

COUNTRY PRESENTATION



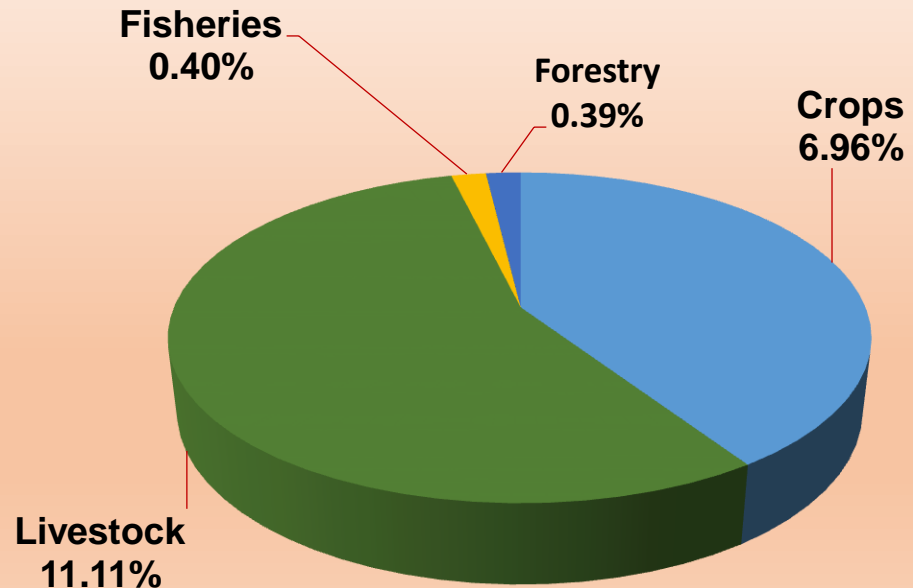
ENGR. LIAQAT ALI SHAHID
Director General

Agricultural Engineering Division
Pakistan Agricultural Research Council
Islamabad-Pakistan

Agriculture in National Economy

Contribution to GDP	= 18.86%
Labour force employed	= 42.3%
Provides Livelihood to rural population	= 64%
Average Growth rate in last 5 years	= 2.8%
Share of agriculture in total exports	= 57.3%

Sectoral Share in Agri. GDP 2017-18



Source: Economic Survey of Pakistan 2017-18

Problematic State of Smallholder Farmers in Pakistan

- Their high exposure to the climatic hazards and the earnest need to decrease both their present and future vulnerability to these dangers.
- Key Vulnerability factors are:
 - Small landholdings;
 - less innovation;
 - low capitalization; and
 - various non-climatic stressors
- Strength Components:
 - family labor;
 - crop expansion; and
 - indigenous knowledge cannot be depreciated.
- Expanding the profitability of smallholder farming systems is a big challenge that will require a critical and specialized, budgetary and political support at national and global levels.

Adoption of Agricultural Mechanization by Smallholders (1)

- Agricultural mechanization plays a strategic role in improving agricultural production and productivity in developing countries.
- The average farm size in Pakistan is small (2.5 acres) and small and marginal landholdings (less than 2.0 ha) account for 85% of landholdings.
- Mechanizing small and non-contiguous group of small farms is against 'economies of scale' for individual ownership of farm machinery.
- It was observed that there was a direct correlation between farm power availability and productivity during the past six decades. Being an agrarian country, mechanization can be called as backbone of Pakistan's economy as it optimizes the use of biological, chemical and hydrological inputs.

Adoption of Agricultural Mechanization by Smallholders (2)

- Selective farm mechanization - remained limited to use of tractors only
- Tractor population: 1975-1984 was about 341%; 1984-1994 was about 61%
- At present there are about 0.94 million tractors in Pakistan, which alone provides 0.84 hp/acre
- Land preparation: Nearly 100% mechanized
- Planting and spraying: Partially mechanized
- Threshing Operation: Nearly 100% mechanized for cereal crops
- By increasing the available hp/acre and by the proper management of agricultural machinery the average crop yield can be enhanced

Policy Measures and Implementation Strategy (1)

Reduction in import duties and taxes on small field machinery	List of small machinery and equipment included in the schedule of import machinery
Reduction in GST on sale of farm machinery	Enhance the use of import substitute agricultural machinery and tractors
Develop efficient farm mechanization and processing technologies to reduce cost of production, enhance timeliness of operations, add value to crops and reduce post-harvest losses at farm level	Encourage and assist research scientists/engineers from PARC and other R&D/Academic institutions to win funding for development and introduction of efficient farm mechanization and processing technologies
Promotion of Precision and Conservation Agriculture for profitable production	Technology development started
Incentives for import of machinery for hay/silage making, milking, dairy and meat products	Reduce import duties and taxes on such machinery

Policy Measures and Implementation Strategy (2)

Aquaculture mechanization for intensive production, processing and maintaining cold chain	Start consultation with R&D institutions and other stakeholders
Persuasion for establishment of a “National Center for Testing of Agricultural Machinery (NCTAM)” with regional/provincial satellite institutions under Ministry of Industry and supported by Engineering Development Board	Quality production of agricultural machinery and tractors
Development of National Network of Agricultural Mechanization to coordinate agricultural mechanization R&D	Start consultation process with concerned national and provincial R&D institutions
Promotion of the use of alternate and renewable energy sources at farm level	Utilization of solar energy for drying
Establishment of machinery pools as farm-services centers by provinces in private sector	Encourage and assist small and medium size private investors and entrepreneurs

Policy Measures and Implementation Strategy (3)

Promotion of innovative practices that increase yields and soil fertility (e.g. Precision/Hydroponic Agriculture) for profitable production	Residue management
Incentivizing industry for manufacturing quality farm machines	Legislation to enforce standardization in agricultural machinery manufacturing sector
Indigenization of economically viable farm mechanization	Dissemination of newly developed machines and technologies through manufacturing industry
Mechanization/processing/value addition through cluster approach	Establish farm-level processing centre

Issues

- Increasing population pressure
- Dwindling land for agriculture
- Shrinking water resources

(Severe shortage in water availability crop production)

- High water losses in irrigation system
- Low agricultural productivity

Options

Conservation Agriculture for Sustainable improvements in crop productivity to:

- **improve livelihood**
- **reduce poverty**
- **foster food security**

Resource Conservation Technologies

- Laser Land Leveling
- Zero Tillage Technology
- Wheat Straw Chopper
- Pak Seeder
- Waste Biomass Processing Technology
- Bed Planting

Laser Land Leveling

- Curtails irrigation application losses (25 %)
- Reduces labor requirement (35%)
- Enhances cultivated area (by reduction of ditches and dikes) (2%)
- Increase crop yield (20%)



Conventional field



LASER leveling in operation

Zero-Tillage Technology

- Substantial Labour and Fuel saving
- Allows timely sowing of wheat
- Enable uniform drilling of seed
- Improves fertilizer use efficiency
- Saves 20-25% water
- Increases yield up to 20%



Crop Residue Management (1)

Burning of wheat stubbles in the fields:

- Deteriorate soil condition
- Lower soil ability to produce high yield
- Burn beneficial insects in the soil
- Endanger natural environment
- Result in considerable financial loss to farmers



Crop Residue Management (Wheat Straw Chopper) (2)

Impact

- Improves soil health, productivity, and microbial activity
- Increases organic matter contents & enhances infiltration
- Less weeds infestation
- Improves water & nutrients use efficiency
- Additional income from grain recovery and chaff sale



Crop Residue Management (Pak Seeder) (3)

Issues:

- Short time window between rice harvesting & wheat sowing in basmati areas
- Low yield of wheat in rice -wheat areas



Performance:

Field Capacity (acres/h):	0.75-1.0
Power Requirement (hp):	50
Fuel Consumption (l/h):	6 L/h

Main Features:

- Mulching of rice straw without burning adds nutrients in the soil
- Saves one irrigation, weedicide & increases yield up to 250 kg/acre
- Saves Rs. 13,000/acre

Crop Residue Management (Power Disk plow (4)

Issue: Seed bed preparation for wheat in paddy fields

Power Source: Tractor PTO

Capacity: 0.4 ha/h

Tillage Depth: More than 7 inches

Saving: Rs. 3500/ha



Waste Biomass Processing Technology

Issue: Non-utilization of trimmed tree-top material and waste biomass

Processing capacity	:	About 1000 (1 tonne/h) kg/h
Raw material	:	Trimmed and other field waste materials
Uses	:	Fuel for brick factories, organic matter for marginal land



Bed Planting of Wheat

- Saves water to the tune of 30-40%

BENEFITS

- Reduces crusting of soil
- Increases yield up to 10%
- Makes intercultural operations easier



Bed and Furrow Planting of Cotton

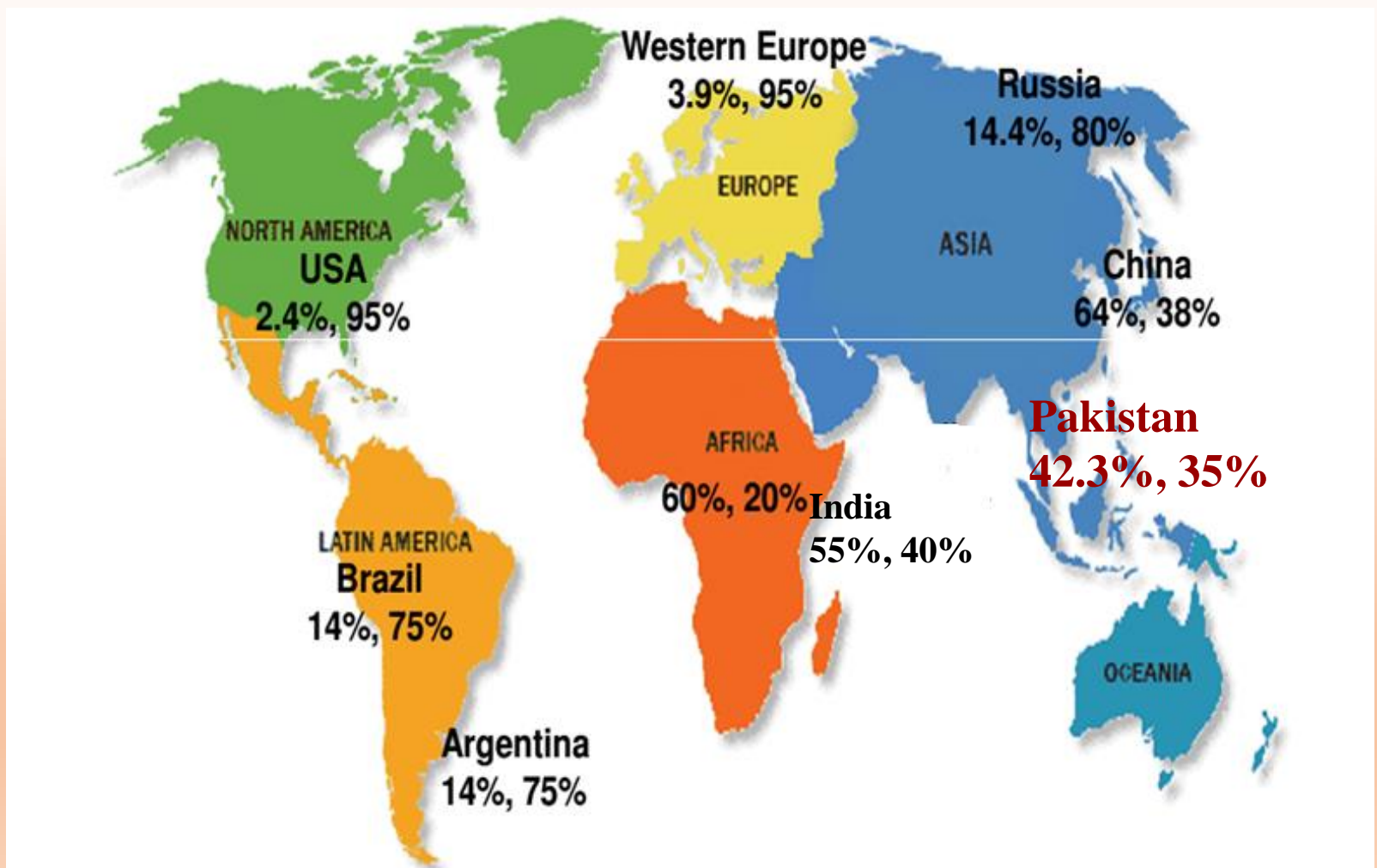
- Savings of about 40 % irrigation water
- Reduce plant submergence
- Controls crusting of soil
- Enhance fertilizer use efficiency



Level of Farm Mechanization in Pakistan

Operation	Percentage
Land and seed bed preparation	40
Seeding and Planting	29
Plant protection	34
Harvesting and threshing	60-70 % for wheat and rice and 5% for other crops
Over all level of mechanization	35

Labour Force/Overall Mechanization Level



Contribution of Tractor Schemes

No doubt, the tractor schemes have helped mechanisation of farming:

- About 76 percent farmers now cultivate land with tractors
- 20 percent with tractors and draught animals; and
- Only 4 percent use draught animals alone.

Number of Implements for Thousand Acres

Machinery	Year 2014	Population w.r.t Tractor Production	Implements for thousand acres
Cultivator	901473	97	29
MB Plow	189784	28	8
Disc Plough	142338	21	6
Disc Harrow	94892	14	4
Ridger	157200	23	7
Drill	295184	43	13
Trolley	340000	49	15
Thresher	353768	51	16
Reaper	66958	10	3
Combine Harvester	13072		1
Chisel Plow	47446	7	2
Rotavator	113870	17	5
Blades	325500	47	14
Sprayers	1438991		63

Power Available for Agricultural Operations

Power Source	Numbers	kW/Unit	Power Available (million kW)	Share of Each Source (%)
Agriculture Labor Force (million)	56.05	0.09	5.04	12
Work Animal (million)	2.77	0.49	1.36	3
Tractor Population Medium size Tractor (37 kW) 80% of total population	0.458	37.00	16.95	42
Large size tractor(51 kW) – 20% of total population	0.114	51.00	5.81	14
Diesel engines and electrical motors (1)	0.177	9.32	1.65	4
Diesel engines and electrical motors (2)	0.746	13.428	10.02	25
Total Power (million kW)		40.83		100
Power available for cultivation, 90% assumed		36.75		
Total cultivated area (million ha)		22.77		
Power Available (kW/ha)		1.61		

Estimated Contribution from Farm Mechanization

- Saving in seed: 15-20%
- Saving in fertilizer: 15-20%;
- Increase in cropping intensity: 5-20%;
- Saving in time : 20-30%;
- Reduction in manual labour: 20-30%; and
- Overall increase in farm productivity 10-15%

Challenges and Opportunities for Agricultural Mechanization (1)

Challenges:

- Agricultural mechanization is mainly limited to crop production
- Wheat production substantially mechanized, however, production of rice, maize, cotton, sugarcane, vegetables and fruit remains partially mechanized
- Low farm power availability
- Underutilized tractor power due to non-availability of complete set of machinery
- Inadequate custom hiring services for farm machinery
- Harvest quality issues due to use of imported old combines
- Limited access of farmers to modern agricultural machinery
- High post-harvest losses and low level of value addition at community level

Challenges and Opportunities for Agricultural Mechanization (2)

Opportunities:

- R&D Facilities:
 - Private sector R&D to meet obligation of product quality at competitive prices
 - Public sector R&D institutes should be upgraded and focus on market driven issues, and such institutes need to be established in each province
 - Central facilities for manufacturing of specialized/critical components
- Joint venture avenues for local production of specialized machinery
- Setting up of rental services centers
- The Long-Term Plan (2017-2030) CPEC - Comprehensive Framework for bilateral cooperation for Industrialization, Value-addition and Job creation

Agricultural Mechanization Strategy

Lessons Learnt and Good Practices (1)

- 15 farm machinery manufacturers in 1959, as a result of liberal government policies their number increased to around 600.
- The growth of tractor industry substantially increased due to relief in government taxes and duties
- Renting of tractors with tillage implements, sprayers and wheat threshers by individual farmers to their neighbors increased
- Renting of combine harvesters by custom hiring companies also enhanced
- Set up Model Farm Service Centers at district level in Khyber Pakhtunkhwa
- Subsidies on farm machinery to selected farmers: Sindh and Punjab

Agricultural Mechanization Strategy

Lessons Learnt and Good Practices (2)

Provision of Farm Machinery to Farmers on 50% Subsidy by Government of Punjab

S. No.	Year	Machinery	Amount (PKR*Million)
1.	2015-17	Rotavator, Disc Harrow, Chisel Plough, Seed Drill and Sugarcane Ridger	1145
2.	2010-11	Wheat Straw Chopper-cum-blower	31.5
3.	2008-10	Rotavator, Disc Harrow, Chisel Plough, M.B. Plough, Coulter Drill, Rota Drill, Groundnut Digger, Reaper-windrower, Potato Planter, Potato Digger, Sugarcane Planter, Sugarcane Ridger, Vegetable Ridger, Maize Sheller, Citrus Sprayer and Dogger Cutter	459

* Exchange Rate: Pak Rs. 106/US\$

Agricultural Mechanization Strategy

Lessons Learnt and Good Practices (3)

- Establishment of Hi-Tech Mechanization Service Centers (HMSCs) in 31 districts of Punjab with a total cost of PKR 3,830.205 million. These centers will be operated by the private sector.
- Credits facilities to Small and Medium Farmers. Five major banks as a group have disbursed Rs. 292 billion or 56.6 percent of its annual target, ZTBL disbursed Rs. 51.9 billion or 41.5 percent of its annual target.
- The production of 45,325 number of tractors during FY 2018 with a remarkable growth of 37.6 percent due to decrease in GST from 10% to 5% that has increased the demand of tractors.
- Due to tax relaxation, the agricultural machinery import during 2016-17 was of US\$50,000 compared to the US\$40,000 during 2015-16 (*Annual Plan 2017-18*).

Present Government Initiatives

- A National Agriculture Emergency Program worth PKR 278 billion has been approved by the federal cabinet chaired by the Prime Minister of Pakistan
- The declaration of an agriculture emergency to increase the profitability of farmers was one of the first 35 initiatives promised by the Ruling Party after coming into power.
- In Agriculture Emergence Program: four crops; wheat, rice, sugarcane and oilseeds: target productivity increase min 7%

Thank You!