at US\$48 million of which 70 percent can be assigned to Punjab.

<sup>6</sup>Total subsidy is US\$14.3 million of which 70 percent is Punjab.

<sup>6</sup>Crop Loan Insurance Scheme.

**5. Punjab's agriculture sector needs a paradigm shift to unlock future opportunities for growth.** The negative consequences of low yields and poor yield growth in agriculture

extend from low farmer incomes to large tracts of land locked up in low value agriculture. There is a high potential pay-off associated with re-allocating public expenditures and associated policies towards best potential investments for outcomes, with a focus on reforms in wheat, irrigation, fertilizer subsidies, marketing and water, plus concomitant investments in improved service delivery, agricultural R&D, agricultural insurance, and climate smart agriculture<sup>1</sup>.

**6. Livestock is an important sector in rural economy of Punjab and > 6.5 million households in the province rear livestock.** Livestock provides 30 to 40 percent of household income and is an important source of livelihoods. Punjab's share in the national livestock herd is 65 percent for buffaloes, 49 percent for cattle, 37 percent for goats, and 24 percent for sheep (Pakistan Economic Survey 2015-16). Milk is the most important product and a source of family nutrition and daily income for many rural households. Beef is traditionally considered a by-product obtained from culled dairy animals or surplus male calves, even though fattening of animals is becoming increasingly popular particularly given the very high demand at the time of Eid-ul-Azha. But animal productivity (especially milk yields) remains low and, just as is the case for most crops, is reflected in high unit production costs. To date increases in livestock production have mainly resulted from increased number of animals rather than productivity gains.

**7. Pakistan (including Punjab) is highly vulnerable to climate change** whose risks are further exacerbated by a rapidly growing population, growing water scarcity and uncontrolled urbanization. The country is ranked among the top ten most climate vulnerable countries in the world in the Global Climate Risk Index and has seen a considerable increase in frequency and intensity in extreme weather events and natural disasters, causing huge losses. The floods in 2010 and 2011 caused estimated damages of US\$10 billion and US\$3.7 billion, respectively. A recent study by the World Bank established that the melting of the Hindu Kush-Karakoram-Himalayan glaciers could affect water flows into the Indus River system with implications for agricultural production.<sup>2</sup> Concerted efforts at adaptation to conserve water and build resilience in the agriculture sector are therefore required.

**8. Agriculture is responsible for approximately 41 percent of all greenhouse gas (GHG) emissions in the country,** mostly through livestock production which accounts for 78 percent of agriculture's total emissions. With a growing population with evolving diets which are increasingly animal based, food demand is expected to increase significantly in to the future, driving commensurate increases in agricultural sector emissions. Climate smart agriculture (CSA) technologies and practices that sustainably increase productivity in agriculture and (particularly) livestock systems while simultaneously enhancing resilience and reducing GHG emissions are therefore increasingly needed.

**9. Pakistan (including Punjab) suffers from a severe gender gap problem** which also manifests itself in the agriculture sector. Ensuring that women have equal access to assets and

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<sup>1</sup> FAO defines CSA as agriculture that sustainably increases productivity, enhances resilience (adaptation), reduces/removes greenhouse gasses (mitigation) where possible, and enhances achievement of national food security and national development goals.

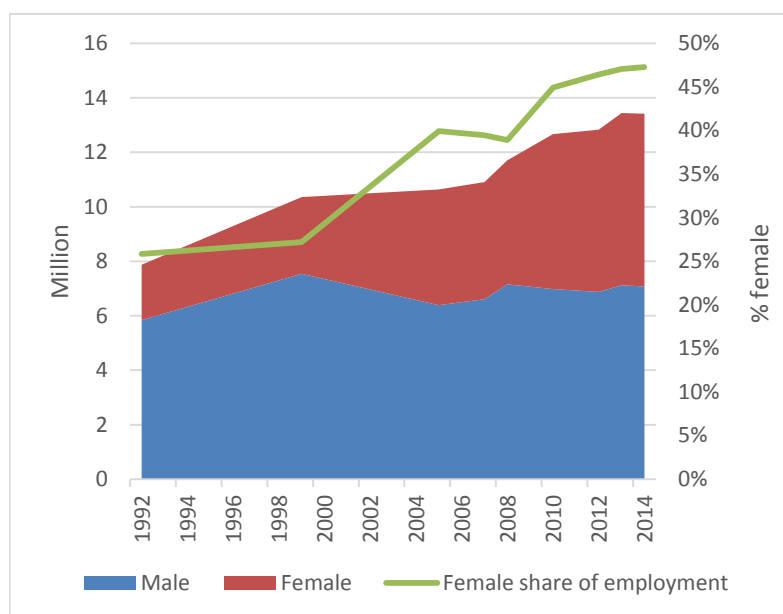
<sup>2</sup> Winston Yu, Yi-Chen Yang, Andre Savitsky, Donald Alford, Casey Brown, James Wescoat, Dario Debowicz, and Sherman Robinson (2013). The Indus Basin of Pakistan – The Impacts of Climate Risks on Water and Agriculture. Washington DC, World Bank.



inputs (including land and credit) has proven to help narrowing productivity gaps in the agricultural sector. The Food and Agriculture Organization (FAO) estimates that ensuring equal access to productive resources for women could raise agricultural output in developing countries by between 2.5 and 4 percent (World Bank, 2014; WDR, 2012). Evidence shows that women’s access and control over agricultural land, besides facilitating access to credit, also improves food security and nutrition outcomes for rural households. However, while agriculture is the main income source for 75 percent of the economically active women, women are less likely to own income-generating assets such as land, machinery or equipment, nor do they have equal access to credit and power in financial or economic decision making. The lack of access to the latest technologies and farming techniques, limited numbers of female agriculture extension workers, and high illiteracy among rural women creates further challenges for women in agriculture. The Punjab Department of Livestock & Dairy Development, while acknowledging women’s primary engagement in livestock rearing and management, has recognized some of the constraints faced by women and invested significantly in improving the capacity of women livestock farmers.

**10. Agriculture is the main sector of female employment in the Punjab, and its importance has been growing over time.** LFS (Labor Force Survey) data show agriculture as the primary sector of female employment in the Punjab. In 2014, approximately 3 out of 5 women employed in Punjab were working in agriculture (Figure 3). The share of female employment in agriculture has been consistently growing over time, in parallel with a gradual shift of male employment towards more productive sectors. In the early 1990s, women accounted for about 26 percent of total employment in the sector, while by 2014, the share had almost doubled, reaching 47 percent. At the same time, the LFS data also show that women employed in agriculture are mostly employed in unpaid agriculture jobs - in 2014, 67 percent of female employment in the sector was accounted for by unpaid jobs. Anecdotal evidence also suggests that women employment is predominant on small farms and that women engage predominantly in horticulture and livestock. Even though the Government has started investing in skills development for rural women under its women’s empowerment package initiative, women’s significant contributions in crop and livestock production remain insufficiently accounted for in the development of plans and programs.

**Figure 3: Feminization of Punjab agriculture**



Source: Bank staff calculations based on Labor Force Survey data.

**11. Punjab is not paying sufficient attention to the potential of value adding in agriculture as an engine of economic growth and job creation.** Agribusiness has considerable potential to grow - income growth and urbanization are shifting demand toward higher-value products (such as horticulture, livestock, and packaged and processed foods) and food-related services. Investments in agro-food processing result in input and income multipliers higher than in any other industry, and the employment effect is about 2.5 times that of other sectors<sup>3</sup>. Increasing demand for higher-value agricultural products and interactions with increasingly sophisticated buyers have significant potential to increase the productivity and income of poor farmers. Furthermore, some of the agricultural products with the highest growth potential, such as dairy products, can disproportionately benefit women. Contract farming has the potential to overcome constraints related to lack of market information and logistical difficulties that prevent small-scale producers from accessing markets efficiently, besides helping to alleviate capital constraints. There are indirect benefits as well, as banks are more willing to lend to farmers that have a contractual arrangement with an off-taker. Thus, encouraging investment in value adding and agro-processing is important for rural development in Punjab. Finally, modern agribusiness requires skills and technological know-how so collaboration with the private sector and public investment in skills training are also essential.

**12. The Government of Pakistan has been making a strong effort to provide quality inputs, machinery and credit at affordable prices to farmers.** The bulk of direct support is provided in the form of subsidies to the fertilizer industry in the form of gas deliveries at below-opportunity cost. In addition, there are subsidized sales of imported fertilizer by the Trading Corporation of Pakistan (TCP) to the National Fertilizer Marketing Ltd (NFML) which in turn supplies to the retail outlets. The GoPunjab also subsidizes credit and a substantial effort is being made to provide farm machinery to farmers through subsidized renting of heavy equipment such as bulldozers.

**13. The use of subsidies as a policy instrument aimed at reducing farmers' production costs often has many unintended implications** (Box 1). Among these, elite capture (i.e. missing the intended beneficiaries because of a lack of an adequate targeting mechanism) is perhaps the most important one. Blanket subsidies on fertilizer and credit, particularly formal credit from public institutions, disproportionately benefit large farmers, while public farm machinery tends to be diverted to the lands of influential people.

**14. The GoPunjab has launched various programs to address the issue of targeting.** A farmer registration program is under way where all farmers would be provided a "Kissan Card" linked to their biometric Computerized National Identity Card (CNIC) and thereby to their mobile phones. The Kissan Card would enable programs to provide vouchers or cash to small farmers through their cell phone which in turn are uniquely linked to their CNIC. So far, some 1.2 million farmers have been registered and it is expected that 90 percent of all farmers in the province will be registered by 2022. In the case of fertilizer, a system of E-vouchers is being introduced which allows registered farmers to reclaim a part of the price, with special focus on small farmers. Currently, the GoPunjab as part of the Kissan package provides a subsidy using the E-voucher system for Potash which is generally deficient in Punjab soils. The selling price of a 50 kg bag of potash is PKR3500 (for Sulphate of Potash - SOP) and PKR 2300 (for Muriate of

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<sup>3</sup> Soujanya Chodavarapu, Aza Giertz, and Peter Jaeger (2016). Agribusiness in South Asia. World Bank, Washington, DC.

Potash - MOP) of which respectively PKR800 and PKR500 can be reclaimed for a maximum of five bags per farmer through their mobile phones. As of end July 2017 about 21,000 farmers had received the subsidy and the Agriculture Department is looking for ways to accelerate the program. It is planned that the E-voucher system will be extended to urea and DAP which are the main types of fertilizer used in the Punjab, as well as possibly to other types of fertilizer and other inputs such as seed etc.

**Box 1: Demystifying agriculture subsidies in the Punjab**

1. Pakistan was a top performer in agriculture 25 years ago; at a time when agriculture subsidies were significantly less than today.
2. Current subsidies do not work as farmers' yields have been lagging for a long time.
3. Current subsidies are enriching those for whom the subsidies should not be intended.
4. Current subsidies are outdated as they have their roots in ensuring self-sufficiency in wheat (and rice), which has been achieved.
5. Current subsidies distort the level-playing field and do not provide incentives to invest in high-value agriculture and post-harvest value-addition where demand is moving towards.
6. Current subsidies generate technical inefficiencies in input use, thereby lowering economic returns.
7. Current subsidies have significant environmental costs.
8. Current subsidies make farmers dependent on government dole-outs and discourage them to play their role as agriculture entrepreneurs;
9. Current subsidies crowd-out private sector investments as they deny them adequate incentives for invest in agriculture and agribusiness.
10. Current subsidies crowd-out public investments that might have attractive returns by unlocking opportunities for growth, resilience, nutrition, social security.

**15. The GoPunjab has set up an Agricultural Commission** with participation of farmers, senior government officials, prominent academics etc. to review the problems in the sector and suggest solutions. The Agricultural Commission is currently working on a new agriculture policy for Punjab while a number of sub-Committees are working on topics such as reform of the marketing law and review of the agriculture research system in the province. A draft policy is expected to be discussed in a consultative workshop in January 2018.

## **I.2 Adequacy of the Government Program**

**16. With World Bank technical assistance, GoPunjab has drawn together various policy and programmatic initiatives into an overall Strengthening Markets for Agriculture and Rural Transformation in the Punjab (SMART Punjab) Program that the PforR will support.** The Government Program (from here on referred to as the “PforR-supported Program”) provides a technically sound and credible approach to agricultural and rural transformation. It represents a move away from the traditional approach followed by the GoPunjab that attempts to promote agriculture through price support and blanket subsidies, and instead focuses on the following:

- a more market oriented development paradigm with key legislation aimed at liberalization of output and inputs markets;

- gradual phasing out of the wheat procurement program - government intervention in the wheat market has resulted in high wheat and flour prices, and large surplus stocks;
- better targeting of subsidies to small farmers;
- improved focus of government spending including on technology innovation, high-value agriculture (HVA), preventive animal health care, crop insurance, CSA, and promoting value adding and agribusiness; and
- greater focus on sustainability and better management of natural resources, particularly water.

It is expected that the proposed changes will not place a further fiscal burden on the GoPunjab but by focusing on improving and redirecting agricultural subsidies and public investment expenditures on agriculture, they would enhance effectiveness of public resources use and even might reduce fiscal outlays.

### **I.3 Institutional Adequacy and Expenditure Framework**

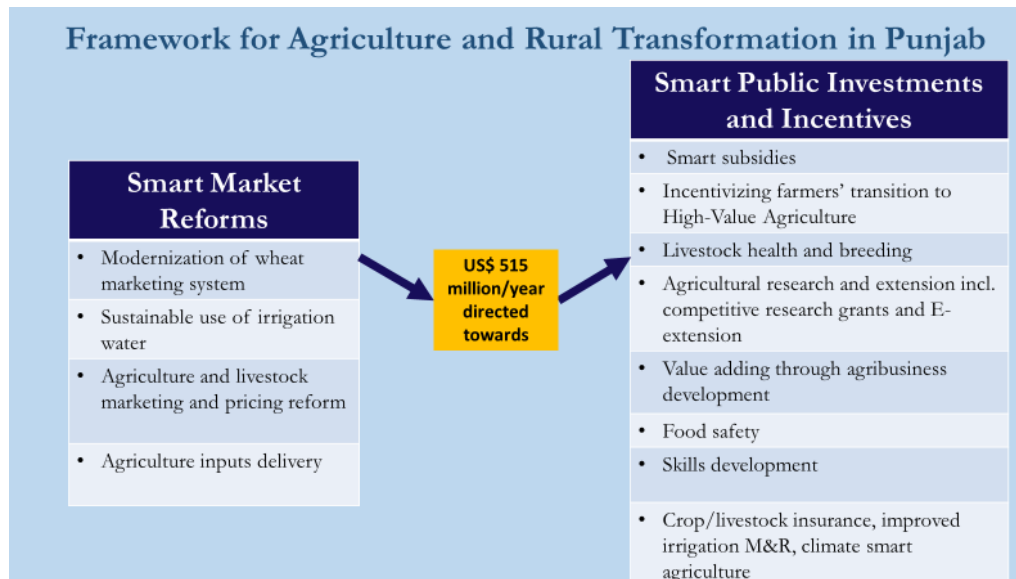
**17. The PforR will support a technically sound Government Program consisting of improvements in agriculture policy, introduction of a series of market reforms and more efficient use of public resources.** SMART reforms including modernization of the wheat marketing system, improving assessment and collection of irrigation water charges (*abiana*), reforms in crop and livestock marketing and pricing arrangements, and improved delivery of agriculture input subsidies will enable the GoPunjab to direct a significant amount of public resources towards a series of productive public investments (including agricultural research & extension, livestock health and breeding, and food safety) and smart subsidies (including E-vouchers for fertilizer, temporary income support for farmers affected by the withdrawal of the government from the wheat market, and helping farmers to make the transition to HVA) (Figure 4). Furthermore, value-adding through agribusiness development would be stimulated through support to the Government's soon-to-be established Agribusiness and Innovation Fund, and skills development. Farmers' resilience would be improved by introducing a crop insurance program, improvement of M&R in irrigation, and increased public investments in CSA.

**18. The PforR-supported Program already includes various initiatives towards agricultural and rural transformation.** These include better targeting of fertilizer subsidy through electronic vouchers, formulation of a provincial agricultural policy, increasing public investments in HVA and CSA, improvements in livestock breeding and health, and providing support to high efficiency irrigation systems with financing from the World Bank<sup>4</sup>. The Government is also implementing a 15,000 kilometers, US\$1.2 billion rural roads program (widening, reconstructing and refurbishing) to better connect farms to markets, and is interested to strengthen rural institutions.

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<sup>4</sup> Through the Punjab Irrigated-Agriculture Productivity Improvement Project (PIPIP – P125999).

Figure 4: SMART framework for Punjab



**19. However, the PforR-supported Program is in need of better focusing and implementing specific actions to achieve results in three critical areas required for agriculture and rural transformation.** These Results Areas include (i) increased on-farm productivity and value of crops and livestock to reduce unit production costs through improving agricultural research and extension systems and targeting subsidies to smallholders; (ii) increased value addition and competitiveness of crops and livestock through modernizing the wheat marketing system, stimulating HVA, deregulating crop and livestock markets with increased private sector participation, improvements in livestock health and breeding, food safety regulation and food quality inspection and testing, and agribusiness development including post-harvest management and value-addition; and (iii) enhanced resilience of smallholder farmers to climate change and natural disasters through improvements in the financial sustainability of surface irrigation systems through better water charge assessment and collection, regulation of groundwater use, and improved water service delivery, as well as improved climate resilience through crop insurance and introduction of CSA technologies.

**20. These critical Results Areas are reflected in the PDO of the SMART Punjab PforR** which is to increase the productivity of crop and livestock farmers, improve their climate resilience, and foster agribusiness development in Punjab.

**21. The PforR will help the Government in better designing and implementing its actions in all three Results Areas.** It will also provide financial support to selected parts of the broader Government program to the extent of US\$300 m. Together these selected parts constitute the PforR-supported Program.

**22. The PforR-supported Program is backed by an adequate expenditure framework.** In recognition of the need for agricultural and rural transformation, the GoPunjab increased the core allocation for agriculture and livestock in its overall investment budget for FY18 by more than

40 percent (from US\$137 m in FY17 to US\$195 m in FY18), with further increases planned for the next 4 years. In addition, the GoPunjab had already launched the Kissan package which adds another US\$95 million to the FY18 agriculture budget and which is expected to be sustained in the coming years. In total during the 5-year period of the PforR, the planned core allocation for agriculture and livestock in the provincial ADP is US\$1,145 million (US\$1,718 million including the Kissan package) while an additional US\$330 million for irrigation M&R and US\$115 million for implementing human resource expenditure would be financed through the recurrent budget, bringing the total size of the PforR-supported Program to US\$1,590 million (Table 2). Table 3 shows the detailed break-down of the expenditure framework of the broader Government program, and Table 4 presents the Government and PforR investment allocations by Results Area for the PforR-supported Program.

**Table 2: Budget for PforR-supported Program and broader Government program (US\$ million)**

Sub-Sector	2017/18	2018/19	2019/20	2020/21	2021/22	Total
	Allocated	Projected <sup>1</sup>	Projected <sup>1</sup>	Estimated <sup>2</sup>	Estimated <sup>2</sup>	FY18-FY22
Agriculture	200	237	235	245	260	1177
Livestock	91	100	110	116	124	541
<b>Sub-Total</b>	<b>291</b>	<b>337</b>	<b>345</b>	<b>361</b>	<b>384</b>	<b>1718</b>
o/w Ag: Kissan (Farmers) Package	95	106	117	124	131	573
Estimated Expenditure of Human Resource involved	20	23	23	24	25	115
Irrigation M&R	60	63	66	69	72	330
<b>Sub-Total of PforR-supported Program w/o Kissan Package</b>	<b>276</b>	<b>317</b>	<b>317</b>	<b>330</b>	<b>350</b>	<b>1590</b>
Irrigation	391	430	473	501	531	2326
Rural Roads Program	163	163	0	0	0	326
<b>Broader Government program</b>	<b>830</b>	<b>910</b>	<b>790</b>	<b>831</b>	<b>881</b>	<b>4242</b>

Source: Bank Staff calculations based on Medium Term Development Framework and Budget Documents, Development Budget Volumes I and II.

<sup>1</sup> Projected by the Medium Term Development Framework (MTDF) of GoPunjab.

<sup>2</sup> Estimated by Bank staff.

**Table 3: Expenditure framework of the broader Government program (US\$ million)**

Subsector	Budget Head	2017/18	2018/19	2019/20	2020/21	2021/22	Total
<b>Development Fund PC22036</b>		<b>BE<sup>a</sup></b>	<b>MTDF<sup>b</sup></b>	<b>MTDF</b>	<b>Estimated</b>	<b>Estimated</b>	<b>FY18–22</b>
<b>Agriculture allocation (Major Head)</b>	<b>0421</b>	<b>105</b>	<b>131</b>	<b>118</b>	<b>121</b>	<b>129</b>	<b>604</b>
<b>Of which high-value agriculture</b>	<b>042103</b>	<b>6</b>	<b>9</b>	<b>10</b>	<b>12</b>	<b>14</b>	<b>51</b>
<b>Of which climate-smart agriculture</b>	<b>042103</b>	<b>6</b>	<b>9</b>	<b>10</b>	<b>11</b>	<b>13</b>	<b>49</b>
Ag. Education	042103	15	16	18	15	17	81
Ag. Extension	042103	7	7	8	9	9	40
Ag. Information	042103	1	0	0	0	0	1
Ag. Mechanization	042103	2	2	2	2	2	10
Ag. Research	042103	7	8	9	9	10	43
Economics and Marketing	042103	3	3	3	3	4	16
Floriculture	042103	0	1	1	1	1	4
Punjab Agricultural Research Board	042103	2	2	2	2	2	10
Ag. Water Management	042103	48	63	75	80	84	350
Other Programs	042103	20	29	0	0	0	49
<b>Livestock &amp; Dairy Development</b>	<b>0421</b>	<b>91</b>	<b>100</b>	<b>110</b>	<b>116</b>	<b>124</b>	<b>541</b>
Government Farms	042106	4	4	4	5	5	22
Livestock Census	042106	1	1	1	1	2	6
Livestock Education	042106	18	20	22	23	24	106
Livestock Research	042106	3	3	3	3	3	15
Livestock Breed Improvement	042106	5	5	6	6	7	29
Livestock Feed	042106	1	1	1	1	1	5
Livestock Extension	042106	6	13	14	15	16	65
Rural Poverty Alleviation	042106	17	8	9	9	10	54
Veterinary Health	042106	4	4	5	5	5	24
Livestock Productivity	042106	28	31	35	38	39	170
Livestock Marketing	042106	3	4	4	4	5	20
Livestock Value Chain	042106	1	6	6	6	7	25
Estimated expenditure of human resources involved in Agriculture and Livestock & Dairy Dev. Departments	PC21018 042103 042106	20	23	23	24	25	115
Irrigation M&R-PC21009	042203-A13 And A134	60	63	66	69	72	330
<b>Subtotal of Agriculture and Livestock</b>		<b>276</b>	<b>317</b>	<b>317</b>	<b>330</b>	<b>350</b>	<b>1,590</b>
<b>Irrigation-PC12037</b>	<b>042203</b>	<b>391</b>	<b>430</b>	<b>473</b>	<b>501</b>	<b>531</b>	<b>2,326</b>
<b>Rural Roads Program-PC12041</b>	<b>045202-6132</b>	<b>163</b>	<b>163</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>326</b>
<b>Total projected investment</b>		<b>830</b>	<b>910</b>	<b>790</b>	<b>831</b>	<b>881</b>	<b>4,242</b>

<sup>1</sup> B.E.: Budget Estimates; <sup>2</sup> MTDF: Medium Term Development Framework, Planning and Development Department, GoPunjab.

**Table 4: Government and PforR investment allocations by Results Area for PforR-supported Program**

	Results Area 1	Results Area 2	Results Area 3
	<b>Increased on-farm productivity and value of crops and livestock</b>	<b>Increased value addition and competitiveness of crops and livestock</b>	<b>Enhanced resilience of smallholder farmers to climate change and natural disasters</b>
<b>Government</b>	US\$673 million including US\$61 million for HVA	US\$162 million	US\$755 million including US\$62 million for CSA
<b>PforR</b>	<b>US\$176 million</b> Increasing agricultural GDP, improving farmers' access to quality inputs, revitalizing research system for crops and livestock, improving livestock breeding and health, transitioning to HVA	<b>US\$52 million</b> Modernizing wheat marketing, modernizing agriculture produce markets, matching grants for agribusiness, food safety	<b>US\$72 million</b> Improving financial sustainability of irrigation infrastructure, increasing investment in CSA, crop and livestock insurance

**23. The Results Areas and their corresponding DLIs have been selected mainly based on their relevance and criticality for achieving transformative change in the agriculture and rural sectors of the Punjab.** The SMART Punjab PforR will support selected parts of the Government's broader program by helping the Government to bring transformational change in the agriculture, livestock, water resources (surface irrigation and groundwater) management, and the agribusiness sector with a focus on increasing productivity, improving the functioning of markets including food safety, supporting the rural non-farm economy, and enhancing resilience and inclusiveness over a five-year period.

**24. SMART Punjab also acknowledges the significance of engaging women and youth in agri-business for rural transformation.** It will do so by providing financial support to agribusiness with special focus on women and youth; targeted capacity building programs in HVA, business development strategy, project management, entrepreneurship and marketing through the Punjab Skills Development Fund (PSDF) and Agribusiness and Innovation Fund; and a gender-sensitive communications strategy.

**25. Results Area 1 (increased on-farm productivity and value of crops and livestock - DLI# 1 to 4) is based on the notion that improving the productivity and profitability of smallholder farming is the main pathway out of rural poverty in using agriculture for development.** Increasing the quantity and quality of inputs available to smallholders through better targeting of subsidies, improving investments in research extension and in animal health care and breeding practices positively impact productivity. A partial shift out of wheat following government withdrawal from the wheat market, and a concomitant shift towards HVA would increase farm incomes and provide cheaper wheat flour to consumers.

**26. Results Area 2 (increased value addition and competitiveness of crops and livestock - DLI # 5 to 8) is based on the notion that there exists significant unexploited potential for income and employment generation through value adding of crops and livestock products.** The rural non-farm sector in general and agribusiness in particular while of great importance to Punjab's overall economic growth, are currently underdeveloped. Further exploitation of the potential would require policy and institutional reforms, including deregulation and modernization of crop markets and agricultural marketing, and elimination of meat and raw milk price caps, combined with public support for private investors to alleviate financing constraints.

**27. Results Area 3 (enhanced resilience of smallholder farmers to climate change and natural disasters - DLI # 9-11) is based on the notion that increasing vulnerability to climate change events warrants specific actions to protect especially the poor.** Exposure to uninsured risks has high efficiency and welfare costs for rural households and especially for the poorer segments of the rural population<sup>5</sup>. In Punjab, addressing issues related to risk management and reducing vulnerability to shock is critical for poverty reduction. According to HIES 2013-14 data, 13.3 million individuals living in Punjab are classified as vulnerable to

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<sup>5</sup> To manage exposure to uninsured risks, farmers might have to forgo activities with higher expected incomes. Poorer households who lack the ability to cope with shocks might be forced into distress sales of land and livestock. Child education and health can suffer long-term consequences when children are taken out of school in response to shocks or are exposed to early periods of malnutrition, leading to intergenerational transfers of poverty. (World Bank, 2008 "World Development Report. Agriculture for Development").



falling in and out of poverty because of a small income shock<sup>6</sup>. In this context, investments aimed at improving efficiency of irrigation systems, increasing access to insurance and adoption of CSA technologies contribute to reducing vulnerability to poverty and intergenerational poverty transmission.

## II. Technical Aspects of SMART Punjab PforR

**28. Through focusing on three Results Areas, the SMART Punjab PforR is expected to contribute to the following outcomes:**

- Results Area 1 (increased on-farm productivity and value of crops and livestock):
  - Increased crop productivity
  - Increased livestock productivity
  - Improved functioning of the agriculture research system
  - Removal of wheat market distortions and shift from wheat to HVA
- Results Area 2 (increased value addition and competitiveness of crops and livestock):
  - Increased value addition of agricultural products
  - Improved employment opportunities in value adding
  - Deregulation of crop and livestock markets
  - Improved food safety
- Results Area 3 (enhanced resilience of smallholder farmers to climate change and natural disasters):
  - Improved sustainability of irrigation systems
  - Improved access to crop and livestock insurance
  - Enhanced resilience of farmers to climate change

These outcomes require a series of intermediary outcomes each of which reflects a certain change in the current situation. These changes will be brought to bear by a number of actions reflected in Disbursement Linked Indicators (DLIs). The sections below discuss the key problems and constraints in the various Results Areas where the proposed actions and reforms reflected in the DLIs will take place, along with a description of how the proposed actions and reforms would contribute to the expected outcomes.

### II.1 Increased On-farm Productivity and Value of Crops and Livestock

#### II.1.1 INCREASED CROP PRODUCTIVITY

**29. Farm level productivity in Punjab is low and has been stagnating.** Low yields are reflected in high unit costs of production and low farm incomes, and result in lack of competitiveness. The latter limits farmers' ability to make investments in improved inputs, machinery and land improvements and traps many small farmers in poverty. Reviving farm level productivity, particularly for small farmers, is an essential first step in transforming rural Punjab.

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<sup>6</sup> Vulnerability is defined considering individuals whose consumption falls within a 20 percent band around the poverty line.

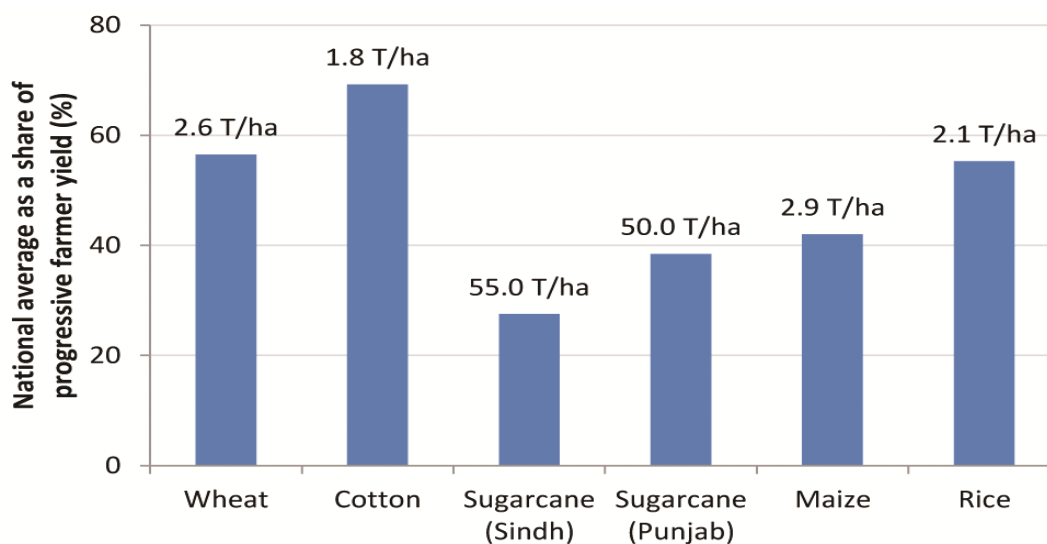
30. For major crops such as wheat, rice, sugarcane and cotton, average yields significantly below those found in other countries. See Table 5.

	Wheat	Paddy rice	Maize	Sugar-cane	Cotton	Pulses
Yields in t/ha						
Punjab	3.2	2.1	2.9	50.0	2.2	0.8
India	4.0	3.5	2.9	63.9		1.2
China	4.8	5.5	5.3	70.6	3.5	1.7
Vietnam		6.7			4.0	

Source: Based on FAO data.

31. Moreover, average crop yields in Punjab are less than half of those achieved by the best farmers. See Figure 5.

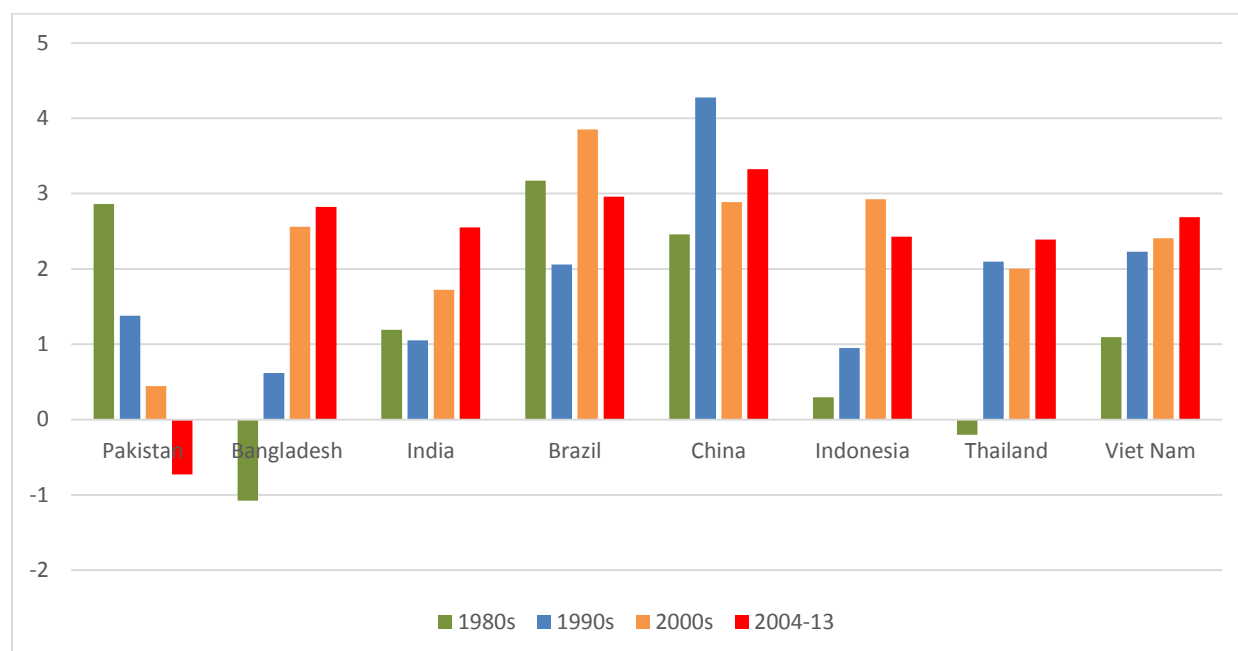
Figure 5: Average farmers' yields as percentage of best farmers' yields



Source: Based on information from Punjab Agriculture Department.

32. Yield growth has also performed poorly and can mainly be attributed to higher input use. Whereas in the 1980s Pakistan led the region in terms of total factor productivity (TFP) growth, TFP growth increasingly became only a small fraction of that in other countries and even turned negative (Figure 6).

**Figure 6: Percentage annual growth in total agricultural factor productivity (TFP)**



Source: World Bank calculations using “Agriculture Total Factor Productivity Indices for Individual Countries 1961-2013,” USDA (2016) International Agricultural Productivity database, available at <https://www.ers.usda.gov/data-products/international-agricultural-productivity/>.

## II.1.2 SEED

**33. There is a longstanding and ongoing effort to improve the quality of seeds for both food and fodder crops.** The focus of attention has been on the provision and multiplication of seeds for major crops. Problems particularly exist in the case of cotton where seed has been of variable quality and with farmers lacking access to the latest cotton seed technology, these are widely considered as the principal underlying reasons for the very poor cotton crop of 2015/16. Seed production, certification and distribution are regulated through Federal laws and the Federal Seed Act of 1978 was amended in 2015.

**34. The devolution of responsibility for agriculture to the provincial level in Pakistan in 2010 resulted in regional variations in interpretation and implementation of the 1976 Seed Act.** In addition, since the Act dates back to a time when there was little private sector activity, it no longer provides an appropriate regulatory framework. As a result, private seed companies are largely unregulated/informal. A review of the Seed Law Amendment (2015) by a World Bank international seed consultant suggested that many further improvements in the amended law are needed to create a dynamic, well-regulated and private sector driven seeds sector. Good quality seed is essential for a successful shift to HVA.

**35. The Punjab Government is working on a series of provincial actions to improve the regulatory framework and the enabling environment in the Punjab.** These actions include the creation of a provincial seed inspection service, and suggested changes to the Federal Law. While the Bank is cognizant of the importance of further amending the Federal Seed (Amended) Act 2015 and has advised the GoPunjab to do so, the latter has instead drafted a Punjab Seed

(Amendment) Act 2017. The Bank has advised the GoPunjab that since seed legislation is a federal subject, it is not in a position to support a provincial Seed Act, and has submitted detailed comments to the GoPunjab based on a careful review of the proposed provincial act (Annex 1).

**36. DLI#1: Improving access to quality farm inputs.** This involves a better targeting of subsidies (initially for fertilizers only, to be extended to other inputs), to small farmers. This would result in a higher use of fertilizer by small farmers as well as a rise in overall levels of fertilizer use.<sup>7</sup> This would increase overall production, while helping small farmers close the yield gap between them and larger progressive farmers, thus reducing poverty. This DLI will be measured by tracking the number of small farmers enrolled in the E-voucher scheme for fertilizers, and involves the following:

- Coverage of the E-voucher subsidy program for agricultural inputs extended to 25,000 farmers (Prior Action).
- E-voucher scheme for agricultural inputs extended to 100,000 farmers by 2019 and 250,000 farmers by 2021.

## II.1.3 RESEARCH AND EXTENSION

### II.1.3.1 *Agricultural research*

**37. Punjab has a large and complex system of public research and extension for both crops and livestock** (see also Annex 2). The research system comprises several institutes, each with their own governing structure, as well as about 40 research farms/experimental stations that are under the direct management of the concerned departments (Agriculture and Livestock & Dairy Development). A number of universities also carry out research with the two major institutes – University of Agriculture at Faisalabad (UAF) and the University of Veterinary and Animal Sciences (UVAS) – being the centers of excellence for a number of topics, including several related to livestock production and health. In addition, several national institutes involved in agricultural research also have presence in Punjab. In 2007, the GoPunjab established the Punjab Agricultural Research Board (PARB) with the mandate of coordinating research with the national and other provinces, as well as managing a competitive grant scheme for crop and livestock research. Despite the right intentions, PARB was only partially successful in changing the traditional focus of agricultural research on the major crops and making research more relevant. The public system for agricultural research is complemented by private research which, however, is rather limited and tends to focus on areas where new technologies can translate into higher sales.

**38. Punjab has 23 crop research institutes.** Of these 12 focus on particular crops such as rice, sugarcane, maize, cotton etc., 5 focus on particular agro-climatic zones (for example, the Barani Agricultural Research Institute, Salinity Research Institute, etc.), and 6 are discipline-focused (e.g. plant pathology, entomology, etc.). The Ayub Agriculture Research Institute (AARI) located at Faisalabad is the premier agricultural institute in the province. The

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<sup>7</sup> Larger farmers who receive subsidized inputs tend to reduce purchases from other non-subsidized sources – the so-called crowding out effect. Redirecting fertilizer subsidies to small poorer farmers would thus raise overall levels of input use as small poor farmers increase their use of fertilizer by more than the reduction by large farmers. Moreover, being lower on the fertilizer yield response curve, the marginal yield increase from a given incremental dose of fertilizer is expected to be larger among smaller farmers.

Agriculture Department also has a large number of research farms with a total of about 19,000 acres of land. In addition, there are several federal crop research institutes with representation in the Punjab.

**39. Punjab has seven livestock research institutes**, four of which are placed under extension in recognition of the fact that they do little research. The two veterinary institutes (located in Lahore) primarily focus on vaccine production, and the one related to poultry located in Rawalpindi looks mostly at disease issues. The Livestock & Dairy Development Department has 21 livestock experiment stations with a total of about 80,000 acres of land that house indigenous breeds for conservation and breed improvement programs. The Department also has 574 district/division level veterinary hospitals, 1605 dispensaries, 161 artificial insemination centers. All of these veterinary paraphenelia have become largely redundant with the establishment of 191 mobile dispensaries by which the animal treatment is supposed to reach at farmers' doorstep. Only recently, the Department has shifted its emphasis from curative to preventive measure, but again it has adopted the veterinary approach rather than comprehensive animal management approach. Of the federal institutes focusing on livestock research, none has representation in the Punjab. Livestock education (both at vocational and university level) is dominated by veterinary sciences, and there is a need to train more livestock production and animal husbandry specialists. This would require a rethinking of current livestock curricula.

#### *II.1.3.2 Agricultural extension*

**40. The Directorate General of Agriculture Extension (Department of Agriculture) has more than 11,000 staff.** Of these, 30 percent are Field Assistants (FAs) and 58% administrative staff. The FAs are located at the Tehsil level and are expected to make regular visits to farmers. The FAs are supervised by staff at District level and are provided regular training at Government training centers. Some input suppliers, notably Engro, Four Brothers, Ali Akbar, and Auriga have established extension and farmer training systems. Their relatively limited experience suggests that better farm management can increase yields and incomes by 10-25% in different crops.

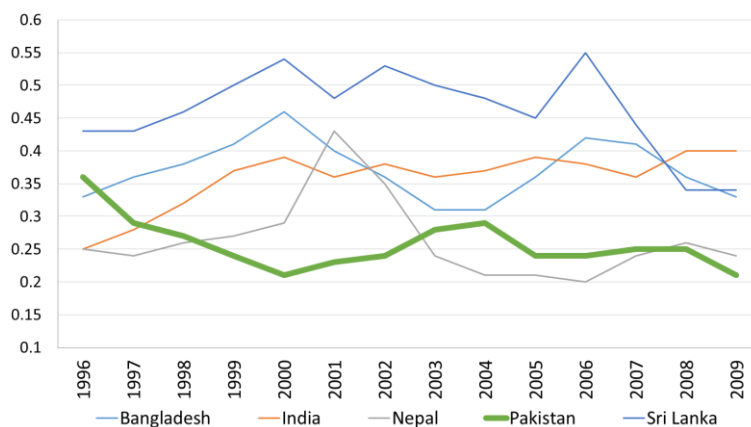
**41. The Livestock & Dairy Development Department's extension service has a strong focus on animal health with relatively little attention to improving livestock owners' animal husbandry and management practices.** The Department does have a vast network of stationary and mobile veterinary dispensaries and hospitals and employs more than 2,400 veterinarians and 3,500 veterinary assistants who primarily cater for preventive and curative needs of livestock. Field veterinary officers occasionally hold meetings with livestock farmers at the village to extend advice on methods to improve livestock productivity – however, their impact is limited. Moreover, there is a need for more extension specialists trained in animal production and management methods to be stationed in the districts. Recently, the Department has set up 9 mobile training schools (one for each division of the province) for the farmers particularly women. The training bus visits the village and 20 – 25 women are invited for a 2 to 3-hour training session on various topics using videos and a trained female veterinarian. The Livestock & Dairy Development Department's focus is on animal health with an increasing focus on preventive rather than curative care. However rather than ignoring the latter, a rather effective system consisting of 300 mobile veterinary dispensaries serves a total of 22,000 villages with monthly visits. The remaining 4,000 villages have static veterinary dispensaries.

**42. The public agricultural research and extension system in the Punjab needs substantial improvement** in terms of financing, strategy and operations. Research funding is limited and largely spent on salaries and allowances – overall spending, both capital and recurrent, is only around 0.2 percent of agricultural GDP which is well below that for other countries in the region (Figure 7). More critically, there is a lack of strategy and direction in setting research priorities; cooperation across provinces, internationally and with the private sector; and managing and incentivizing staff. Scientists often publish in non-certified journals and opportunities for training are limited. Management committees and structures tend to be dominated by government staff that are often not in consonance with the private sector research and farmers’ priorities. Moreover, the focus is mainly on major crops – for example, a center of excellence for horticulture research is lacking with horticulture research currently highly fragmented across six institutes (Horticulture Research Institute, Vegetable Research Institute, Mango Research Institute, Citrus Research Institute, Potato Research Institute, Post Harvest Research Institute). After a promising start in 2007, PARB has not performed according to expectations and is in need of a revised mandate and restructuring. A Bank-supported review of agriculture research and extension in the Punjab started in August 2017 with financial support from the Australian government, and a final report is expected by December 2017.

**43. DLI#2 - Revitalizing provincial crop and livestock research and extension systems.**

This DLI comprises the design of a comprehensive and strategically relevant agriculture and livestock research and extension policy. In addition, funding for public research would increase over time (measured as percentage of AgGDP spent on research), as would the role of the private sector (as measured by composition of PARB and percentage of research funding awarded on a competitive basis). DLI#2 therefore involves the following:

**Figure 7: Agricultural research expenditure as percentage of Ag GDP**



- Cabinet approval and subsequent notification of an Agricultural Research and Extension Policy and Strategy (based on the earlier assessment carried out with Bank support).
- Punjab Agricultural Research Board reconstituted with a majority of private sector representatives.
- Gradual increases in allocation to research which should reach 0.4 percent of agriculture GDP by 2022. Of this, at least 20 percent should be channeled through competitive research grants with private sector participation.

**II.1.4 LIVESTOCK PRODUCTIVITY**

**44. Growth in livestock production in Punjab has been mainly the result of increased numbers of animals** whereas livestock productivity has remained low and stagnant. Many farmers keep animals, particularly large and small ruminants, as a form of saving to be cashed in at times of need, with insufficient attention to optimal feeding, watering and housing. This often has severe negative impacts on production and productivity. Other problems include poor processing and marketing services, including sanitary and phytosanitary (SPS) measures and traceability processes, availability of credit, and poor quality of drugs and vaccines, all limiting the export potential of livestock products.

**45. An important constraint for improved livestock productivity is the prevalence of many infectious and parasitic diseases.** A high proportion of animals is affected by preventable diseases such as foot-and-mouth disease (FMD) and *peste des petits ruminants* (PPR), as well as high parasitic loads. Another key constraint is the lack of a high quality certified gene pool of local dairy animals that can be used for herd improvement. Whereas medium to large dairy farmers frequently rely on imported exotic animals, despite their much higher husbandry standard requirements, smaller farmers continue to rely on non-descript animals that provide 3-6 liters of milk per day.

Artificial insemination (AI) services are becoming increasingly popular but remain limited, reaching an estimated 20 percent of cattle and less than 15 percent of buffaloes in Punjab. The Livestock & Dairy Development Department employs 935 AI technicians who use semen from three public production centers or (occasionally) imported semen of Holstein Friesian cattle. Private companies and individuals also provide AI services using both local and exotic semen. However, most of the buffaloes and cattle, as well as sheep and goat, are bred using natural breeding from unregistered animals. In 2016 the Government has established a registration scheme for bulls used for natural breeding, but the number of animals registered remains relatively small.

A PVS (Performance of Veterinary Services) was conducted for Pakistan in December 2014 by the World Animal Health Organization (OIE) and the report was submitted in 2016 to the Government of Pakistan. Even though the report was not officially shared with the provinces, the main findings were discussed in a meeting of all Livestock Departments including Punjab. The PVS pointed out a large number of deficiencies (Box 2), some of which have been effectively addressed in the meantime by the Department of Livestock and Dairy Development.

**46. The GoPunjab has notified a Livestock Breeding Policy (2012), followed by a Livestock Breeding Act (2014) and a Livestock Breeding Services Authority (2015).** The breeding policy narrates that well-known local cattle breeds like Sahiwal and Cholistani (cow), and Nili Ravi (buffalo) should be bred as pure breeds and crossbreeding should only be undertaken in non-descript animals. For crossbreeding the semen of Holstein Friesian and Jersey could be used.

### **Box 2: Main findings of OIE PVS for Pakistan**

**Human, physical and financial resources:** Training is largely lacking, particularly in technical service areas such as risk analysis, analytical epidemiology and food safety. Internal coordination between the various responsible institutions responsible for veterinary services remains weak, and their operational budgets are limited.

**Technical authority and capability:** The quality assurance system and accreditation for diagnostic and vaccine production laboratories used to be very limited but have improved significantly in recent years with the help of FAO. Long land borders make border control difficult and expensive. There are no animal quarantine facilities at any of the borders. Surveillance for most animal diseases is lacking. Ante- and post-mortem inspection data at slaughterhouses is not used for passive surveillance. The lack of an animal identification and traceability program complicated effective disease control, but in Punjab this situation has significantly improved as a result of the comprehensive animal tagging and registration program of the Punjab Livestock & Dairy Development Department. However, traceability of food of animal origin is not yet officially recognized. Control of veterinary medicines and biologicals is largely absent.

**Access to markets:** Veterinary legislation in Pakistan is not compliant with OIE standards and the WTO SPS Agreement. Veterinary certification does also not comply with OIE standards. Notifications to the OIE on the national animal health situation remain incomplete. There hardly exist any communication and information exchange with neighboring countries.

#### **II.1.4.1 Animal health**

**47. The GoPunjab operates an extensive network of animal health facilities** including 573 veterinary hospitals and 1,799 veterinary dispensaries (including 193 mobile veterinary dispensaries) to provide preventive and curative veterinary services throughout the province. The Department provides vaccinations against all major livestock diseases (hemorrhagic septicemia (HS), black quarter (BQ), FMD and PPR). However, this is only being done in selected districts of the province as availability of vaccines is limited. Currently, government veterinary field staff also provide curative services with most of medicines to be purchased by the farmer from the market. There is a growing number of private practitioners who provide curative services mostly in areas with commercial livestock farming and dairy colonies.

**48. In line with the GoPunjab's 2015 Livestock Policy, the Livestock & Dairy Development Department is shifting its focus from curative to preventive services.** Prior to approval of the Livestock Policy in 2015, the Department of Livestock & Dairy Development spent most of its budgetary resources on purchase of medicines for curative purposes. The ratio of expenditure on preventive to curative medicines has traditionally been around 30:70. However and in line with the 2015 Livestock Policy, the ratio of expenditure on preventive versus curative medicines reached 65:35 in 2016. The Department is also prioritizing more mobile health facilities (vans and motorcycles) as opposed to static facilities (hospitals and dispensaries). These trends are expected to continue. Currently vaccination coverage ranges from 25 to 80 percent for different livestock diseases and in line with the 2015 Livestock Policy, these percentages would increase significantly. Even though the quality of vaccines and veterinary medicines is regulated by the Drug Regulatory Authority of Pakistan (DRAP), many farmers continue to complain about the quality of vaccines, drugs and vaccines manufactured by the government institutions which are not always licensed. However, recently this situation has improved with the help of



imported vaccines and technical assistance from FAO, in line with the recommendations of the 2014 PVS.

**49. DLI#3(a) - Improving livestock health.** This involves moving further away from curative animal health care towards preventive health care measured by the ratio of expenditures on preventive and curative medicine. A higher share of preventive medicine would result in improved animal health and reductions in losses due to preventable animal diseases. DLI#3(a) therefore involves the following:

- Establishment of separate head of account for preventive and curative care allocation in the recurrent budget.
- Animal health care budget re-allocated towards preventive care from curative care – ratio preventive care to curative care gradually increased to 9:1 by 2022.

#### ***II.1.4.2 Animal breeding***

**50. The Livestock & Dairy Development Department has a breeding and progeny testing program** for the improvement of the two best local breeds in Pakistan – the Sahiwal (a dairy zebu cattle breed) and the Nili-Ravi buffalo. Currently this program is rather limited in scope (for example, there are only about 7,000 high quality animals registered) but is being expanded to reach the necessary critical mass from which to launch a credible breeding program. Arrangements are also being put in place for appropriate scientific and technical back-up by scientists and academia. This experience and technology will be applied to other cattle breeds, as well as for small ruminants, and is in line with the recommendations of the 2014 PVS.

**51. DLI#3(b) - Improving livestock breeding.** Animal productivity would benefit from improved animals for which a sufficiently large stock of breeding animals (as measured by the number of breeding animals) is a pre-requisite. DLI#3(b) involves the following, and as such is compatible with the Performance of Veterinary Services (PVS) pathway diagnostic undertaken by the World Organization for Animal Health (OIE) for Pakistan in 2015:

- Number of animals registered in progeny testing program of Sahiwal cow, Cholistani cow and Neeli Ravi buffalo to gradually reach 30,000 by 2022.

#### **II.1.5 SHIFT FROM WHEAT TO HIGH VALUE CROPS**

**52. The domestic wheat price in Pakistan is driven by the Government's wheat procurement program** that procures wheat at 40-60 percent above the world market price. This has led to a consistent domestic surplus of wheat and inhibits the diversification of production into high value crops. The government's wheat procurement program involves substantial losses, particularly excess stocks on which the government incurs operational and financial costs. It also penalizes the sector's growth trajectory as it encourages cultivation of wheat, a product in which Pakistan has no international competitive advantage and for which domestic demand is declining; and discourages cultivation and supply chain development of fruits and vegetables whose demand is growing rapidly in inside and outside the country and for which the China Pakistan Economic Corridor (CPEC) will provide additional opportunities.

**53. Until recently however, little attention has been given to the promotion of fruits, vegetables, pulses and oilseeds** (usually referred to as minor crops) and efforts were mainly focused on wheat, rice, maize, sugarcane and cotton (referred to as major crops). This bias is particularly clear in existing research and extension efforts, and in public investment in agriculture as reflected in the GoPunjab's ADP. The Government is now taking substantial efforts to promote high value crops. This includes reduced duties and taxes on machinery and equipment for protected agriculture, public funding (under the Bank-supported PIP) for high efficiency irrigation, and a higher proportion of the allocation for agriculture in the ADP for HVA (3.5 percent of total agriculture allocation in the FY17 ADP versus 6 percent of total allocation to agriculture in the FY18 ADP).

**54. In Punjab, the Food Department implements the government wheat procurement program.** The Food Department of GoPunjab buys about 40 percent of the marketed wheat surplus equivalent to approximately 20 percent of the total harvest. Currently the Government procurement price is US\$310/ton (PKR1,300/40kg) against a world market price which has hovered between \$180-200/t for several years now, and an estimated cif Lahore price of around \$220-240/t. The high procurement price has resulted in (i) production of wheat consistently in excess of domestic needs (ii) an import tariff of 60 percent on imported wheat to ensure that government is able to sell the wheat procured; (iii) consumers paying significantly higher prices than they would in a liberalized wheat market; and (iv) huge public wheat stocks (6 million tons in the Punjab alone).

**55. The wheat procurement system has been reviewed several times and has found to be ineffective in meeting its goals of supporting poor farmers, stabilizing prices and providing cheap flour to urban consumers.** Its direct fiscal cost is US\$330 million/year and its indirect costs include substantial physical losses due to poor storage; over-production of wheat and under-production of other higher value commodities; diversion of credit from the banking system; and disincentives to private traders. Bank borrowings are not retired through the revenues generated from the collateral stocks of wheat resulting in a current wheat debt of the GoPunjab to the State Bank of Pakistan of US\$3.36 billion against a collateral wheat stock worth half that amount at best. Efforts to dispose of the excess wheat stock in export markets have been largely unsuccessful even with generous export subsidies of US\$120 per metric ton.

**56. The phasing out of the wheat procurement program in Punjab would be transformative for the entire Punjab economy** reducing food prices, facilitating the transition towards high value crops, reducing the fiscal costs of an inefficient logistic and storage system, and releasing bank credit for other activities. However, there are also strong vested interests in the wheat procurement system. These include the larger farmers and middlemen who sell to procurement centers at prices higher than those that would prevail in a liberalized market; millers (to the extent that they depend on government wheat released to them at a subsidized rate); manufacturers of gunny bags in which wheat must be supplied to the government procurement centers; and banks whose who have a lucrative government guaranteed line of business. Some of the main losers – particularly the sellers of wheat whose CNIC (computerized national identity card) numbers and quantities sold are available with the Government – would be temporarily compensated for a limited amount of wheat based on the difference between the latest procurement price and the estimated import parity price. Nevertheless, navigating and managing

these interests will need a strong political commitment and a well-defined communications strategy that would set the abolition of wheat procurement in the context of a wider agriculture transformation program and mobilize beneficiaries particularly urban consumers. The GoPunjab with support from the Bank is currently designing an effective communications strategy. GoPunjab will also establish modern bulk storage facilities for up to 2 million tons of strategic wheat stock on a public-private partnership basis. The first 400,000 tons of such storage have already been tendered for.

**57. DLI#4(a) - Modernizing the wheat marketing system.** Deregulating the wheat market would reduce wheat and flour prices while moving land released from wheat production into HVA would substantially raise farm incomes and employment. This DLI will be measured by the official notification of withdrawal of the GoPunjab from the wheat market and subsequent phasing out of government wheat procurement. DLI#4(a) involves following:

- GoPunjab to notify by 2018 the plan to gradually withdraw the wheat procurement program. Gradual reduction in government procurement of wheat to 3 million tons and 2 million tons in respectively 2019 and 2020, with full withdrawal from wheat procurement by 2021. GoPunjab to reduce the strategic grain reserves to not more than 2 million tons with the excess quantities to be auctioned. Modern bulk storage facilities for up to 2 million tons of strategic wheat stock established under a Public Private Partnership basis.

**58. DLI#4(b) – Transitioning to high-value agriculture.** Withdrawal from the wheat market by the Government would save substantial fiscal resources which could be re-allocated to help farmers transition to HVA. With rapid rural population growth, creating jobs in rural areas, especially for relatively more educated youth with limited interest in traditional farming, is a critical challenge. Low levels of mechanization in vegetable production and the need for careful handling of produce often create a specific demand for female labor. Over the past ten years, domestic consumption of high value products has increased substantially - budget shares devoted to the consumption of meat and fish, dairy products, and fruits and vegetables have increased substantially over time for both the poorest and richest segments of the population, and this trend will continue. In line with the overall improvement in living standards, consumption is progressively moving away from cereals towards more nutritious and expensive sources of calories (see Figures 1 and 2). DLI#4(b) involves the following:

- The proportion of the GoPunjab's crops sector ADP allocated to transition towards HVA to increase from 3.5 percent in FY17 to 6 percent in FY18 (Prior Result), with gradual increases to 15 percent by FY23.
- In addition, the Punjab Agriculture Policy, which is under preparation under the overall purview of the Agriculture Commission, completed, reviewed and approved by the Cabinet GoPunjab by 2018. The Policy will also need to be well communicated and disseminated to ensure that the public debate is well informed.

## **II.2 Increased Value Addition and Competitiveness of Crops and Livestock**

### **II.2.1 THE RURAL NON-FARM SECTOR IN PUNJAB**

**59. The non-farm sector is an important but underserved part of Punjab’s rural economy.** In rural Punjab, just over one third of households derive their incomes mainly from agriculture. Another third relies mainly on non-farm activities while the rest are involved in both on and off-farm activities. With growing fragmentation of land ownership, an increasing number of households are relying on non-farm incomes and employment. Transforming rural Punjab will require increased primary production as well as post-harvest activities such as improved transport, storage, processing and marketing. To exploit the opportunities that these “non-farm” rural activities present in terms of enhancing employment and incomes, it is important to stimulate agri-business development and ensure that increasingly affluent and health-conscious consumers have access to safe food products. Experience of other Asian countries also shows that movement of larger numbers of workers into more productive off-farm employment is one of the main factors behind the sustained growth and falling levels of poverty.<sup>8</sup> Moreover, creating such off-farm jobs in rural areas or in small towns, rather than in major cities, carries major benefits.

**60. So far, the bulk of investment in rural industries has been in traditional activities related to the four major crops** – mainly milling of wheat, rice and sugar, and cotton ginning. There are now also an increasing number of enterprises that cater to the growing markets for fresh and processed fruit, vegetable, meat and milk. Some are large scale and use modern equipment and facilities. However, these account for a relatively small proportion of total output. For example, less than 5 percent of milk output is processed by large scale, modern dairy units. They also tend to have weaker backward linkages - for example, many dairy plants use significant quantities of imported powder milk instead of locally produced raw milk. Similarly, several large producers of juice and drinks use imported raw material due to lack of competitive and reliable local supplies. At the other end of the spectrum, there are many small local processing units which are inefficient and survive due to the low prices paid to primary producers. Lack of funds limits the size of most rural enterprises and an estimated 30-40 percent of enterprises make very small fixed investments. Small rural enterprises also tend to be risk averse – reluctant to make innovations or adopt new technologies; atomistic – rarely belong to business associations; and have relatively poor access to key business services and support areas – marketing, insurance, legal services, engineering services and IT services. Lack of credit at reasonable interest rates and appropriate maturities, is also a key constraint for most rural enterprises<sup>9,10</sup>. Major barriers to institutional credit include lack of collateral, poor financial records and an inability to prepare business plans<sup>11</sup>. As a result of limited access to credit, enterprises generally rely on their own savings, loans from friends and relatives, and supplier credit for both capital and operational expenses. Small businesses are also scattered geographically, leading to higher costs for lenders in identifying potential borrowers, due diligence and loan supervision.

**61. The GoPunjab is making efforts to enhance the participation of the private sector in rural areas.** Various initiatives such as favorable tax treatment are being offered and there is the

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<sup>8</sup> Chodavarapu et al. (2016).

<sup>9</sup> Pakistan Rural Investment Climate Survey 2014.

<sup>10</sup> Nazli, Hina. Haider, Syed Hamza (2012). Pakistan Rural Household Panel Survey 2012 Round 1. Pakistan Strategy Support Program (PSSP) Working Paper No. 007. Islamabad, International Food Policy Research Institute.

<sup>11</sup> This low number may also partially reflect the general reluctance among firms to give out financial data for fear of tax liabilities.

possibility of creating special parks with bespoke facilities. A Public Private Partnership cell has been created in the Planning and Development (P&D) Department of the GoPunjab. In addition, various credit programs for agro-processing units have been in operation, including with the Zarai Tarakiyati Bank, through the previous Agri-Business Support Fund supported by the Asian Development Bank, and through various initiatives supported by USAID through its Punjab Enabling Environment Project (PEEP). The GoPunjab is also in the process of establishing a new Agribusiness Innovation Fund.

## II.2.2 PUNJAB'S AGRIBUSINESS SECTOR

**62. The potential for agribusiness development in Punjab is substantial.** However, the presence of considerable regulatory impediments across the agribusiness supply- and value-chain continue to dampen private sector interest and confidence to investment in the sector. While significant initiatives are already being taken to address these issues, which are common across all sectors – for example, the ‘Doing Business Reform Initiative’ in the indicators for which Punjab has regulatory control, and the Bank-financed Jobs & Competitiveness PforR operation – there has, to date, been little attention paid to sector-specific regulatory issues. Given the existing importance of the agricultural and agribusiness sectors in Punjab and the major potential for growth, an initiative to improve the regulatory environment within the sector is warranted.

**63. There are three main areas of regulation specific to agribusiness in which good practice is important in both domestic markets and (especially) export markets.** These include (i) operational health and safety (OH&S) for workers at every stage of the production process, (ii) food safety (for animals and humans), and (iii) avoidance of malpractices and compliance with quality standards, labelling laws and effective inspection systems. In addition, the regulatory environment should be agile enough to drive transfer of technology, innovation and productivity in the agribusiness sector, and give confidence to potential agribusiness investors. Therefore, and in view of the importance of an effective – and comprehensive – regulatory framework for the further development of the agribusiness sector and the current lack of knowledge of exactly which regulations are in place, the way in which these are being administered and the extent to which they are available in the public domain, a comprehensive mapping of the regulatory framework for agribusiness is required. This would need to be followed by a detailed assessment of the existing regulatory arrangements including (but not limited to) reform of the existing arrangements – both the regulations themselves and the administrative practices, including compliance monitoring through inspection – to establish simpler, more business-friendly arrangements, placement of the existing arrangements on appropriate websites, identification of gaps in the existing regulations (particularly with respect to product standards required for successful exports to high value markets), and automation and integration of regulatory approvals and inspection systems using risk-management tools.

**64. In addition to weaknesses in the regulatory environment, local infrastructure for implementing food safety standards and quality control (of production inputs, produce etc.) are also insufficiently developed.** However, the GoPunjab has recently enacted the Punjab Agriculture, Food and Drug Authority Act, 2016 and is planning to establish a network of agriculture produce and food testing laboratories. All marketing functions involved in transferring agricultural products from producer to consumer exhibit inefficiencies. For example, the functioning of wholesale markets – which are characterized by lack of storage facilities,

unhygienic display sites, exploitation and illegal deductions by intermediaries, and lack of accurate and transparent market information and price setting mechanisms – reinforce market distortions that do not encourage private investment in value addition. Value adding is done for only a small portion of total agriculture produce. One of the major reasons resulting in these functional and institutional inefficiencies is a lack of skilled management, entrepreneurship and risk-averseness. There is also a near absence of Pakistani brand promotion in international markets. Pakistani meat exporters are concerned with the limited shelf-life of their produce and rely on relatively expensive air-freight to customers in the Middle East, rather than investing in cold-chain sea shipments. Efforts to differentiate their meat by branding, cuts or packaging are virtually absent, and exporters continue to compete against meat exporting countries at the lower ends of Middle Eastern markets. Nonetheless, some corporate entities are changing the agribusiness culture – for example, agribusinesses have helped reduce post-harvest handling losses, encouraged wider use of technology, created higher marketable surpluses, introduced quality standardization, enhanced storage capacity, improved market access for farm produce, and improved packing and packaging. Some multinational corporations have slowly begun to view Pakistan as an attractive investment destination. In the dairy sector, Unilever and Nestlé continue to invest and grow their local businesses, while Friesland-Campina recently acquired a controlling stake in Pakistan’s largest dairy processor, Engro Foods.

**65. DLI#5- Providing incentives to agribusinesses for investments in value addition and agricultural technology.** To alleviate access to finance constraints in the private sector, a financial support mechanism will be developed to further stimulate or promote private sector investments in farm production and agribusiness. This would include matching grants<sup>12</sup> (see Annex 3) for agro and agro-industrial entrepreneurs and associations that to enable them to procure technical assistance, finance productive assets and investments used to develop agricultural value chains, promote innovation and technology, enhance access to extension and support services, support farm diversification, set standards, and build regional and international linkages. Technical assistance as well as training/capacity building activities would also qualify for matching grant support. The SMART Punjab PforR would support a matching grants scheme under the Agribusiness and Innovation Fund to be set up by the GoPunjab. Matching grants will be awarded on a competitive basis with special emphasis on females<sup>13</sup> and youth. This DLI will be measured by measuring the number of matching grants awarded for agribusiness and involves the following:

- Operational Manual for Matching Grants approved and notified and implementation mechanism in place by 2018.
- At least 240 matching grants awarded by 2022 (with intermediate targets from 2019 onwards) out of which at least 97 to female and/or youth entrepreneurs.

### **II.2.3 DEREGULATING CROP AND LIVESTOCK MARKETS**

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<sup>12</sup> The Program has opted for a matching grants scheme rather than a partial guarantee fund, given the less than positive previous experience with the latter due to moral hazard, high administrative cost, low demand from small and medium enterprises, and limited outreach by banks.

<sup>13</sup> Evidence suggests that women entrepreneurs need technical and financial support to run successful agribusinesses and strengthen value chains, including women workers in the agriculture sector. See “Women in Agriculture in Pakistan”, Food and Agriculture Organization of the United Nations (FAO), Islamabad, 2015.

**66. Current marketing arrangements for crop and livestock products in Punjab are inefficient and not suitable for a dynamic agriculture sector.** Market inefficiencies are passed on to producers and consumers. The Punjab Agricultural Produce Markets Ordinance (PAPMO), 1978, provides for exclusive public sector control of marketing of crops (mainly fruits and vegetables) in wholesale markets (*mandis*). The current system constrains rather than incentivizes growers to produce in line with market demand. The system suffers from malpractices, market inefficiencies, and stifles private sector involvement in the establishment, operation and management of agricultural markets. Both growers and consumers pay dearly for inefficiencies and malpractices of middlemen including market committee staff, dealers and other market functionaries. For example, annual sales of fresh fruits and vegetables in Punjab are estimated around US\$1.5 to 2 billion while the impact of current distortions and disincentives is around 20 percent (US\$300-400 million).<sup>14</sup> The functioning of wholesale markets thus reinforces market distortions and discourage farm diversification and private investment in value addition.

**67. The marketing system for livestock and livestock products is also poorly served with inadequate facilities, operational inefficiencies and with little attention for hygiene.** Milk typically passes through several middlemen before reaching the consumers with little or no cool chain facility during these transfers. Most animals are slaughtered in unapproved facilities and meat (beef and mutton) is sold as fresh without any cool chain storage. These practices result in poor quality of milk and meat for most consumers.

#### **II.2.4 DEREGULATION OF LIVESTOCK SECTOR PRICES**

**68. Under a Federal Law on essential consumer items, the Department of Industries of the GoPunjab can authorize district governments to fix retail sale prices for 34 commodities including meat (beef and mutton) and raw (fresh) milk.** District governments notify and monitor prices and apply sanctions. The price caps have little effect on prices paid by consumers for most of the year. The retail milk market is highly fragmented with sellers offering a range of prices that correspond to different qualities, packaging and shelf life. However, the caps do act as a negotiating factor for middlemen buying milk from producers and as a rent extraction mechanism for local officials. A similar situation prevails in the meat market. Price capping also acts as a disincentive to produce better quality products - a study<sup>15</sup> for the USAID Agribusiness Development Project (2012) concluded that fixed pricing of beef and mutton by government provided no price premium for quality meat, compromising the viability of a commercial industry with flow-on effects to livestock selling, meat processing, food standards, and retailing. In addition, price capping may stimulate malpractices among traders with negative public health implications. The Livestock & Dairy Development Department has repeatedly requested the de-capping of prices which would require the Department of Industries to discontinue notification of these prices.

**69. DLI#6 – Improving market conditions for meat and raw milk.** Removal of price caps on meat and raw milk would stimulate production and marketing of larger quantities and better quality and safer livestock products, thus raising the incomes of livestock farmers while

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<sup>14</sup> Preston S. Pattie (2012). Agriculture Marketing Policy Framework. Pakistan, USAID.

<sup>15</sup> Bradfield M and Tahir, T (2012). Meat Value Chain Assessment of the Livestock Sector in Pakistan. Washington DC, CNFA.

enhancing supplies to urban areas. This DLI would be measured by the discontinuation of notification of meat and milk prices and involves the following:

- GoPunjab – in particular the Department of Industries and the relevant district level officials - discontinue notification of meat and milk prices each year, starting in FY19.

## II.2.5 MODERNIZATION OF AGRICULTURAL MARKETS

**70. Agriculture produce, apart from cotton, sugarcane and wheat, is regulated by the Punjab Agricultural Produce Markets Ordinance (PAPMO), 1978.** Under PAPMO the Government has a monopoly on the establishment of wholesale markets for primary produce. Only a limited number of licensed dealers (commission agents or *artis*) are allowed to operate in the market. Market fees are high, and incommensurate with the level of services provided - markets lack even basic facilities for quality control, hygiene, grading, packaging & labelling, and food safety. Absence of alternative marketing channels, such as farmer markets, consumer markets, direct marketing and e-marketing, discourage the further development of value chains. While according to PAPMO markets should be run by Market Committees made up of representatives of wholesalers, in practice these markets have been run by Government appointed “Administrators” who are members of the Market Committees. There is a perception that Administrators are focused on extraction of rents rather than service provision.

**71. The GoPunjab has drafted a new law – the Punjab Agricultural Marketing Regulatory Authority (PAMRA) Act, 2017.** The proposed Act would significantly liberalize the agricultural marketing system. It allows any person, subject to registration, to set up a wholesale market, farmer market, consumer market, or an electronic/web based market dealing in primary agriculture produce in the province. The law also improves regulations governing these markets, requiring registration of service providers/companies providing packaging and grading services, (cold) storage, transportation, collateral management, quality assessment, insurance, accreditation, security and loans. The implementation of the PAMRA Act will be overseen by a new Authority comprising four members from the private sector and three members from the GoPunjab. The Authority would register and oversee wholesale markets, as well as promote alternative marketing channels, adoption of fair auctioning systems in line with best regional and international practices, and contract farming. PAPMO and PAMRA would co-exist for a limited amount of time to facilitate transition to the new crop marketing regime.

**72. DLI#7 – Modernizing agricultural markets.** Reforming the existing wholesale market legislation to allow greater private sector participation and enhancing transparency would help reduce the margins taken by middlemen and commission agents and reduce the government’s role in controlling these markets. This DLI would be measured by the approval and notification of the Punjab Agricultural Marketing Regulatory Authority Act, 2017. The DLI involves the following:

- The Punjab Agricultural Marketing Regulatory Authority Act approved and notified by 2018.
- Agricultural produce marketing exclusively governed by PAMRA, thus essentially nullifying PAPMO by 2021.



## II.2.6 FOOD SAFETY

**73. Consumers in Pakistan face high levels of exposure to contaminated foodstuffs.** The prevailing climate favors proliferation of pests and naturally occurring toxins, water supplies used to clean and process food are frequently unsafe, and regulatory standards are either low or not well enforced. Rapid and largely uncontrolled urbanization has complicated the situation, by changing people's traditional ways of handling their food: more people depend on markets, and many rely, at least in part, on food prepared outside the home. Additionally, Pakistan agriculture is dominated by informal food supply chains and improving food safety raises both technical and organizational challenges. These are areas where there are no ready-made solutions, either because knowledge is lacking on the incidence and characteristics of hazards, or because the nature of the supply chain means that imported solutions are not entirely suitable without modification – for instance, the need to accommodate large numbers of scattered actors, the lack of integration in value chains, and rudimentary processing technologies.

**74. In an effort to tackle food safety related problems, the GoPunjab has established the Punjab Food Authority (PFA) under the Punjab Food Authority Act, 2011.** Its basic purpose is to establish food standards and to regulate food processing, storage, distribution, sale and import. PFA has authority to oversee all steps involved in manufacturing, transportation, storage, and marketing of food items. The Act was amended in 2015 and 2016 to increase PFA's powers and penalties. While the legislation covers end product inspection and testing, it does not address a preventive approach to the complete food chain. Linkages between PFA and the Departments of Agriculture and Livestock & Dairy Development are also not well established. Last year the GoPunjab established the Punjab Agriculture, Food and Drug Authority (PAFDA which falls under the Agriculture Department) for forensic examination and testing of fertilizer, pesticide, food and drugs.<sup>16</sup>

**75. Enhanced efforts for improved food standards in the Punjab have increased pressure on food safety laboratories with the necessary accreditation** – a process whereby laboratories demonstrate adherence to a set of quality management norms. Punjab has some laboratories but their capacity for food safety testing is limited. A new provincial reference laboratory, along with a network of local level certified testing laboratories, is required. These facilities should initially concentrate on establishing adequate facilities for basic physical, microbiological and chemical analyses; build capability, reliability and accuracy in handling multiple samples; and then add more complex instruments, apparatus and library facilities as required. PFA should seek a reputable foreign partner to help guide and develop its work program. In this way and with modern transportation and communication systems, sophisticated testing of food samples beyond PFA capacities can be quickly referred to the foreign partner's central laboratories for analysis, reference to extensive libraries of similar food safety problems globally and recommendations for control.

**76. DLI#8. Improving food safety.** Development of better food and agriculture standards backed by suitable testing and enforcement mechanisms would improve the quality of food products and positively contribute to public health. This DLI would be measured by tracking progress against establishing and operationalizing a network of food safety testing laboratories,

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<sup>16</sup> Punjab Agriculture, Food and Drug Authority Act 2016.

including a provincial reference food testing laboratory and a number of regional and mobile testing laboratories. The DLI involves the following:

- One provincial reference agriculture, food and drugs testing lab established and operational by 2019.
- One regional agriculture, food and drugs testing lab established and operational by each of the years 2020, 2021 and 2022.
- Two, three and four mobile food testing labs operational by respectively 2020, 2021 and 2022.

The establishment of laboratories would need to be complemented by training of technicians; quality assurance programs; accreditation of the laboratory by an appropriate accreditation agency; establishment of protocols for methods of sampling and analysis; and a complaints and dispute resolution mechanism. This would be part of DLI#12 (see below).

## **II.3 Enhanced Resilience of Smallholder Farmers to Climate Change and Natural Disasters**

**77. Pakistan is among the countries that are most at risk from climate change.** Temperatures are expected to rise, water flows from rain and glacial melt to increase, and more extreme events of floods and droughts. The arid climate and the heavy reliance on irrigation make agriculture particularly vulnerable. Estimated economic losses associated to the 2010-2014 floods amount to US\$14 billion, affecting the livelihoods of 38 million people and causing damages to approximately 4.3 million ha of cropland. Changes in climate have been manifested through long-term reduction in rainfall in the semi-arid regions of the country and higher glacial melts<sup>17</sup> that contribute to over 70 percent of river flows. Moreover, the mean temperature across the country has increased by 0.5°C in the past 30 years<sup>18</sup>.

**78. Further changes are projected with temperatures and rainfall levels expected to rise across the country but with more frequent extreme weather events.** Projections indicate an increase in mean temperature of 1.4°C - 3.7°C by 2060 in Pakistan (higher than the expected global average), with the north potentially experiencing higher temperatures compared to the south of the country. Temperatures are also expected to increase more in winter than in summer in Pakistan. Projections for precipitation change are less clear, due to considerable model uncertainties for the region. Meeting these challenges will require Pakistan to better manage water - its most important resource; and help farmers cope with the new emerging weather patterns.

### **II.3.1 SUSTAINABILITY OF IRRIGATION SYSTEMS**

**79. Over 90 percent of Punjab's agricultural output comes from irrigated lands.** These cover an area of 14.8 million ha of which 11.7 million ha receive surface irrigation from the public system, with the remainder relying on groundwater. Basic maintenance and repair (M&R) of the public surface irrigation system requires an annual expenditure of approximately US\$200 million (2005/06 prices) of which only US\$70 million is provided (FY2016 data). The lower-

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<sup>17</sup> Annual glacial melting rates in Pakistan amount to 2.3%, representing one of the fastest melting rates in the world.

<sup>18</sup> See Winston Yu *et al.*

than-required spending on M&R has resulted in a backlog of deferred maintenance of the system which conservatively is estimated at US\$5 billion. At the same time, the irrigation bureaucracy has grown over time and currently the PID has over 40,000 employees whose costs account for over 60 percent of the annual PID budget. Lack of adequate maintenance, poor operating procedures and rent seeking actions have resulted in unreliable and inequitable surface water deliveries; low water use efficiency (35-40 percent), and poor water productivity (approximately 60 percent and 90 percent lower than in India and China respectively when measured in GDP per unit of water). *Abiana* – the area-based flat charge for surface water supplies – should be the major source of finance for M&R but at the current rate (PKR 85/acre for *Kharif* and Rs 50/acre for *Rabi*) would only yield about US\$20 million each year. However, less than half the amount due (US\$10 million) is actually collected, supplemented by approximately US\$60 million (FY16 data) from GoPunjab public funds.

**80. Improving M&R, as well as making system management operations more efficient and transparent, is critical to increase water efficiency.** This would require actions in a number of areas including some complex matters such as illegal extractions from canals and tampering with watercourse-level outlets. Improving *abiana* assessment is a measurable and uncontroversial measure worth of a serious effort by the Provincial Irrigation Department (PID) to improve M&R. Currently the assessment is done by PID staff through field data which is subject to misreporting and manipulation. One option would be to move the system of assessment to the remote sensing platform set up by SUPARCO with assistance from FAO to be able to provide reliable real time data on area cultivated, crops planted and crop conditions. Together with improvements in collection rates, improved assessment can be expected to increase the amount collected. Whereas raising *abiana* rates closer to the economic price of surface irrigation water is certainly desirable, this should eventually be done in the context of a wider effort aimed at improving service delivery as an integral part of better irrigation management and sustainability in the Punjab. PID is fully cognizant of the fact that water theft is a serious problem and is willing to start tackling this issue by improving water service delivery in six major canals.

**81. An important share of irrigation water used by farmers in the Punjab is groundwater which is becoming increasingly scarce.** There has been a rapid growth in the number of tubewells in the Punjab – it is estimated that the current number of units in operation exceeds one million. In rural areas, tubewells are installed in both rainfed (*barani*) areas and in areas irrigated by canals, particularly at the tail end of the system where surface water supplies are limited and erratic. Many of the larger pumps, owned by the bigger farmers, are electric and are provided subsidized power, at an estimated cost of PKR31 billion per year. Smaller farmers tend to use diesel powered tubewells. The cost of running a tubewell is estimated at PKR3,000-5,000 per acre (as opposed to PKR85 or PKR50 per acre for surface water) and there is an active market for sale of water. A number of tubewells are also installed in urban areas for either industrial or domestic use. Currently there are no regulations on the installation and operation of tubewells and in a large number of areas groundwater tables are falling and/or water quality is deteriorating. The Government has prepared a draft Punjab Water Policy and a draft Punjab Groundwater (Protection, Regulation & Development) Act for management of groundwater. Key elements of the Water Policy and Groundwater Act include the licensing of all existing tubewell

operating in urban areas for industrial and domestic use, and of tubewells in rural areas considered critical or at risk of falling water tables.

**82. DLI # 9. Improving sustainability and efficiency of irrigation.** Improvements in equity in access to water, and in assessment and collection of *abiana* would encourage more efficient on-farm water use and increase the resources for maintenance and repair. In addition, adoption of a provincial water policy and groundwater act would help Punjab address the issue of overexploitation, falling groundwater tables and increasing salinization, all of which threaten the efficient long term use of soil and water resources. This DLI would be measured by the approval of the Punjab Water Policy, notification of the 2017 Punjab Groundwater Act, improvement in area assessed for *abiana*, and tracking *abiana* collection rates and water delivery performance ratios. This DLI is composed as follows:

- Punjab Water Policy approved and notified by 2018, providing clear policy directions on the sustainable use, management and development of water from all sources of water, for all sub-sectors across the entire province, in order to halt or reverse environmental and water resource degradation, while maintaining beneficial uses of water that support socio-economic outcomes. At a minimum, the policy would specify appropriate and realistic key policy actions for five priority areas: (i) water governance, (ii) water allocation, (iii) water quantity and water-related disaster management, (iv) water quality management, and (v) water management outside irrigation command areas.
- *Abiana* assessment increased to PKR2 billion (about US\$20 million) based on irrigated area cultivated (perennial and non-perennial) by 2018.
- *Abiana* collection rate increased to 75 percent, 80 percent, 85 percent and 90 percent of improved assessment by respectively 2019, 2020, 2021 and 2022.
- Punjab Groundwater Act 2017 approved & notified by 2019. This Act at a minimum would (i) establish an appropriately constituted Integrated Water Resources Commission with the power and responsibility to prepare and implement policies and plans for the sustainable use and management of water resources, (ii) require the demarcation of “critical areas” of groundwater over-extraction, (iii) require the registration of existing tubewells, (iv) require a permitting process to be established for any new tubewells, and (v) establish and enforce a licensing regime for tubewell drillers.
- Critical areas for groundwater demarcated with map published, and zoning scheme notified, by 2020.
- ICT-based geo-referenced database and registration of tubewells operationalized.
- Improved equity of water distribution in accordance with entitlements with delivery performance ratio<sup>19</sup> (DPR) of 0.75, 0.80 and 0.85 by respectively 2018, 2019, 2020 in six canals (Muzaffargarh, Abasia Link, Abasia, CRBC-III, Rangpur, and Upper Jhelum).

### II.3.2 ACCESS TO CROP AND LIVESTOCK INSURANCE

**83. Access to crop and livestock insurance for farmers in the Punjab is becoming increasingly important as weather patterns become more variable.** The Crop Loan Insurance Scheme (CLIS) provides insurance cover to banks for default of farmers’ loans and has been in existence since 2008. The CLIS is a catastrophe crop-credit insurance scheme which only pays

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<sup>19</sup> Delivery performance ratio is defined as actual amount of water delivered divided by amount delivered as per canal design, measured at different points along the canal.

out if damages or losses are greater than 50 percent in the defined area (district or tehsil), and designed to protect the banks' seasonal crop loans to farmers. It is mandatory for all seasonal crop credit borrowers with less than 25 acres of cultivated land and the premium is capped at 2 percent, and 100 percent subsidized by the Federal Government through the State Bank of Pakistan (SBP). Since its launch in 2008, there has been only one major widespread catastrophic event affecting multiple provinces and villages (the floods in 2010) which resulted in significant insured losses. The overall loss ratio over the 10-year period was less than 70 percent, meaning the CLIS has been profitable from the insurers' perspective. An estimated 700,000 farmers (13 percent of total) in Punjab are insured in 2016/17 under the CLIS.

**84. The CLIS primarily protects banks but does not protect farmers from loss of crop revenue.** Moreover, the declaration by the local government of a disaster appears to be rather subjective; banks are required to pre-finance the premiums and reclaim the premium (subsidized 100 percent) from the government; and there are delays of 1 and 2 years for banks being reimbursed by the Government.

**85. Since 2015/16, the Federal government has supported a livestock credit-guarantee insurance which covers individual animal mortality for cattle and buffalo.** However, the uptake of this program has been quite low to date. There may be opportunities for GoPunjab to promote individual animal accident and mortality cover for dairy cattle through the banks, dairy cooperatives, or (fresh) milk processors. For large commercial dairy herds, insurers may be willing to offer All Risk Mortality covers. There do not appear to be major opportunities at present to develop livestock index based insurance (e.g. pasture drought normalized difference vegetation index (NDVI) cover with the help of remote sensing technology).

**86. The Bank has prepared a feasibility study on agricultural insurance in Punjab province, following a diagnostic mission in April 2017.** Based on that report, the following agricultural insurance activities have been included in SMART Punjab:

(i) Gradual roll out of agricultural insurance products for all farmers in Punjab with type of insurance product and premium subsidy levels differentiated by farm category - i.e. small/subsistence farmers with less than 2.5 acres, small to medium progressive/semi-commercial farmers between 2.5 and 25 acres, large commercial farmers > 25 acres, and horticultural farmers.

(ii) For smallholder farmers (2.2 million farmers or more than 40 percent of all farmers in Punjab) and semi-commercial farmers of cereals and industrial crops, the proposed insurance product would consist of Area Yield Index Insurance (AYII) that the GoPunjab (rather than individual farmers) would take out. The GoPunjab would also pay the premium in full for subsistence farmers (basically as a social safety net program) and may consider subsidizing the premium for semi-commercial farmers (but not for commercial farmers). Commercial farmers of say at least 100 acres would be potential clients for yield insurance (Multiple Peril Crop Insurance, MPCl). Named-peril crop insurance (NPCl) and (possibly) weather index based insurance (WII, in areas adequately covered by weather stations) may be feasible for horticulture farmers. However, neither MPIC/NPCl nor WII are currently offered in Pakistan so a market feasibility study for the development of these types of crop insurance would need to be carried out during implementation of SMART Punjab.

(iii) The financial/fiscal costs to GoPunjab are tentatively estimated at around US\$73 million per year at full-scale implementation of the program (from year 5 onwards – fiscal costs during first four years would be lower). This amount would cover 100 percent of the crop insurance premium for 80 percent of all smallholders (< 1 ha), 50 percent of the premium for 25 percent of all semi-commercial farmers (1-10 ha) and 10,000 horticulture farmers, plus operating costs involved with improved crop cutting methods, strengthening of data management systems, and communication programs.

**87. DLI#10 Rolling-out an agricultural insurance system.** Introducing crop insurance would help crop producers to stabilize incomes and sustain their resilience in the face of natural events that reduce farmers’ harvests. The feasibility report produced by the Bank contains a blueprint for a suitable crop insurance scheme and was submitted to the GoPunjab in July 2017. A follow-up mission was conducted in October-November 2017. This DLI is measured by the official approval of the report by the GoPunjab, development and notification of a work plan in line with the recommendations of the report, piloting of a crop insurance scheme in at least two districts, and roll-out of the scheme in other districts. The DLI requires the following actions:

- Diagnostic report submitted analyzing CLIS and options for agriculture insurance coverage (Prior Action)
- GoPunjab to develop work plan in line with the recommendations of the Diagnostic Report and notified by 2018
- Agriculture insurance system piloted in at least 2 districts, one each in rice and cotton belt of Punjab by kharif 2018, with an insurance take-up reaching 50,000 policies sold in FY18
- Agricultural insurance system gradually rolled out to other districts, an insurance take-up reaching 1,000,000 policies sold in FY22

### II.3.3 CLIMATE-SMART AGRICULTURE

**88. Pakistan’s contribution to global greenhouse gas (GHG) emissions represents only 0.8 percent of global emissions, making the country 148th placed among global emitters.** However, agriculture is the single largest contributor representing approximately 41 percent of the emissions, mainly through livestock rearing (78 percent) and crop cultivation (22 percent). With a growing population with evolving dietary preferences, food demand is expected to increase significantly in the future, driving commensurate increases in agricultural sector emissions. Potential interventions to reduce livestock sector emissions are especially important in Pakistan. Technologies and practices that improve the production efficiency of livestock while simultaneously reducing emissions may include the following: improved animal feed and feeding techniques that can reduce methane and nitrous oxide generated during digestion and the decomposing of manure; improved breeding; adapted manure storage and management practices; and improved pastures and management of grazing lands which could improve productivity and create carbon sinks. Meanwhile, for the cropping sector, improved irrigation and water management, particularly in rice cultivation, would control the release of methane from paddy cropping systems. No-till farming and conservation agriculture may also be applied to reduce the use of chemical fertilizers and control weeds and pests for several cropping systems in Pakistan.

**89. The Government is aware of these issues and has already significantly increased the share of climate-smart agriculture projects in the agriculture allocation in the ADP**, from 3 percent in FY17 to 6 percent in FY18. Under SMART Punjab this percentage would be further increased in later years. Together with the increased focus on research and extension, the greater public sector allocations to climate-smart agriculture would have impacts on mitigation and adaptation.

**90. DLI#11 Increasing public investment in climate-smart agriculture.** Enhancing public sector investment in CSA would help farmers adopting new technologies and approaches and lower potential yield losses caused by climate change. This DLI would be measured by tracking the percentage of the allocation of agriculture in the ADP meant for CSA schemes. The DLI would involve the following:

- 6 percent of agriculture allocation in annual ADP allocated to investments in CSA in FY18 (Prior Action).
- Gradual increases in allocation for CSA to reach 15 percent of total allocation for agriculture in FY23.

## **II.4 Communications and Capacity Building**

**91. Given the scale and transformational nature of the SMART Punjab Program, the GoPunjab with support from the Bank has started to develop a strategic communications plan** to properly communicate with a diverse range of stakeholders and affected parties, both external and internal. An international consultant has been hired with Bank support to help with the strategy design and provide necessary training for relevant government officials – in stakeholder mapping, strategy design, stakeholder engagement and two-way communication, messaging, etc. The Communications Strategy and corresponding Action Plan will aim to i) provide an integrated communications approach that encourages broad-based public support for the proposed series of reforms; ii) inform the general population about the benefits of SMART in terms of job creation, increased incomes, lower prices for consumers, more efficient irrigation, etc.; iii) provide transparency and credibility to the SMART Program through a process of two-way communication, engagement and transparent consultations with key stakeholders; and iv) address potential resistance of selected stakeholders and mitigate the risk of opposition to the proposed reforms. Bank support will continue through the strategy's implementation phase.

**92. The SMART Punjab PforR will also support strengthening the institutional capacity of, and trans-sectoral linkages between, key public institutions responsible for agriculture and rural development.** In recognition of the fact that improved agricultural policies and public investment allocation will have to be accompanied by institutional change, the PforR will help the GoPunjab in strengthening the institutional capacity of, and trans-sectoral linkages between, key public institutions responsible for agriculture and rural development including the agriculture, livestock, irrigation, food, industries, finance, and planning & development departments, as well as selected other agencies including the Punjab Agricultural Research Board (PARB) and the Punjab Livestock & Dairy Development Board (PLDDB). Institutional strengthening and change also imply a reorientation of the functions of public institutions away

from direct market interventions towards control and enforcement; e.g. the Food Department would move away from focusing on wheat procurement towards ensuring food safety. The Bank has committed to provide technical assistance to help implementing the wheat marketing modernization program led by the Food Department.

**93. The main capacity building and systems strengthening activities along each Results Area would include the following:** (i) Results Area 1 (Increased on-farm productivity and value of crops and livestock): The Program will support the Agriculture and Livestock & Dairy Development Departments to improve the capacity of the research and extension systems through sponsoring degree and non-degree training of key personnel, study tours, incentive payments etc.; (ii) Results Area 2 (Increased value addition and competitiveness of crops and livestock): The Program will strengthen the capacity of the Agriculture, Livestock & Dairy Development, and Food Departments with respect to agribusiness, HVA, and modernizing agricultural markets. The Program will also build the capacity of the soon-to-be-established Agribusiness and Innovation Fund (in the Agriculture Department) and the Punjab Skill Development Fund (PSDF) in agribusiness; (iii) Results Area 3 (Enhanced resilience of smallholder farmers to climate change and natural disasters): The Program will improve the capacity of the Agriculture Department and the Livestock & Dairy Development Department to develop and implement a strategy for CSA and implementation of an agriculture insurance scheme in the Province. The strategy will provide a framework to identify, design and implement CSA projects as well as rolling out agriculture insurance to all districts of the province in a phased manner to strengthen resilience of farmers.

**94. Another area of capacity building supported by the SMART Punjab PforR will be skills training.** In general, the agricultural labor force suffers from low or outdated skill levels. Skills training being provided by large public sector organizations such as Punjab Technical and Vocational Training Authority (TEVTA) is primarily aimed at the industry and service sectors and does not pay requisite attention to the agricultural sector. Therefore, SMART Punjab will support expansion of the scope of the present provision of training programs to cover vital areas/sectors which have remained unaddressed thus far. Examples of types of skills training required include drip irrigation technology, laser land leveling, dairy production for formal milk chains, grading- packaging-merchandizing (for crops, floriculture and poultry), small business accounting and management, etc. In this respect, SMART Punjab will collaborate closely with the PSDF which receives support from the on-going Bank-financed Punjab Skills Development Program (P130193). In addition, and given that the accessibility of trainings for women (in particular) and in the western and southern districts of Punjab generally is restricted by the distance to the training facilities, and course contents and delivery methods rely nearly exclusively on formal class-room methods, the Program will explore and test new models for instruction, including revised teaching methods and improved training materials with special focus on the accessibility and training needs of women.

**95. Monitoring and evaluation.** M&E are fundamental to implementing the results-based approach. Although certain public institutions in Punjab have experience with application of the PforR instrument, this will be the first PforR in the crop and livestock sectors. Implementing a new results-based culture in the participating departments will require considerable support for planning and implementation, in addition to monitoring progress in achieving results on the



ground. Key results of the Program and DLIs will be regularly measured and reported. The Program Coordination and Monitoring Unit (PCMU) in the Planning and Development (P&D) Department with the support of competitively recruited staff and an ICT-based Management Information System (MIS) will have overall responsibility for coordinating, monitoring, and reporting on the Program's results indicators. All participating departments, particularly the key implementing departments (Agriculture, Livestock & Dairy Development, Food, Irrigation) will have a PDU staffed by competent professionals who will be required to share their respective annual work plans to implement relevant DLIs which will be used for monitoring progress within the agreed timelines. The Independent Verification Agency with support of the PCMU will undertake verification of achievement of DLIs, operating in accordance with agreed protocols. A Steering Committee chaired by the Chief Minister and comprising representatives of all relevant stakeholders will supervise the development and implementation of the Program including the policy reforms and institutional changes agreed with the GoPunjab.

**96. DLI#12 Communications, beneficiary feedback, capacity building and monitoring and evaluation.** This DLI would involve the following:

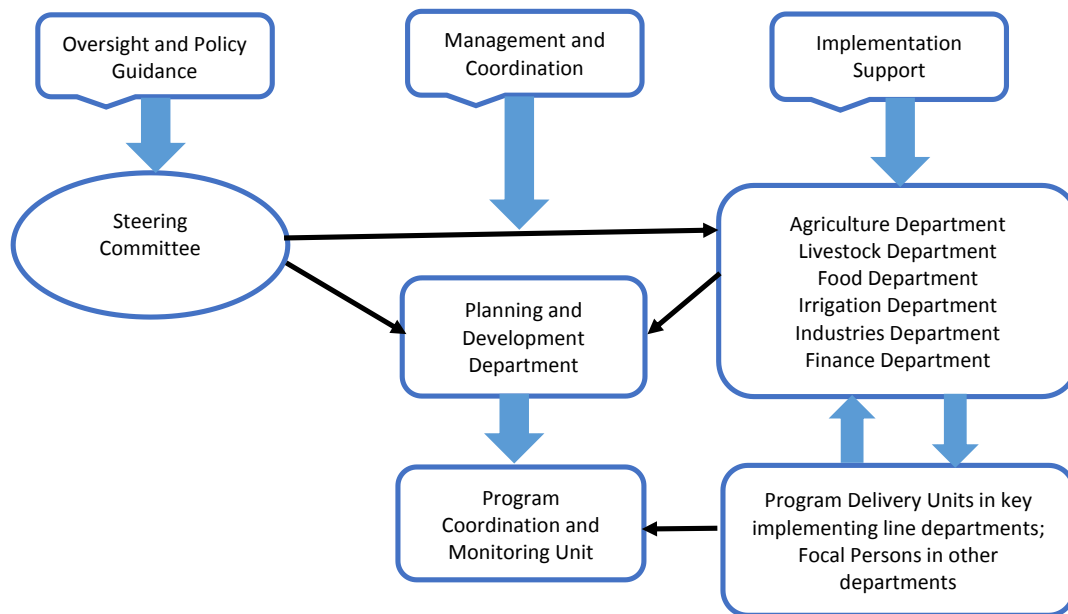
- Communications strategy developed and started implementation, including beneficiary feedback (Prior Result).
- Annual capacity development plans in agribusiness, institutional strengthening of implementing GoPunjab Departments and other government organizations, developed and implemented for FY19, FY20, FY21 and FY22.

### **III. Institutional and Operational Arrangements**

**97. The institutional and operational arrangements of the implementing entities of SMART Punjab were assessed to be adequate.** The Departments of Agriculture, Livestock & Dairy Development, Food, Irrigation, Industries, Finance, and Planning and Development (P&D) are responsible for Program implementation (Figure 8). Several of the implementing Departments (including Agriculture, Irrigation, Industries, P&D and Finance) have experience in carrying out Bank-supported project and programs, including PforR operations (P&D, Industries, Finance). The combination of a series of Program Delivery Units (PDUs) in the main line departments combined with a Program Coordination and Monitoring Unit (PCMU) located in the Planning and Development (P&D) Department will offer appropriate capacity in carrying out policy reforms and managing institutional change. P&D has already started to establish the PCMU including the hiring of dedicated fiduciary, monitoring and evaluation (M&E) and communications staff, and line departments have started assembling their respective PDUs or (where appropriate) appointed focal persons. The Agriculture Department has a substantive Agriculture Delivery Unit (ADU) staffed with competent professionals which will be responsible for implementing the SMART Punjab Program. In the Irrigation Department, the Statistical Planning and Reform Unit (SPRU) will act as PDU. The Food Department and the Livestock & Dairy Development Department will establish a PDU or (in the case of the Industries Department and Finance Department) focal person before Program appraisal.

**98. The PCMU in the P&D department will be responsible for coordinating and monitoring the implementation of the Program.** The Program Coordination and Monitoring Unit (PCMU) will be headed by a Program Director assisted by qualified support staff, all hired on a competitive basis. The PCMU will coordinate with the seven implementing agencies, monitor and evaluate implementation, and report to the Bank in accordance with the terms and conditions of the Financing and Program Agreements. It will consolidate reports of all implementing agencies and communicate them to the Bank; to do so, it will develop a standard template for monitoring and reporting progress. The PCMU will also coordinate with the independent verification agency for verifying achievement of DLIs and reporting, and will establish an Assignment Account to manage technical assistance funding supported by the PforR.

**Figure 8: SMART Punjab Program oversight, management, and implementation framework**



**99.** The Finance and P&D Departments will ensure that PforR resources are adequately budgeted for in their annual budget and disbursed in line with the expenditure framework to accomplish the DLIs. In turn, the PDUs will also ensure adequate preparation and reporting to the PCMU in the P&D Department regarding: (i) annual investment plan relating to their department; (ii) implementation progress of each DLI under the Program; (iii) Program financial statements including procurement, if any; (iv) internal audit reports; and (v) communication strategy implementation.

**100. Fund availability.** Both the Finance Department as well as the P&D Department will ensure that Program resources are adequately budgeted for in their annual budget each year, and disbursed in accordance with the Program expenditure framework to accomplish the DLIs.

**101. Funds flow.** Program funding will be included in the provincial annual development budget (ADP) following the regular budget cycle, and channeled to the Government of Punjab Non-Food Account-1 through the State Bank of Pakistan. All funding (regardless of the source) will flow through distinct budget line items. Program funds will be used to cover development expenditures related to Program activities. The Finance Department will track and report the source of funds in its budget. However, the executing agency/implementing agencies will see no difference between the Punjab Government's funding and the Bank's support to the Program.

**102. Program Steering Committee.** A SMART Steering Committee (SC) headed by the Chief Minister Punjab and which includes as members the administrative heads from all the implementing agencies, and other key stakeholders, was established on November 25, 2016. The SMART SC will provide strategic guidance and direction, facilitate coordination between seven implementing agencies, and oversee progress in all three Results Areas and DLIs on a quarterly basis as reported by PCMU. The SC may refer any matter where a policy decision is needed or there is a major implementation challenge for guidance by the existing three high-level committees- the secretaries' committee, the commissioners' conference, and the DCOs committee - which are chaired by the chief secretary, to ensure the effective implementation of the Program. The SC has already played a constructive role throughout preparation of the Program, especially with regard to guiding and confirming policy reforms and institutional changes. On October 27, 2017, the Chief Minister established two sub-committees of the SC, respectively dealing with *abiana* reform and wheat marketing reform.

## **IV. Impact of the PforR-supported Program**

### **IV.1 Impact of SMART Punjab on Income, Employment and Poverty**

**103. The impact of SMART Punjab on income, employment and poverty will be significant and consist of US\$2.2 billion in additional AgGDP, 350,000 additional jobs, and 1.7 million people lifted out of poverty over a period of five years.** SMART Punjab will raise incomes from primary production, as well as from agriculture-based value adding activities. It would also increase employment, particularly of youth and of women; and improve sustainability and resilience of agriculture and rural activities. The various actions that comprise the PforR-supported Program are mutually reinforcing, with most income and employment gains stemming from the modernization of the wheat marketing system and shift to HVA (Table 6). The significant poverty impact of the Program is a reflection of the Program's impact on AgGDP combined with the high poverty-reducing impact of agricultural growth. The Program will also significantly contribute to reducing spatial inequalities in Punjab.

**104. Through promoting agriculture sector development, SMART Punjab will positively contribute to poverty reduction in Punjab.** Over the past decade and a half, Punjab made significant progress in the fight against extreme poverty, more than halving its headcount poverty rate, from 61 percent in FY02 to 25 percent in FY14. With less than one-third of the population living in urban areas and 40 percent of the population engaged in the agriculture sector, promoting agriculture development is key to reducing poverty in Punjab. Estimates over the

period 2002-2014 indicate an elasticity of poverty to agriculture GDP growth of -1.28, implying that a one percent growth in agriculture GDP reduces poverty by 1.28 percent. As the Program is expected to add an extra 5.5 percent to Ag GDP over its duration, poverty has the potential to decline by approximately 7 percent by the end of the Program<sup>20</sup>. In terms of absolute numbers, the Program thus has the potential to lift approximately 1.7 million people out of poverty.

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<sup>20</sup> Source: Bank Staff calculations based on Pakistan Bureau of Statistics data for Ag GDP and poverty.

**Table 6: DLI-wise economic impact of SMART Punjab**

DLI	Disbursement	Effects	Impact	
			Production	Jobs
<b>DLI#1 Improving access to quality farm inputs</b>	US\$16.00 million	<p>Yield of small farmers are 40-50% below those of progressive farmers<sup>21</sup>. About 30% (US\$5.5 billion) of crop production in Punjab comes from small farmers with less than 5 ha of land. These farmers account for 60% of all farms in Punjab and are eligible for fertilizer subsidies through an electronic voucher system. This system would eventually reach a minimum of 200,000 farmers (or 7% of all small farmers) by 2022, with intermediate targets of 100,000 farmers by 2019, 133,000 farmers by 2020, and 167,000 farmers by 2021. A 20% yield increase by these farmers would generate additional income of US\$500 million<sup>22</sup> equivalent to approximately 1.3% of agricultural GDP over the duration of the Program.</p> <p>Crops account for 20% of total employment in the province. A 1.3% AgGDP increase (based on an employment elasticity of 0.58) translates into an employment increase of 0.75%. According to the Pakistan Bureau of Statistics, the size of the labor force in Punjab is 35 million of which approximately 20% (7 million) work in crops. Thus a 0.75% increase would be equivalent to 53,000 jobs.</p>	US\$500 million (1.3% of Ag GDP) over the duration of the Program.	53,000 over the duration of the Program.
<b>DLI#2 Revitalizing provincial crop and</b>	US\$23.00 million	<p>Rates of return on public research have been consistently estimated to be in the range of 30-50%.<sup>23</sup> Under the SMART Punjab there would be a gradual increase in allocation for research from 0.1% to</p>	Growth in Ag GDP would be 0.975% over the	79,000 after 5 years

<sup>21</sup> Planning Commission. 2009. Task Force on Food Security: Final Report. Islamabad. Government of Pakistan. The national average yields of major crops such as rice and wheat are about 45 percent of progressive farmers' yields. The yield gaps are even greater for some cash crops, such as sugarcane in Sindh (73 percent) and Punjab (62 percent). Likewise, the yield gap for cotton and maize is 31 percent and 58 percent, respectively.

ACIAR, "Crop Yields and Global Food Security" 2010, Chapter 8, Closing Yield Gaps. Prudent farmers would normally work to achieve 70-80 of potential yields. Factors determining yield gaps include diseases, pests, inadequate irrigation supply and poor fertilizer management. Low soil fertility (especially nitrogen) and weeds were identified as additional key constraints for South Asia.

Engro (a fertilizer company in Pakistan) Foundation found that revenues for small farmers could be increased by 50% and profits by almost 40% through improved fertilizer and pesticide applications, reduced tillage and improved post-harvest handling.

Shively G. and J. Ricker-Gilbert "Measuring the Impacts of Agricultural Input Subsidies in Sub-Saharan Africa: Evidence from Malawi's Farm Input Subsidy Program." Purdue Policy Research Institute, 2013. The study shows significant yield increases, especially if fertilizer and seed are supplied together. It also shows that subsidies to poor farmers are more effective than to larger farmers where it crowds out private purchases. This suggests that redirecting subsidies to poorer farmers would increase fertilizer use.

Nicole M. Mason, T. S. Jayne, and Rhoda Mofya-Mukuka, "A Review of Zambia's Agricultural Input Subsidy Programs: Targeting, Impacts, and the Way Forward" Indaba Agricultural Policy Research Institute (IAPRI), 2013. The study shows similar crowding out for subsidies provided to larger farmer and suggests targeting to poor and female farmers and to areas less well served by the private sector would have a bigger impact on poverty and production.

<sup>22</sup> Based on the following calculation: 100,000 farmers for 4 years (2019-2022), 133,000 farmers for 3 years (2020-2022), 167,000 farmers for 2 years (2021-2022) and 200,000 farmers for one year (2022) – total 1,333,000. Total additional income by the end of the Program would therefore be  $(1,333,000/200,000) * 0.07 * 0.2 * 5.5 \text{ billion} = \text{US\$500 million}$ .

<sup>23</sup> Alston J.M. et. al. "A Meta-Analysis of Rates of Return to Agricultural R&D" IFPRI Research Report 113, 2000. This review covered 292 studies which contained 1,886 rates of return. The estimated annual rates of return averaged 73 percent overall–88 percent for research only, 45 percent for research and extension, and 79 percent for extension only.

Evenson R.E. et. al. "Agriculture Research and Productivity Growth in India" IFPRI Research Report 109, 1999. This report suggests rates of return of above 50%.

World Bank ICRs for similar projects in Pakistan and the region:

"Bangladesh: Agriculture Research Management Project", 2002. Ex-post rates of return on various research projects range from 15-15% for major crops and 44% 112% for selected other crops.

DLI	Disbursement	Effects	Impact	
			Production	Jobs
livestock research and extension systems		0.4 % of agriculture GDP - starting with 0.2% in year 2, 0.25% in year 3, 0.3% in year 4 and finally 0.4% in year 5. The corresponding increases in AgGDP (at a conservative 30% rate of return) by the end of the Program would be US\$90 million (or 0.23%). <sup>24</sup>  In terms of jobs, the addition would be 0.58 (employment elasticity) * 0.975% * 14 million (40% of all jobs in Punjab are in agriculture including livestock) = 79,000 jobs. In addition and to the extent that public research funding could help leverage private research, growth could be raised further but this is not quantified in this estimate of impact.	Program period. This is equivalent to US\$400 million.	
DLI#3(a) Improving livestock health	US\$15.00 million	At least 50% of Punjab Ag GDP (or US\$20 billion) comprises livestock products – milk, meat and eggs. Punjab has about 22 million buffaloes and 19 million cattle. Studies in other countries <sup>25</sup> suggest that 10% of animals may be affected by FMD and losses could be about US\$100 per animal, indicating losses of US\$400 million. If 85% of animals are vaccinated using good quality vaccines, losses could be reduced by about US\$200 million. Improved breeding and de-capping of prices is estimated to improve productivity of meat and milk by about another US\$100 million, for a total of US\$300 million.	US\$300 million after 5 years.	61,000 after 5 years.
DLI#3(b) Improving livestock breeding	US\$15.00 million	A US\$300 million increase in AgGDP represents a 0.75% increase which (at an employment elasticity of 0.58) would mean 0.75% * 0.58 * 14million = 61,000 jobs.		
DLI#4(a) Modernizing the wheat marketing	US\$70.25 million	The Punjab Agriculture Department aims at shifting 1.0 million acres (or 400,000 ha) out of wheat to HVA. Based on available cost-of-production estimates for Punjab, returns (to land and own labor) from high value crops can conservatively be calculated at PKR100,000 per acre as opposed to about	US\$0.8 billion (2% of Ag GDP) after 5 years.	113,000 after 5 years.

“Bangladesh: National Agriculture Technology Program”, 2015. Ex-post rate of return estimated at 30%.

“India: National Agriculture Research Project”, 2005. Ex-post rate of return estimated at 29% with 34% on the work related to agro ecosystem research, zero tillage, IPM and household food and nutrition security.

“India: National Agriculture Research Project II”, 1997. Ex-ante return estimated at 20% for an average research subproject. No ex-post rate of return was done.

“Nepal: Agriculture Research and Extension Project” 2003. Ex-ante rate of return estimated at 51-70%. Ex post rates of return not calculated but production and productivity increased during the project period.

“Pakistan: Agriculture Research II Project” 1998. No rate of return calculated as project was poorly implemented and outcome was rated unsatisfactory.

<sup>24</sup> Calculated as follows: AgGDP increase would be 0.13% as of year 2 (= 0.1% increase in spending in year 2 yielding 30% return lasting for 4 years from year 2-5), 0.065% as of year 3 (reflecting a further 0.05% increase in spending in year 3 yielding a 30% return lasting for 3 years from year 3-5), 0.065% (reflecting a further 0.05% increase in spending in year 4 yielding a 30% return lasting for 2 years from year 4-5), and 0.13% in year 5. Total AgGDP growth during the 5 years of the Program would thus be (\*0.13%\*4) + (0.065%\*3) + (0.065%\*2) + (0.13%) = 0.975% or US\$400 m.

<sup>25</sup> Estimates of losses caused by various livestock diseases are rather limited. However, some studies do exist:

Ferrari, G., L. Tasciotti, E. Khan and A. Kiani “Foot-and-Mouth Disease and Its Effect on Milk Yield: An Economic Analysis on Livestock Holders in Pakistan”, *Transboundary and Emerging Diseases* 61(6) · March 2013. The study estimates that milk production for affected animals fell from about ten liters/day to below seven and that losses over a 60-day period were about 200 liters (value of PKR10,000 or US\$100).

Knight-Jones T.J.D. and J. Rushton, “The economic impacts of foot and mouth disease – What are they, how big are they and where do they occur?” *Preventive Veterinary Medicine*, Volume 112, Issues 3–4, 1 November 2013. The paper estimates that annual impact of FMD in terms of visible production losses and vaccination in endemic regions alone amount to between US\$6.5 and 21 billion. The paper looks at impacts on FMD outbreaks and control in various countries – e.g. Uruguay increase exports by 50% (\$110 million) after obtaining FMD free status in 1996; and in Turkey direct impact of infection is \$150-300 with 10% of cattle population of 11 mill head being infected. (in a separate study for Andhra Pradesh FMD infections were found for 9% for indigenous cattle, 23% for cross breeds and 4% for buffaloes.

DLI	Disbursement	Effects	Impact	
			Production	Jobs
<p><b>system</b></p> <p><b>DLI#4(b) - Transitioning to high-value agriculture</b></p>	US\$36.00 million	<p>PKR20,000 per acre in the case of wheat. Based on this difference of about \$800/acre, the increase in AgGDP from converting 1.0 million acres would approximately be US\$0.8 billion (or 2% of AgGDP).</p> <p>The employment effect is calculated as 0.02 (2% AgGDP growth) * 0.58 (employment elasticity) * 7 million (current labor force in crop sub-sector) = 81,000 jobs. In addition to these on-farm jobs, another 32,000 jobs (40%) can be expected to be generated through post-harvest value-adding activities.</p>		
<b>DLI#5 Providing incentives to agribusinesses for investments in value addition and agricultural technology</b>	US\$10.00 million	The Matching grant scheme of \$10 million would co-fund about \$20 million in investment by Agribusiness enterprises. Rates of return on these schemes are expected to be in the range of 20-30% suggesting a return on investment of US\$8-12 million, or US\$40-60 m over the 5-year Program period.	Not quantified as it complements DLI#4(b).	Not quantified.
<b>DLI#6 Improving market conditions for meat and raw milk</b>	US\$10.00 million	De-capping of meat and raw milk prices would raise returns to farmers. This would, given appropriate support services to improve animal productivity through increased preventive health care and breeding, increase milk production and enhance supplies to urban consumers thus improving their welfare.	Included in calculations for DLI#3(a)/(b).	Not quantified.
<b>DLI#7 Modernizing agricultural markets</b>	US\$22.00 million	Greater private sector participation and enhanced transparency processes, would help reduce the large margins taken by middlemen and agents. These reduced margins are likely to benefit both producers and consumers raising real incomes for both.	Not quantified as it complements DLI#4(a)/4(b).	Not quantified.
<b>DLI#8 Improving food safety</b>	US\$10.00 million	Better control would initially favor consumers while imposing costs on food processors and producers. Over the medium to longer run, better food standards, backed up with suitable testing and enforcement mechanism, provide an essential prerequisite for a dynamic growth in the processing and preparation industry.	Not quantified as it complements DLI#5.	Not quantified.
<b>DLI#9 Improving sustainability and efficiency of irrigation</b>	US\$16.00 million	<p>Currently about 11.7 million ha in Punjab receive water from the public surface irrigation system. Water use efficiency is low (35-40%) and water productivity (crop-per-drop and US\$/m<sup>3</sup>) is lower than in India and China.</p> <p><i>Abiana</i> revenues would gradually increase from PKR0.5 billion in FY16 to PKR1.8 billion by FY22 as a result of improvements in assessment and collection, for a total increase in <i>abiana</i> revenues of approximately PKR5.1 billion (US\$50 million) over the five-year period of the Program which would be allocated to improve M&amp;R.<sup>26</sup> Improved M&amp;R and greater incentive to use water efficiently would enhance efficiency of delivery and on-farm utilization.</p> <p>Investments in irrigation improvements typically generate a 25% ERR<sup>27</sup> - about US\$13 million.</p>	US\$13 million over the 5-year period.	3,000 by year 5.

<sup>26</sup> Calculated as follows: current *abiana* collection is about PKR0.5 billion per year. Improvements in *abiana* assessment (basically doubling the area assessed) combined with a gradual increase in the *abiana* collection rate from 50% to 90% would result in *abiana* revenues of PKR1 billion in 2018, 1.5 billion in 2019, 1.6 billion in 2020, 1.7 billion in 2021 and 1.8 billion in 2022. Compared to a baseline of PKR0.5 billion per year this would amount to additional *abiana* revenues of PKR5.1 billion, or an average of about PKR1 billion per year.

<sup>27</sup> Punjab Irrigated Agriculture Productivity Improvement Program Project, PAD, 2012. The project is improving water courses, land levelling, HEIS and better technology. The ERR for the base case is about 32.6%. which reflects a very conservative estimate and the ERR realized is likely to be higher than this. The ERR is 43.2% for HEIS, 32.7% for

DLI	Disbursement	Effects	Impact	
			Production	Jobs
<b>DLI#10</b> Rolling-out an agricultural insurance system	US\$14.00 million	Improving crop insurance would help crop and livestock producers to stabilize incomes in the face of unexpected events such as weather events and, in the case of livestock, disease and death. This would in the medium to longer term enhance willingness of farmers and banks to increase lending.	Not quantified as insurance basically involves monetary transfers.	Not quantified but small.
<b>DLI#11</b> Increasing public investment in climate-smart agriculture	US\$32.00 million	Yu <i>et al.</i> report an average AgGDP loss of about 5% across different climate change scenarios. If by the end of year 5, CSA would be adopted on 20% of cropland and can mitigate 50% of that loss, that would mean $0.2 \times 0.5 \times 5\% = 0.5\%$ AgGDP loss avoided, or \$200 million. Employment effect would be $0.58$ (employment elasticity) $\times 0.005$ ( $=0.5\%$ ) $\times 14$ million (ag sector work force) = 41,000 jobs.	US\$200 million	41,000.
<b>DLI#12</b> Communications, beneficiary feedback, capacity building and monitoring and evaluation	US\$10.00 million		Not quantified as contributes to all other DLIs.	Not quantified.

laser leveling, 28.1%, for full and 23.1% for partial watercourse improvement in the canal area, and 19.7% in non-canal or *barani* areas. The operation would create 53,750 jobs at an investment cost per job created of US\$3,700.

Sindh On-Farm Water Management Project – ICR 2014. The project included improvements in watercourses, distributaries and minors, and branch canals. The ex-post ERR was estimated at 25% compared to 21% at Appraisal. The PAD also justified this projected return on economic evaluations of on-farm and canal rehabilitation investments in Pakistan that had been undertaken over a 20-year period in the context of project appraisals, ICRs, OED audits, and impact evaluation reports, with ERR estimates ranging from 20 to 35%. The ERR of past system rehabilitation projects was estimated at around 50%.

Sindh Irrigated Agriculture Productivity Enhancement Project –PAD 2015. The project improved water courses, land levelling, HEIS and better technology. The ex-ante ERR is estimated at 36%. Moreover, by improving productivity on 550,000 acres (220,000 ha.), 80,690 jobs (investment cost of \$3,000 per job) would be created of which almost 90% would be hired labor.

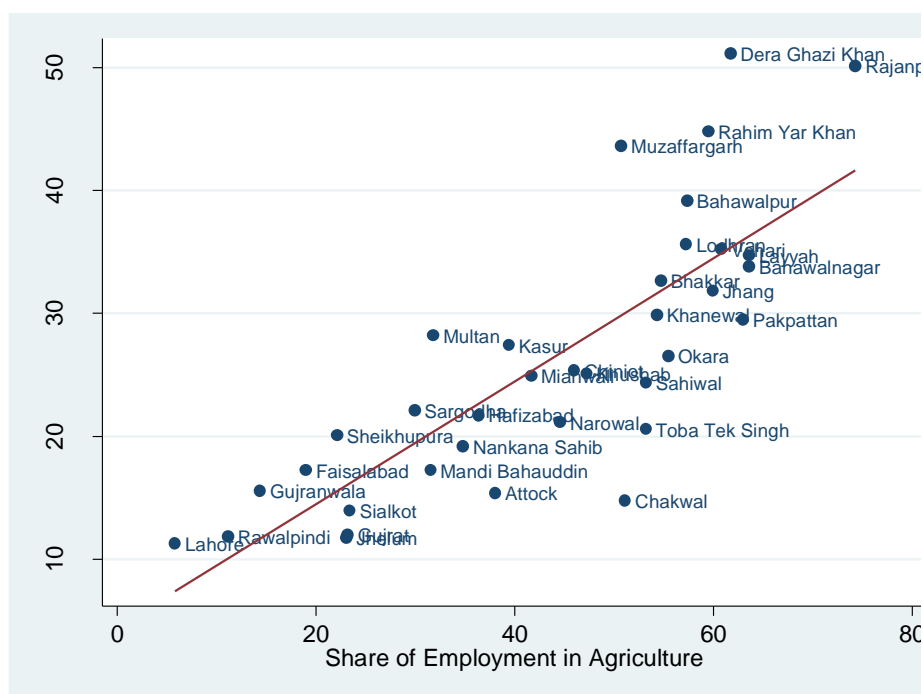


## IV.2 Impact of SMART Punjab on Poverty Reduction

**105. By promoting agriculture sector development, SMART Punjab will also contribute to reducing spatial inequalities in Punjab.** Poverty varies considerably between urban and rural areas and across Punjab’s districts. According to HIES 2013-14 data, poverty in rural Punjab is 29.8 percent, 13.4 percentage points higher than in urban areas<sup>28</sup>. Of the 22.9 million people in

Punjab who were poor in 2013-14, 18 million people (4 out of five) were in rural areas. As shown in Figure 9, poverty tends to be highest in districts that rely on agriculture the most. Indeed, 14 of the 17 poorest districts in Punjab have 50 percent or more of their workforce engaged in the agriculture sector<sup>29</sup>. Therefore, promoting agriculture sector development has the potential to benefit poorest areas the most and contribute narrowing inequality.

**Figure 9: Poverty incidence and employment in Punjab agriculture, by district**



Source: Bank Staff calculations based on HIES and PSLM data

## IV.3 Contribution to Twin Goals

**106. All components of the SMART Punjab PforR are contributing to the twin goals.** In particular:

**107. Results Area 1 (increased on-farm productivity and value of crops and livestock - DLI# 1 to 4):** Improving the productivity, profitability, and sustainability of smallholder farming is the main pathway out of poverty in using agriculture for development (WDR, 2008 “Agriculture for Development”). Increasing the amount and quality of inputs available to smallholders through better targeting of resources, investments in research, extension, and animal health care and breeding practices have a clear poverty reducing impact. On the other hand, the poverty impact of reforming the

<sup>28</sup> The rural headcount poverty rate in 2013-14 is 29.8 percent, against 16.4 percent in urban areas.

<sup>29</sup> Districts with poverty headcount higher than the provincial poverty headcount.

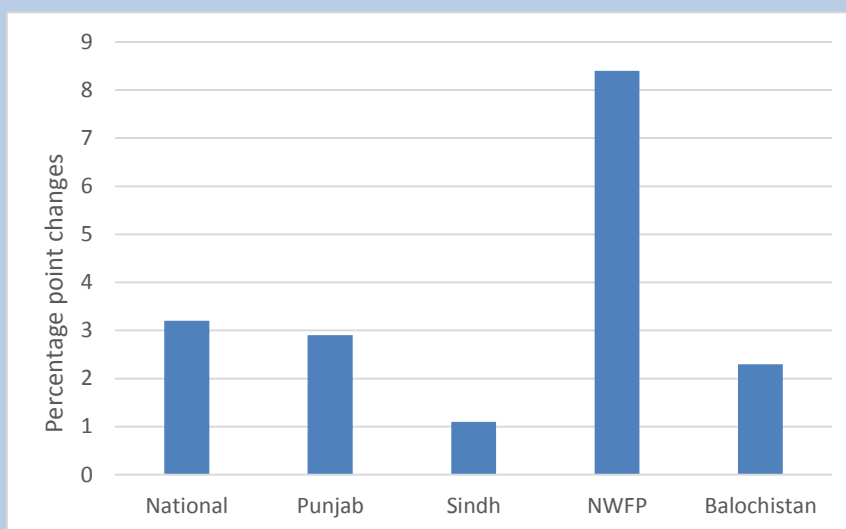
wheat procurement system is not determined *a priori*, but depends critically on whether rural poor are net producers (negative impact) or net consumers (positive impact) of wheat. Empirical evidence from the 2007-08 food price crisis suggests that the vast majority of the rural poor are net consumers of wheat and hence likely to benefit from the wheat reform implementation (see Box 3).

**Box 3: Poverty impact of the 2007-08 food price crisis**

The surge in global commodity prices during 2006-08, coupled with the global financial crisis of 2008-10 fueled rapid inflation in South Asian countries. In Pakistan, the price index of the overall food basket increased by 16 percent, and the price of wheat by almost 80 percent. The price of wheat is of paramount importance for consumer welfare in Pakistan, especially for the poor and several studies were conducted to assess the impact on poverty of the crisis.

From a theoretical perspective, a higher price of wheat would negatively (positively) affect net consumers (net producers). Therefore, the (short term) impact of an increase of wheat prices on poverty depends on whether poor households are on average net consumers or producers of wheat. Estimates based on the PSLM 2004-05 suggest that the national poverty headcount has increased by about 3.3 percent as a result of the crisis, resulting in approximately 5 million additional people falling into poverty. Estimates of poverty impact also reveal considerable variation at the subnational level reflecting different production and consumption behaviors in rural areas (see Figure 10).

**Figure 10: Regional poverty impact of wheat price increase**



Source: Vishwanath, T. and Serajuddin, U. (2010) "Welfare impact of rising food prices in South Asian Countries". Pp. 45-83 in: Ahmed, Sadiq, and Jansen, Hans G. P. 2010 (eds.). *Managing food price inflation in South Asia*. Washington, DC: World Bank.

**108. Results Area 2 (increased value addition and competitiveness of crops and livestock - DLI # 5 to 8):** With rapid rural population growth, creating jobs in rural areas, especially for relatively more educated youth with limited interest in traditional farming, is a critical challenge. The development of HVA has a strong growth and employment generation potential and it is likely to contribute to reducing poverty, boosting shared prosperity and promoting socio-economic inclusion.

**109. Results Area 3 (enhanced resilience of smallholder farmers to climate change and natural disasters - DLI # 9-11):** Exposure to uninsured risks has high efficiency and welfare costs for rural households and especially for the poorest segment of the rural population<sup>30</sup>. Addressing issues related to risk management and reducing vulnerability to shock is critical for poverty reduction in Punjab. A total of 13.3 million individuals living in Punjab are classified as vulnerable to falling in and out of poverty because of a small income shock<sup>31</sup>. In this context, investments aimed at improving efficiency of irrigation systems, increasing access to insurance and adoption of CSA technologies are likely to reduce vulnerability to poverty and intergenerational poverty transmission.

#### **IV.4 Climate co-Benefits and Gender Gap**

**110. The Program is expected to generate considerable climate adaptation co-benefits calculated at US\$105.68 million.** In Results Area 1, DLI#2 (reorienting and increasing funding to agricultural research) would result in more funding to climate resilience-oriented agricultural research (US\$2.3 million). DLI#3a (improving livestock health) will improve animals' resilience to heat stress and diseases (US\$15 million). DLI#4a (modernizing wheat marketing) includes improved wheat storage which contributes to climate resilience of emergency wheat stocks, compared to the current storage in dilapidated go-downs (\$21 million). A shift to HVA (DLI#4b, US\$18 million) involves crop diversification, short growing cycles, and efficient use of irrigation, thus reducing farmers' vulnerability to climate change. In Results Area 2 of the Program, DLI#5 (providing incentives to agribusiness for investment in value addition) may finance improved storage facilities which would improve climate resilience of stored agricultural products (US\$1 million). In Results Area 3, DLI#9 (improving sustainability of irrigation) benefits adaptation to impacts of climate change on water resources (US\$16 million). DLI#10 (agricultural insurance, US\$14 million) and DLI#11 (climate-smart agriculture, US\$16 million) focus on increasing farmer resilience to adverse weather events.

**111. In addition, the Program is expected to generate climate mitigation co-benefits calculated at US\$49.13 million.** DLI#3b (improved livestock breeding) would reduce pressure on rangelands and benefit maintenance of carbon pools in rangeland areas (US\$15 million). A shift to HVA is expected to lead to reduced fertilizer use (DLI#4b, US\$18 million). Increased investments in climate-smart agriculture are likely to lower emissions from agriculture (DLI#11 - climate-smart agriculture, US\$16 million). In summary, **51.6%** of the total loan amount (US\$154.81 million out of a total loan amount of US\$300 million) contributes to climate resilience.

**112. The Program is expected to contribute to narrowing the gender gap** through the following mechanisms: (i) diversification into HVA will lead to higher productivity with positive impact on wages; (ii) increasing opportunities for post-harvest value-addition,

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<sup>30</sup> To manage exposure to uninsured risks, farmers might have to forgo activities with higher expected incomes. Poorer households who lack the ability to cope with shocks might be forced into distress sales of land and livestock. Child education and health can suffer long-term consequences when children are taken out of school in response to shocks or are exposed to early periods of malnutrition, leading to intergenerational transfers of poverty.

<sup>31</sup> HIES 2013-14 data. Vulnerability is defined considering individuals whose consumption falls within a 20 percent band around the poverty line.

including agribusiness matching grants which will aim to focus on women entrepreneurs; and (iii) removal of price caps in the livestock sector and more productive animals will benefit small livestock producers, many of which are women.

**Table 7 – Climate co-benefits**

Disbursement Linked Indicator (DLI)	Total financing (US\$ m)	Adaptation co-benefits (US\$ m)	Mitigation co-benefits (US\$ m)	Reason for assigning CCB
DLI 1 - DLI 1 - Improving access to quality farm inputs	16.00			<p>Adaptation co-benefits cannot be assigned since there is no linkage to the vulnerability context.</p> <p>Mitigation co-benefits cannot be assigned since none of the activities are on the multilateral development banks (MDB) List of Eligible Mitigation Activities.</p>
DLI 2 - Revitalizing provincial crop and livestock research and extension systems	23.00	2.30		Adaptation co-benefits can be assigned since this DLI is expected to result in more funding to climate resilience-oriented agricultural research.
DLI 3(a)- Improving livestock health	15.00	15.00		<p>Vulnerability context: (i) heat stress, (ii) expansion of areas susceptible to vector borne diseases.</p> <p>(i): Higher temperatures increase body stress in animals making them more susceptible to diseases.</p> <p>(ii): Climate change expands the areas susceptible to vector borne diseases.</p> <p>Intervention: Animal health services.</p> <p>Result: Adaptation co-benefits can be assigned since healthier animals are better able to withstand the effects of climate change.</p>
DLI 3(b) - Improving livestock breeding	15.00		15.00	<p>Vulnerability context: Large herds of low-productivity animals fed by grazing contribute to rangeland degradation and carbon losses.</p> <p>Intervention: Improved breeding of higher-productivity stall-fed animals.</p> <p>Result: Mitigation co-benefits can be assigned because (i) improved animals lessen</p>

Disbursement Linked Indicator (DLI)	Total financing (US\$ m)	Adaptation co-benefits (US\$ m)	Mitigation co-benefits (US\$ m)	Reason for assigning CCB
				the pressure on rangelands, and (ii) farmers who have access to improved animals reduce their herd size. Both these effects result in better maintenance of carbon pools in rangeland areas.
DLI 4(a) - Modernizing the wheat marketing system	70.25	21.00		<p>Vulnerability context: (i) increasingly heavy rainfall events causing excess moisture and flooding, (ii) extreme heat causing losses of stored grains.</p> <p>Intervention: Wheat storage under controlled conditions in bulk in modern steel silos with proper ventilation and aeration equipment.</p> <p>Result: Adaptation co-benefits can be assigned because of improved resilience of emergency wheat stocks, in particular reduced susceptibility to extreme temperatures and heavy rainfall events moisture.</p>
DLI 4(b) - Transitioning to high-value agriculture	36.00	18.00		<p>Vulnerability: Susceptibility of monocropping to seasonal shortages of water and increased risk of drought.</p> <p>Intervention: Diversification into HVA, including vegetable crops with shorter growing cycles and more efficient use of available irrigation water.</p> <p>Adaptation co-benefit: Adaptation co-benefits can be assigned because of (i) changes towards production patterns that are more resilient to different weather patterns, (ii) increased water use efficiency as value of production per unit of water increases, and (iii) higher and more diversified farmer incomes.</p>
			18.00	<p>Mitigation co-benefits: High value crops require less fertilizer per unit value of production, hence the overall emission intensity of production will be reduced. Data from the Bank-supported PIP (Punjab irrigated agriculture Improvement project) show up to 60% less fertilizer use in HVA as compared to traditional crops such as</p>

Disbursement Linked Indicator (DLI)	Total financing (US\$ m)	Adaptation co-benefits (US\$ m)	Mitigation co-benefits (US\$ m)	Reason for assigning CCB
				rice, wheat etc.
DLI 5 - Providing incentives to agribusiness for investment in value addition	10.00	1.00		Vulnerability context: see DLI 4(a). Intervention: some matching grants would co-finance improved storage facilities. Result: Improved resilience of storage to climate change impacts.
DLI 6 - Improving market conditions for meat and raw milk	10.00			Adaptation co-benefits cannot be assigned since there is no linkage to the vulnerability context.
DLI 7 - Modernizing agricultural markets	22.00			Mitigation co-benefits cannot be assigned since none of the activities are on the multilateral development banks (MDB) List of Eligible Mitigation Activities.
DLI 8 - Improving food safety	10.00			
DLI 9 - Improving sustainability and efficiency of irrigation	16.00	16.00		Vulnerability: Increased risk of drought, variability and concentration of precipitation events. Intervention: Improved irrigation management in three steps. Adaptation co-benefits: Improved adaptation to impacts of climate change on water resources.
DLI 10 - : Rolling-out an agricultural insurance system	14.00	14.00		Vulnerability: Climate change to increase the incidence of a number of agricultural risks, including drought, irregular rainfall, extreme heat spells.

Disbursement Linked Indicator (DLI)	Total financing (US\$ m)	Adaptation co-benefits (US\$ m)	Mitigation co-benefits (US\$ m)	Reason for assigning CCB
				Intervention: Agriculture insurance. Adaptation co-benefits: Increased farmer resilience to adverse weather events.
DLI 11 - Increasing public investment in climate-smart agriculture (CSA)	32.00	16.00	16.00	Mitigation co-benefits: Lower emission agriculture sector.
DLI 12 - Communications, beneficiary feedback, capacity building, and monitoring and evaluation	10.00	2.22	0.12	Pro-rated
Front end fees	00.75	0.16	0.01	Pro-rated
<b>TOTAL</b>	<b>300.00</b>	<b>105.68</b>	<b>49.13</b>	



## **Annex 1: Bank Comments on Draft Punjab Seed (Amendment) Act 2017**

The draft Punjab Seed (Amendment) Act 2017 is in effect not an amendment to Federal Seed Act 2015 but a new law which is intended to be enacted. It proposes a paradigm shift with far-reaching consequences and serious ramifications for the seed market in Pakistan. Transitional arrangements will be very complicated and will lead to many uncertainties among the stakeholders. It may also create opportunities for malpractice while the new system is being commissioned. It may also trigger serious federal-provincial tensions. The Bank's position is that Punjab as the most important agricultural province in the country should focus on leading a countrywide reform process, rather than 'going alone'. Therefore, the Bank is not in a position to support a provincial Seed Act. Detailed comments on the Draft Punjab Seed (Amendment) Act 2017 are listed below.

- (i) The new draft Punjab Seed (Amendment) Act 2017 has omitted several important sections and clauses of the Federal Seed (Amended) Act 2015 apparently for promoting genetically modified seed like GM cotton, GM corn, GM rice, GM vegetables etc. If this is indeed the intention, then it would imply that biosafety is also devolved to the provinces and that would be an unusual situation.
- (ii) Sub-clause (ii) of Section 2 of the Federal Act is proposed to be deleted. This sub-clause relates to definition of "approved seed", defined as seed true to species as approved by the Federal Seed Certification and Registration Department (FSC&RD). While removing this seed class would not necessarily mean that more unapproved seed would be marketed, making certification generally becomes less robust would increase risks to seed quality in the market.
- (iii) Substituting the words "Punjab Seed Certification and Registration Department or by another organization so authorized by the Government of Punjab" for the words "Federal Seed Certification and Registration Department (FSC&RD)" in sub-clauses (iii) to (vi) of Section 2 and elsewhere in the federal law would mean that the function of seed certification will no longer rest with the FSC&RD and will be assumed by a newly created Punjab Seed Certification and Registration Department. However, transition arrangements from FSCRD >>PSCRD could be very complicated and will surely cause disruption. Moreover, there is a real possibility that this may not be accepted by other provinces and will trigger the initiation of own processes of certification on other provinces as well. In turn this may lead to more distortions in the seed market and also would imply barriers in free trade across provinces, which would be in conflict with Article 151 (3) of the Constitution.
- (iv) The draft Punjab Seed (Amendment) Act 2017 proposes to omit Sections 3 and 4 of the Federal Act, thus debilitating the status of the National Seed Council in Punjab. This is considered a perverse step because there could be matters of national concern that should be handled at a federal level and Punjab would ignore them.
- (v) The draft Punjab Seed (Amendment) Act 2017 proposes to omit the most important section — Section 22A — of the Federal Seed Act 2015 which imposes a restriction

on registration or enlisting of imported plant varieties or hybrids, and compulsory adaptation trials at multiple locations in Pakistan for at least two crop seasons to check their performance under local agro-climatic conditions. This removal of most of the testing regime carries the risk of exploitation by not only by aggressive multi-nationals but also by rogue local companies, as demonstrated by the ‘cotton chaos’ a few years ago.

(vi) Clause (a) of Section 6 (Functions of Punjab Seed Certification and Registration Department) of the draft Punjab Seed (Amendment) Act 2017 clearly states “controlling the quality of seeds through truth-in labelling”, implying the following:

(a) Any individual, breeder or seed company would be allowed to import GM and non-transgenic seeds, plants and hybrids of any major and minor crop without any testing, evaluation and risk assessment. This could potentially lead to the spread of unknown diseases and viruses which in turn can be a major threat to agriculture productivity and even may put food security in danger.

(b) Truthful labelling, formally introduced in regulations passed in 1991, is based on the principle that the seller is required to label each sales unit accurately with regard to both the variety name and seed quality. Truthful labelling (also called truth-in-labelling) is typically applied to crops that are not eligible for certification and is a relatively relaxed regulatory approach that works best where market enforcement is strong and the majority of the seed is being sold by reputable entities that have their own internal quality assurance procedures. In such circumstances, ‘truthful labelling’ which essentially transfers responsibility for seed quality to the seller, can replace the technical procedures required for certification. Effectively the reputation of the seller becomes the motivation for quality assurance, rather than the threat of legal sanction. Thus, ‘truthful labelling’ is fine when the majority of the sellers wish to follow the rules and maintain their reputation. However, where market enforcement is less strong and seed companies lack adequate internal quality protocols, there is a risk that much of the seed entering the market would be of poor quality, making the farmer lose confidence in purchased seed. In such circumstances and given that ‘truthful labelling’ is seldom enforced much in practice, it merely opens the door to low-level corruption when inspectors wish to harass a particular seller if they find seed that does not comply. Although truth-in-labelling is often considered in the context of seed quality attributes (mostly purity and germination), it is a very weak way to control varieties, especially if the registration (or enlistment) process is rather lax. It is therefore also necessary to officially declare/record the variety, and variety declaration/recording depends on having a proper registration system.<sup>32</sup>

(c) Sub-rule (2) of Rule 8 of the Seed (Truth-in-Labelling) Rules 1991, amended in 1993, specifies that “Import of seed of only those varieties shall be allowed which have been approved by the Agriculture Research Institutes and entered

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<sup>32</sup> Michael Turner’s November 2016 Mission Report.

and notified by the Federal Government in the National Register for seed and crop production in Pakistan.” Since trade as well as bio-safety are federal subjects and the GoPunjab cannot allow import of seeds unless it is permitted by the federal government in line with these rules, shifting this responsibility to the Provinces would add uncertainty and may even create confusion.

- (d) Truth-in-Labeling requires an effective and transparent enforcement mechanism which is currently lacking in Punjab Province.
- (e) Approval of the Truth-in Labeling rules was given in 1991 to facilitate market penetration of hybrids for vegetables and other minor crops given the rapidly and continuing changes in hybrid technologies. Truthful Labeling for the seed of secondary crops is justified, especially if imported, because the official system simply cannot control them. However, the Punjab draft Act proposed to include all seed varieties as well as hybrids of major crops under Truth-in Labeling rules.
- (vii) The draft Punjab Seed (Amendment) Act 2017 proposes to omit clauses (d) to (h) of Section 6 of the Federal Act which deal, for the purpose of issuance of certificates as well as post-control trials, with field inspection of crops of registered varieties and released varieties intended for sale as basic or certified seed; sampling and testing of seed lots intended for sale to ascertain their purity, viability, germination capacity and health status in the prescribed manner.
- (viii) The draft Punjab Seed (Amendment) Act 2017 proposes to omit Section 9 of the Federal Act dealing with the establishment of Provincial Seed Councils.
- (ix) Section 10 of the draft Punjab Seed (Amendment) Act 2017 proposes to empower the Punjab Seed Certification and Registration Department to notify Official List of varieties, hybrids or species of seed, effectively assuming the powers of the FSC&RD. However, those varieties may not be listed in the other provinces which may cause problems.
- (x) The draft Punjab Seed (Amendment) Act 2017 proposes to omit Section 22D of the Federal Act which deals with registration of seed processing units. This is considered very risky, especially if local companies engage in repacking of imported seed. It could increase the opportunities for selling ‘fake seed’.
- (xi) The draft Punjab Seed (Amendment) Act 2017 proposes to omit the word ‘Registration’ from the title of Section 22G and replace it with ‘Enlisting’ – presumably because registration requires any imported GM seed to be tested during at least two crop seasons for regulatory trials and during as many crop seasons for large scale trials, and at different locations in the country as prescribed under bio-safety rules and bio-safety guidelines. However, ‘enlisting’ can be a very unregulated process, enabling renaming, duplicate naming and potentially causing confusion in the market. A robust system would be required to manage it, and it remains unclear if there is any serious intention to put that in place.

- (xii) The draft Punjab Seed (Amendment) Act 2017 proposes to delete clause (c) of Section 22G which requires “field data of two crop season trials in respect of bio-safety and performance as prescribed” for registration of GM or hybrid varieties. This deletion effectively by-passes collection of bio-safety data and risk assessment in local environment as required under the Cartagena Protocol on bio-safety to the Convention on Biological Diversity (CBD):

“Article 1 of the Protocol states that it aims to “contribute to ensuring an adequate level of protection in the field of the safe transfer, handling and use of living modified organisms resulting from modern biotechnology that may have adverse effects on the conservation and sustainable use of biological diversity, taking also into account risks to human health, and specifically focusing on transboundary movements”. In short, it seeks to protect biodiversity from the potential risks of living modified organisms (LMOs) resulting from modern biotechnology. The more general risk of deleting clause (c) of Section 22G is that varieties of major crops could be introduced without any verification of their merit.

- (xiii) The draft Punjab Seed (Amendment) Act 2017 proposes to delete Section 22-I (constitution of Federal Seed Committee) of the Federal Seed (Amended) Act 2015 which gives powers to seed committees —consisting of representatives of the Federal Government and Provincial Agriculture Departments, Public and Private seed sectors, progressive farmers and any experts — to assess imported or local GM seeds and other seed varieties grown in trial fields. Even though a Punjab Act cannot impact directly on bodies established at a Federal level, by writing themselves out of this process, Punjab is weakening the authority and value of those bodies.
- (xiv) Similarly, the draft Punjab Seed (Amendment) Act 2017 proposes to omit Section 22-J (constitution of Variety Evaluation Committee) from the Federal (Amended) Act 2015 to abolish said Committee. The Variety Evaluation Committee is responsible for evaluating candidate lines, cultivars and varieties of public and private sectors, and imported seed material for disease and the agronomic value of all fields and horticulture crops as prescribed.
- (xv) The draft Punjab Seed (Amendment) Act 2017 does not include a single clause which penalizes importers of misbranded or low quality seeds.

## **Annex 2: The Agriculture and Livestock Research System in the Punjab**

**PARB - Punjab Agricultural Research Board** (<http://parb.agripunjab.gov.pk>). Primarily funds competitive grants in all sectors of agriculture.

**The Departments of Agriculture, Livestock & Dairy Development, Fisheries and Forestry.** All have research stations, for which the operational costs are met from the regular department budgets (mainly salaries, building maintenance, travel costs, stationary). Only approx. 10-15 percent of total budget is spent on research activities. Not all research topics are logically allocated to departments, e.g. pasture is under forestry and fodder is under agriculture.

**Planning & Development Department, Government of Punjab.** Primarily funds development projects for new infrastructure such as labs, buildings, technology, subsidies.

**Livestock Research Stations.** Livestock research stations can be found on the website of the Department of Livestock & Dairy Development, <http://www.livestockpunjab.gov.pk/>:

- Veterinary Research Institute: primarily involved with veterinary biologics production and little research
- FMD Research Institute: FMD vaccine production, FMD antiserum production and FMD diagnosis
- Livestock Production Research Institute (LPRI), Bahadurnagar, Okara
- Buffalo Research Institute, Pattoki, Kasur
- Barani Livestock Production Research Institute, Fateh Jang, Attock
- Poultry Research Institute, Rawalpindi, <http://poultry.punjab.gov.pk/>
- Research Centre for Conservation of Sahiwal, Jang, <http://rccsc.com.pk/>
- Livestock experimental stations (18) (= "government farms")  
<http://dlfpunjab.webs.com/farms.htm>

### **Agricultural Research Stations**

- Ayub Agriculture Research Institute, Faisalabad, <http://aari.punjab.gov.pk/>
- Barani Agricultural Research Institute, Chakwal, <http://barichakwal.org/> (operates a number of outstations: horticulture, groundnuts, cotton, gram)
- Fodder Research Institute, Sargodha, <http://aari.punjab.gov.pk/institutes-sections/fodder-research-institute>
- Maize and millet Research Institute, Sahiwal, <http://www.aari.punjab.gov.pk/aari/our-scientists/422-aari/our-scientists/1175-maize-millets-research-institute-yusafwala-sahiwal>
- Agriculture Mechanization Research Institute, Multan
- Soil and Water Conservation Research Institute, Chakwal, <http://www.aari.punjab.gov.pk/aari/our-scientists/422-aari/our-scientists/1183-soil-water-conservation-research-institute-chakwal>
- Soil Salinity Research Institute, Pindi Bhattian
- Rice Research Institute, Kala Shah Kaku, <http://aari.punjab.gov.pk/institutes-sections/rice-research-institute>
- Irrigation Research Institute, Lahore, <http://irrigation.punjab.gov.pk/IRI.aspx>
  - Directorate of Extension and Adaptive Research, <http://ext.agripunjab.gov.pk/>

### **Annex 3: The Matching Grant Scheme**

The matching grant scheme (MGS) is intended to mobilize investment and employment generation in targeted, potentially transformative agricultural subsectors, such as livestock markets, quality assurance for food and inputs, post-harvest handling of horticultural crops, processing, milk collection and distribution, and meat retailing. It would reduce the risk associated with adopting more productive and efficient technologies, strengthen the capacity and competitiveness of private enterprises and/or farmer groups, and support new investments as opportunities arise from reforms and incentives that enhance the enabling environment for agribusiness.

The matching grant scheme would be part of the Agribusiness and Innovation Fund that the Agriculture Department is in the process of establishing, but would function independently. Experience from matching grant projects in developing countries indicate that autonomous management of the implementing agents offer increased flexibility, improved responsiveness and a more entrepreneurial attitude in meeting client needs than public sector providers. Companies are more willing to participate in a MGS that has a rigorous, transparent and competitive selection procedure that adds credibility and integrity to the process. Also, start-up delays can be significantly reduced with an independent implementing partner contracted to deliver agreed results in a specified time frame. Therefore, the Manager of the MGS (MGSM) would be a private sector organization, selected through a competitive process. The MGSM would operate at arm's length from funding agencies, whilst being accountable to the funding agencies.

The MGSM would consist of a team that is knowledgeable about the agricultural business sector in Pakistan so that they can act as a facilitator of ideas and proposals, and be proactive in promoting the MGS as a means to commercialize agriculture and stimulate agribusiness development. The MGSM would be led by a business expert with knowledge and experience of developing downstream agricultural businesses in developing countries. The Team Leader would be supported by local advisors with extensive experience working in agribusiness and other business enterprises in Pakistan. These team members would be supported by a Financial Manager responsible for administration, accounting and developing financial management training courses as required. The expected cost for this independent management model may be in the range of 10-20 percent of the total MGS budget.

A successful MGS requires a constructive awareness raising and communication campaign targeting potential business applicants, managed by the MGSM assisted by one or more communications specialists. The MSM would actively solicit responses from businesses, rather than simply advertising the scheme with the expectation that the target market will be ready with workable project proposals. With the help of communications specialist(s), the MSM would develop and implement a Marketing and Communications Strategy to attract businesses to establish subsidiary investments in Punjab, companies in Punjab to expand their operations, and new start-up businesses. The Marketing and Communications Strategy will inform the business community of the types of opportunities that exist in Punjab agricultural industries, and facilitate the generation of ideas and preparation of applications. This would necessitate personal meetings, phone calls, roadshows, workshops and seminars

in order to build knowledge of MGS and potential business opportunities within the business community. The Punjab Chamber of Commerce would be a good partner in this respect.

Consideration may be given to implement a two-tier MGS in which **Tier 1** would target large-sized enterprises where an opportunity exists to expand supply networks through additional funding. Examples include projects with smallholder farmers in promoting minimum tillage and mechanization of cereal cropping, fresh milk collection, modern butcher retailing, or development of new industries in Punjab such as floriculture and controlled-atmosphere storage for high value fruit and vegetables to exploit higher prices in off-seasons and export markets. Tier 1 investment projects would be selected based on their potential to impact large numbers of farmers. Strategic partnerships between a private company and public funding would expand supply networks through greater inclusiveness of smallholder farmers in higher value markets.

Projects under Tier 1 would involve Grants in a range of \$250,000 - \$500,000 matched by companies on a percentage basis. The investment projects would involve equipment and machinery purchases, infrastructure, technical support, training and development of contract farming agreements. The grant contribution would be devoted to investments primarily in the produce supply-side of the project (i.e. on-farm costs) and the company contribution would be for infrastructure, machinery and technical support to farmers. The MGS would be proactive in identifying large companies wishing to expand their networks and grow their businesses, with a substantial social benefit. The MGS would design a multi-year investment project in collaboration with the company, sign partnership and funding agreements, and monitor the investment results.

#### *Example*

MGS could consider partnering Engro Foods, which operates the largest UHT Milk supply chain in Pakistan. They work with about 43,000 farmers, mostly smallholders (3-5 cows) and operate 1500 milk collection centers. About 35 percent of their daily milk supplies are sourced through middlemen, and Engro would like to reduce this level further, by collecting more milk direct from farmers. They have a network of animal husbandry advisors, veterinarians and affiliated input suppliers located in the field which provide an efficient package of services to their milk suppliers with the objective of providing clean milk into their processing factory. The MGS would support smallholders on-farm investments in housing, breeding, and feeding to bring them up to the required Engro standards. Engro investments would be in village milk chilling centers, technical support and training to farmers, establishment of village-level Artificial Insemination services, and supply of other improved production inputs.

**Tier 2** investments encourage small and medium enterprises (SMEs) to propose innovative and sustainable investment projects that demonstrate a social benefit through their impact on smallholder farmers in Punjab. Size of grants would be \$50,000 to \$250,000, again on a percentage basis. The MGS would help to overcome the lack of readily available affordable finance for SMEs to fund their growth and expansion in the local agricultural industry, which is a serious impediment to the growth of value addition in downstream industries of key agricultural commodities within Punjab. Under this Tier, special attention would be

given to attracting female entrepreneurs and younger people into agriculture and agribusiness, as well as recent graduates from universities and veterinary colleges who have technical expertise but lack financial and business support.

Applications for funding would be assessed through a two-stage competitive bidding process. The first stage would involve submission of a simple Concept Note (CN) which will outline the project and bidder and demonstrate that they satisfy the eligibility criteria. This process allows the MGSM to filter out ineligible bidders at an early stage without the need to construct a detailed business plan. CNs would be reviewed and bidders whose concepts are accepted, will be invited in stage two to develop a full-fledged application that sets out the full business case/production enhancement for the proposed investment project. The MGSM would provide 'light touch' support to businesses requesting assistance to draft their applications – in the interests of transparency and competitiveness, the MGSM would only be able to provide generic advice to businesses in completing the MGS pro-forma application and would not provide technical advice or business direction on any proposals.

All applications supported by the MSM would be referred to an independent appraisal panel to evaluate, score and rank proposals, and make funding recommendations. It would be expected that a large proportion of proposals that reach this stage would be approved for funding. The size and complexity of applications would determine the experts required on the appraisal panel – small investment projects may require only one reviewer, whereas larger, more innovative or technically complex proposals may require several reviewers. Grants would be awarded to commercial activities based on criteria such as matching contributions from the beneficiary companies, capacity to leverage private funds, and potential for wider social impact (drawing smallholders, especially women, into HVA value chains).