

POLICY BRIEF

BEYOND THE TRACTOR

Pakistan's Next Mechanization Wave

APRIL, 2026



Acknowledgements

This policy brief has been developed by Shan E Ahmed (shaneahmed1@gmail.com) as part of Pakistan Business Council's aim to review specific thematic areas in the agriculture and livestock sector. The author extends special thanks to Mr. Aadil Farooq Khan (CEO, Dawood Agro Company), Dr. Ahmad Nawaz (International Agronomist, Asian Development Bank), Mr. Amjed Ahmed (Head of Operations, Jaffer Brothers Ltd./Khushaal Kissan), Mr. Chaudhry Ashraff (ex-Director General, On-Farm Water Management Wing Punjab), Mr. Hamza Muneer Asam (Agricultural Engineer/Consultant, Asian Development Bank), Mr. Khalid Mehmood (National Sales Manager, Meskay & Femtee Trading Company), and Mr. Yasir Bajwa (GM Farm Equipment, Farm Dynamics Pakistan) for their generous guidance and support for this policy brief.

The Pakistan Business Council (PBC) is a research-based business policy advocacy platform, supported by over 100 private sector companies, local and multinational, that have significant and long-term commitment to sustainable growth of the country. They come from 17 major sectors of the formal economy, generate 40% of annual exports, contribute a third of Pakistan's total tax revenues and employ three million. Their combined sales represent every 9th Rupee of Pakistan's GDP. PBC's major thrust is "Make-in-Pakistan" with three pillars: "Grow More/Grow Better", "Make More/Make Better" and "Serve More/Serve Better," all with the objective of generating jobs, promoting exports and reducing imports. This study is under the "Grow More/Grow Better" pillar. (www.pbc.org.pk)

Disclaimer

The findings, interpretations and conclusions expressed do not necessarily reflect the views of the Board of Directors and Members of The Pakistan Business Council or the companies they represent. Any conclusions and analysis based on the data from reports, and expert interviews are the responsibility of the author(s) and do not necessarily reflect the opinion of the above organizations. Although every effort has been made to crosscheck and verify the authenticity of the data, The Pakistan Business Council, or the author(s), do not guarantee the data included in this work.

For any queries or feedback regarding this report, please contact hareem@pbc.org.pk

THE PAKISTAN BUSINESS COUNCIL

COMPANY OVERVIEW

The Pakistan Business Council (PBC) is a research-based business advocacy platform established in 2005. It is now supported by over 100 private sector local and multinational businesses with significant investment in, and long-term commitment to sustainable growth of the country. They come from 14 countries, have leading roles in 17 major sectors of the formal economy, generate 40% of annual exports, contribute a third of Pakistan's total tax revenues and employ three million. Their combined sales represent every 6th Rupee of Pakistan's GDP.

PBC's major objectives are to advocate policies that lead to creation of jobs, value-added exports and reduction in import reliance through improved competitiveness of manufacturing, services and the agriculture sectors. It also promotes formalization of the economy.

PBC's over-arching theme, "Make-in-Pakistan" consists of three pillars: "Grow More/Grow Better", "Make More/Make Better" and "Serve More/Serve Better." Its evidence-based advocacy is backed by over a hundred studies to date through its full-time research team, supplemented by collaborative research with renowned industry experts and economists.

Through its Centre of Excellence in Responsible Business (CERB), PBC works to build capacity and capability of businesses beyond its membership, to adopt high environmental, social and governance standards. PBC holds conferences, seminars and webinars to facilitate the flow of relevant information to all stakeholders in order to help create an informed view on the major issues faced by Pakistan. Through its presence in Islamabad and Karachi, it works closely with relevant government departments, ministries, regulators and institutions, as well as other stakeholders including professional bodies, to develop consensus on major issues impacting the economy.

PBC is a pan-sectoral, not-for-profit, Section 42 entity. It is not a trade body; therefore, it does not advocate for any specific business sector. Rather, its key advocacy thrust is on easing barriers that thwart competitiveness of businesses in Pakistan. Further information on the PBC is available on: www.pbc.org.pk.

The PBC's founding objectives are:

1. To provide for the formation and exchange of views on any question connected with the conduct of business in and from Pakistan.
2. To conduct, organize, set up, administer and manage campaigns, surveys, focus groups, workshops, seminars and fieldwork for carrying out research and raising awareness in regard to matters affecting businesses in Pakistan.
3. To acquire, collect, compile, analyze, publish and provide statistics, data analysis and other information relating to businesses of any kind, nature or description and on opportunities for such businesses within and outside Pakistan.
4. To promote and facilitate the integration of businesses in Pakistan into the World economy and to encourage in the development and growth of Pakistani multinationals.
5. To interact with governments in the economic development of Pakistan and to facilitate, foster and further the economic, social and human resource development of Pakistan.

The PBC Member Companies



INTERLOOP

INTERNATIONAL INDUSTRIES LTD.

ISMAIL INDUSTRIES LIMITED

Daraz

JS BANK

Jubilee
GENERAL INSURANCE

K&N's

KE
KARACHI ELECTRIC SUPPLY CO. LTD.

THE STRENGTH
KOHAT CEMENT

LIBERTY

LIPTON
Teas and Infusions

LOTTE

LUCKY CEMENT

MACPAC FILMS



Martin Dow
Creating Opportunities for Life

CHANGAN AUTO

MEGA
MEGA CONGLOMERATE

MAHMOOD GROUP

National FOODS
SINCE 1970

NAVEENA GROUP

Nestlé
Good food. Good life

NIMIR

OLP

Packages Limited

Jazz

Pakistan Oxygen

PSL
PAKISTAN SERVICES LTD.

PSX
PAKISTAN STOCK EXCHANGE LIMITED

PEPSICO

قشقرق

reckitt

MASOOD ROOMI

SAIF GROUP

SAP

Sapphire

Servis

Shan

Atlas

SICPA

SIEMENS

Soneri Bank

SOORTY
WIND OF SOON

SPEL
Synthetic Products Enterprises Limited

Standard Chartered

systems



The PBC Affiliates



Contents

Executive Summary	11
Current State of Farm Mechanization in Pakistan	12
<i>Mechanization Adoption and Trends</i>	12
<i>Types of Machinery in Use</i>	14
<i>Gaps and Productivity Implications</i>	15
Key Players and Service Delivery Models	16
Challenges to Widespread Mechanization in Pakistan	19
Box: A Tale of Two Machines	23
Opportunities and Future Prospects	25
Recommendations	27

AUTHOR

Shan E. Ahmed

shaneahmed1@gmail.com



Executive Summary

Agricultural mechanization in Pakistan has grown over time but remains uneven, fragmented, and well below global benchmarks, limiting its contribution to productivity and farm incomes. With farm power at just 0.09 horsepower per acre - far below the recommended 1.4–1.8 hp - there is a clear structural deficit in mechanical capacity. While tractors are widely used and operations like land preparation and threshing are largely mechanized, key stages such as sowing, transplanting, and harvesting remain inefficient or manual in many areas. This partial mechanization constrains yields and contributes to significant post-harvest losses.

A major issue is the widespread use of outdated and poorly maintained machinery. Combine harvesters, often averaging around 40 years old, are typically imported near the end of their lifecycle and kept running through temporary fixes. Although this reduces upfront costs, it leads to inefficiencies, including grain losses of 10–15% in major crops like wheat and rice—equivalent to about USD 1.5 billion annually. The use of mismatched machinery, such as wheat combines for rice harvesting, further reduces quality and increases losses. Regional disparities also exist, with Punjab relatively more mechanized, while Sindh relies heavily on manual harvesting due to unsuitable soil conditions for heavy machinery.

Pakistan's smallholder-dominated farm structure means most farmers cannot afford to own machinery and instead depend on rental services. These service providers are central to mechanization access but face challenges such as inconsistent demand, limited scale, and peak-season shortages. As a result, timely availability of machinery remains a persistent issue.

The mechanization ecosystem involves government programs, private suppliers, and development partners. Public initiatives, such as the successful promotion of laser land levelling in Punjab, show that targeted support and private sector engagement can drive adoption. However, weak standards, limited testing, and poor after-sales services continue to undermine equipment quality and reliability.

Several interconnected constraints hinder progress. High machinery costs, exchange rate volatility, and limited access to credit push farmers toward cheaper but inefficient equipment. Tax and duty structures further raise costs and discourage formalization. Additionally, shortages of skilled operators and mechanics, weak repair systems, and poor suitability of machines to local conditions reduce efficiency.

Going forward, the focus should shift from simply increasing machine numbers to building a reliable mechanization services ecosystem. Strengthening rental markets, promoting service hubs, improving standards, and enabling better access to finance are critical. Integrating mechanization with sustainability, particularly through better residue management, can also create economic value. Overall, a coordinated, system-wide approach is essential to unlock productivity gains and improve farmer incomes.



Current State of Farm Mechanization in Pakistan

Agricultural mechanization in Pakistan has expanded significantly over the past few decades but remains uneven, incomplete, and far below global standards. The current state of mechanization is a major reason for the limited productivity and efficiency across major crops grown in Pakistan. Agriculture continues to be a cornerstone of the economy and a major employer of the country's labour force, yet its performance is constrained by low mechanization, fragmented landholdings, and outdated practices.

Mechanization Adoption and Trends

Mechanization uptake has risen steadily over time, mostly driven by increased tractor usage and growing use of harvesters and threshers. However,

available evidence suggests that mechanization is selective and incomplete, with certain operations mechanized (e.g., tillage and threshing) while others, especially sowing, transplanting, and harvesting in many regions, remain largely manual.

Low mechanization per acre: Pakistan currently has an estimated 0.09 horsepower (hp) of farm power per acre, far below the internationally recommended 1.4 to 1.8 hp per acre benchmark for efficient farm mechanization indicating a significant gap in mechanical capacity on farms.¹ Around 700,000 tractors are operational nationwide², which are insufficient relative to crop area, especially in power requirements.

¹ International Trade Administration <https://www.trade.gov/country-commercial-guides/pakistan-agricultural-machinery-and-equipment>.

² Pakistan Economic Survey 2024-25, p 35.

Most of the tractors used in Pakistan are low horsepower machines (often with rated power of 85 hp but operationally around 55 hp) that often require multiple passes to prepare the land and are often unable to operate farm implements effectively. For example, reversible ploughs which are used for deep ploughing to overturn the land to effectively mix the stubble and roots from the previous crop (which then decomposes and nourishes the soil), cannot be operated effectively with the current fleet of tractors available in Pakistan.

High losses due to old and improper machinery:

Combine harvesters and reapers are now far more common, but harvest losses remain stubbornly high, driven largely by mismatched machinery. Losses of 10 to 15% are still reported in key cereals such as wheat and rice, with losses often worsening when wheat-oriented combines are used to harvest rice paddy.³ Even under a 10% loss assumption, the implied value of grain lost at harvest alone is roughly USD 1.5 billion per year.

A defining feature of the mechanization landscape is the age profile of equipment. An ADB survey found the average combine harvester age to be around 40 years.⁴ Many of these machines are long obsolete elsewhere. They enter Pakistan at the end of their lifecycle, often as scrap, and are kept running through cannibalized parts, local fabrication, and patchwork repairs. This keeps services cheap in the short run, but it also locks the system into higher losses, frequent breakdowns, and unreliable performance.

Much of the growth in mechanization has been driven by labor scarcity and rising wage costs, but the degree of mechanization adoption varies widely across provinces and among farm sizes.

■ Commonly used implements in Pakistan



Disc Harrow



Cultivator



Rotavator



Chisel Plough



Laser Land Leveler

³ Rehman, et al. *Current Status and Overview of Farm Mechanization in Pakistan – A review*. *Agricultural Engineering International: The CIGR e-journal*. 18. 83-93.

⁴ *Asian Development Bank: Punjab Climate-Resilient and Low-Carbon Agriculture Mechanization Project* <https://www.adb.org/sites/default/files/project-documents/57196/57196-001-iee-en.pdf>

Mechanization adoption is the highest in Punjab's wheat and rice belts, particularly for land preparation and cereal threshing, where machinery rentals and custom hiring is the norm, followed by to a large extent in Sindh. However, most of the harvesting of rice in Sindh is done by hand as the larger combine harvesters that are used in Punjab are not suited for Sindh's soils. Large parts of Sindh have clayey soils which retain water and are not sufficiently dry at the time of harvest and large combines tend to get stuck in the mud. In the absence of proper machinery, farmers continue to rely on manual harvesting methods.⁵

Land preparation is almost universally mechanized across much of Pakistan's agricultural landscape, anchored by widespread tractor ownership and implement use, particularly for tillage operations. Commonly used implements include the disc harrow (breaks large clumps of soil and also chops and incorporates stubble from previous crop), cultivator (prepares soil into an aerated seed bed), rotavator (breaks and aerates the soil), and chisel plough (for deep tillage), while laser land levelling has also become increasingly prevalent.

Planting and spraying equipment have grown in number but are still far from being efficient. Seed drills have increased significantly compared to traditional broadcasting, improving seed placement and typically reducing seed rates per acre. Precision technologies such as pneumatic planters, however, remain limited and are largely confined to advanced, commercial farmers.

Smallholder farmers, who make up the overwhelming majority of farms, often lack the scale or capital to own machinery and rely on rental of machinery through service providers, and in case the machinery is not available, to manual

operations for critical tasks like transplanting and harvest timing.

Types of Machinery in Use

The mechanization landscape in Pakistan includes a mix of imported and domestically assembled equipment, but local capacity is limited, meeting only a certain portion of total machinery requirement. Tractors remain the key feature of the current state mechanization, with both local assemblers (e.g., Al-Ghazi Tractors and Millat Tractors) and imports supplying the market. Nearly all cereal threshing is mechanized⁶ as locally produced threshers are available for rent at the village level, though efficient use depends on timeliness and operator skill. Spraying has also moved from hand-pumped knapsack sprays to battery operated knapsacks but unsafe use which puts the sprayer at risk of exposure to harmful pesticides remains a problem.

A few drone spraying companies have entered the market and by one industry estimate, there are around 700 drones operating the country, however, the demand is much higher than that. Drone sprays for pesticides are especially effective on sugarcane and maize crops as the height of the crop makes it difficult to go in the field to spray manually. However, scaling of drone operations has been slow due to compliance friction and operating constraints, including security concerns that limit who can import drones, and a permissions regime where operators may need operational approvals/ NOCs from local authorities to fly in many areas. As a result, only a handful of importers and service companies are able to operate.

⁵ Interviews with farmers and service providers

⁶ Memon, Z. et al. *Adoption of Farm Mechanization for Improved Yield in Pakistan: A Comprehensive Review International Journal of Agriculture & Sustainable Development*. (https://www.researchgate.net/publication/387749663_Adoption_of_Farm_Mechanization_for_Improved_Yield_in_Pakistan_A_Comprehensive_Review)

Costs also remain a hurdle as drone spraying is typically twice as expensive as manual application (around Rs. 800 vs. Rs. 350 per acre), although many farmers still prefer it because more controlled application can reduce wastage of chemicals.

Gaps and Productivity Implications

The current mechanization profile reveals several gaps that directly affect agricultural productivity:

- **Under-mechanized operations:** Land preparation, sowing/transplanting, and proper harvesting remain weak points in many areas, contributing to unrealized yield potential and post-harvest losses
- **Low utilization:** Machinery utilization is often seasonal and uneven, reducing cost-effectiveness, especially for expensive equipment on small plots
- **Unavailability of machines:** the right crop-specific machines are often not available at all
- **Technology quality and age:** A large share of machinery in use is old or poorly maintained, with performance and reliability well below modern standards, which raises losses, increases breakdowns, and undermines service quality.

Collectively, these gaps mean that while mechanization has grown, its potential to transform productivity and reduce labor bottlenecks is not fully realized, leaving significant room for progress/development.

Key Players and Service Delivery Models

There are several important players that influence the machinery ecosystem which includes government departments, private machinery supply chains (manufacturers, importers, dealers), and, most importantly for smallholders, service providers who rent machinery as a paid service. Evidence from ADB-supported work in Punjab shows that adoption is less about machine ownership and more about whether farmers can access reliable services, spare parts, skilled operators, and timely availability.⁷

Public sector: Provincial agriculture departments and public programs

Provincial agriculture departments shape mechanization primarily through program design, subsidies/procurement, demonstrations, and training/extension. A key public role is facilitating diffusion through demonstrations and farmer outreach. In recent past, government has supported farmers to access advanced harvest and post-harvest technologies by mobilizing the private market rather than building state-run fleets.

A strong example of effective public support for mechanization is Punjab's program to scale laser land levelling between 2005 and 2008 which was then followed by further promotion of the technology under the Punjab Irrigated-Agriculture Productivity Improvement Project (PIPIP) which ran from 2012 to 2016.



⁷ Enhancing Technology-Based Agriculture and Marketing in Rural Punjab, Asian Development Bank, Nov 2024.

These programs marked a pivotal shift in approach: instead of the government trying to deliver the service itself, it focused on crowding in private provision and encouraging farmers (including part-time farmers) to become service providers. It also placed extra emphasis on quality assurance, with stringent eligibility and pre-qualification criteria for supply and service companies participating in the scheme. Training, capacity building, and after-sales oversight were built into the program design, helping ensure machines remained functional and services reliable. Once a critical mass was reached, laser land levelling began to operate as a self-sustaining market, and improved availability made adoption easier for farmers season after season.⁸

A second (often missing) public function is regulation and standards. Machinery and implements have historically entered the market without adequate testing, which has contributed to quality and after-sales issues.⁹

Private machinery supply chain: Manufacturers, importers, and dealer networks

The private supply chain determines what machinery is available, how affordable it is, and whether it can be kept operational through spare parts and repairs. Pakistan often imports used and old harvesters because of their low price,

and certain older models dominate because they are inexpensive, easy to operate, and have readily available spare parts. Newer series are present but remain limited (reasons are discussed in the Challenges section of this brief).

Service providers: The core delivery channel

For small and medium farmers, mechanization is most commonly accessed through rental services, especially for harvesting and other capital-heavy operations. A machine that is able to serve around 500 acres can only be bought by very large farmers which are few and far between. Service providers make it easy for even a 10-acre farmer to access these machines against a service fee for operators to come and deliver these services at the farm. Demonstrations through these service providers is often the best way for the promotion of machines. Service providers are not just delivery agents; they also create new markets based on demand. For example, many service providers imported rice-specific harvesters in response to farmer demand for lower losses and better paddy prices for better quality.

⁸ Interview with ex-Director General On-Farm Water Management of the Punjab Agriculture Department

⁹ *Enhancing Technology-Based Agriculture and Marketing in Rural Punjab*, Asian Development Bank, Nov 2024.



Development partners

Donors and implementers typically play a catalytic role: piloting machinery packages, producing evidence on performance and losses, and structuring stakeholder capacity building. Studies by donor organizations also include market mapping of service providers, manufacturers, and importers of machinery matters because mechanization often fails due to weak information on who provides what services, where, and at what reliability.

“Enablers” that determine whether service delivery works

Across players, the ecosystem hinges on a few practical enablers.

- **Spare parts and repair ecosystems:** Machinery choice is driven not just by performance but by whether spare parts, workshops, and operators exist locally. One reason for New Holland’s popularity is linked to the fact that spare parts, maintenance workshops, and experienced operators are readily available.
- **Standards and certification:** Weak testing and lack of standardization contribute to poor quality and after-sales problems, prompting calls for testing, evaluation, and certification centers.

Challenges to Widespread Mechanization in Pakistan



Despite steady growth in machinery use, especially in land preparation and harvesting, Pakistan's mechanization trajectory is constrained by interlocking economic, technical, institutional, and structural challenges. The constraint is rarely "too few machines" in the abstract; it is whether farmers and service providers can finance machines, access them on time, match them to field conditions, operate them well, and keep them running through parts and repair.

High upfront costs, exchange-rate exposure, and affordability constraints

A dominant barrier is the capital intensity of modern machinery (particularly harvesters and specialized equipment) alongside heavy exposure to currency volatility and imported components. In the rice-wheat belt, for example, a reconditioned Kubota rice combine was reported to rise from PKR 3.5 million (2019) to PKR 6.5 million (2023), attributed largely to rupee devaluation. This affordability squeeze pushes the market toward older, used imports that are cheaper upfront but often incur higher losses and maintenance burdens over time.¹⁰

¹⁰ *Enhancing Technology-Based Agriculture and Marketing in Rural Punjab*, Asian Development Bank, Nov 2024.

Pakistan's wheat harvester market, for instance, is characterized by the import of used and old harvesters because of low price. Where a new combine harvester costs around PKR 60 million, an old model in working condition would be for around PKR 15 million.

A related constraint is the broader farm power deficit and the high cost of upgrading. As mentioned earlier, Pakistan's available farm power has been cited at roughly 0.09 horsepower per acre versus a much higher "required" benchmark of 1.2 to 1.4 hp per acre.¹¹

Old and poorly maintained machinery drives losses and quality penalties

Mechanization outcomes depend on the quality of the machine base and how it is operated and maintained. In wheat, harvesting is highly mechanized, yet combines in use are frequently described as very old and poorly maintained, contributing to significant harvest losses. Field studies also show that operational parameters (e.g., speed) materially affect losses.

In rice, the quality penalty is even more pronounced when wheat-oriented combines are used to harvest paddy. Measured performance comparisons show conventional combines associated with higher impurities, broken grains, and higher average field losses than rice-specific harvesters.¹² The problem is compounded by residue outcomes as high stubble height from conventional combines (around 15 inches) can obstruct land preparation and increase incentives for residue burning.

Timeliness failures: machines are available, but not when farmers need them

Many mechanization benefits are time-sensitive. When harvest is delayed, or when sowing and land preparation slip, losses rise and the next crop window is compressed. Industry experience in the rice-wheat system highlights that delayed rice harvesting increases grain and straw losses and can delay seedbed preparation and planting and the accompanying labor shortages during peak season further push harvest delays.¹³

Smallholder structure and weak aggregation reduce service viability

Pakistan's farm structure makes individual ownership of many machines uneconomic and makes service delivery expensive per acre. The recent Agriculture Census reporting indicates a majority of farmers own less than 12.5 acres, of which large share operate very small farms (almost one-third of farming area belongs to farms under 5 acres).¹⁴

Service-provider models are essential for farmer inclusion, but fragmentation creates last-mile failures as small, scattered plots increase travel time, idle time, and transaction costs, making it commercially rational for providers to prioritize larger contiguous blocks unless demand is aggregated. This is one reason mechanization gaps persist most sharply around peak windows and in smaller-holder segments.¹⁵ One service provider interestingly quoted that middle-size farms around 25-30 acres are their preferred category as opposed to farms that are too small or too large.

¹¹ International Trade Administration <https://www.trade.gov/country-commercial-guides/pakistan-agricultural-machinery-and-equipment>

¹² Enhancing Technology-Based Agriculture and Marketing in Rural Punjab, Asian Development Bank, Nov 2024.

¹³ Asam, H. et al. Performance Evaluation of Half-Feed Rice Combine Harvester Pakistan Academy of Sciences 61(1): 81-88 (2024)

¹⁴ Agriculture Census 2024 - Pakistan Bureau of Statistics

¹⁵ Food and Agriculture Organization (FAO) policy dialogue Agricultural mechanization for smallholder farmers in Pakistan 2024

Large farms with hundreds of acres may make more economic sense, however, the service provider quoted “political issues” in dealing with these large farms.

Credit constraints for farmers and service providers

Mechanization is a capital investment problem as much as a technology problem. Formal credit constraints are especially binding for smaller farms and tenant farmers. One diagnostic using Pakistan’s farm structure shows that while only a minority of farms access direct bank loans, large farms capture a disproportionate share of formal financing, leaving smallholders more reliant on informal credit channels.¹⁶ When service providers cannot access medium-term asset finance, the replacement cycle of a machine stretches and service providers rely on older machines and “repair-to-survive” strategies.

Duties, taxes, and distorted incentives for formal service provision

The tax and duty regime raises the effective cost of mechanization and tilts the market toward informality. High import duties and related charges can increase the landed price of new machinery by around 30%, making modern equipment unaffordable for many farmers and service providers. At the same time, formal-sector service providers who want to professionalize and deliver reliable services face a double tax burden of income tax (around 15%) plus the provincial service sales tax (around 16%), which makes them less competitive than informal operators who are not in the tax net and can undercut prices (and frequently operate older, cheaper machines). Moreover,

financing support and subsidized schemes are commonly capped per beneficiary, which may help create new small-scale service providers but does not accommodate larger operators who need to finance multiple machines to achieve scale and year-round coverage.¹⁷

Without policy adjustments that recognize and support both pathways, that is, micro service entrepreneurs and scaled professional providers, the sector risks remaining fragmented, low-quality, and seasonal rather than evolving into a dependable mechanization services industry.

Skills gaps: operators, mechanics, and repair ecosystems

Across crops, the quality and efficiency of mechanization is heavily dependent on the operator’s skill. Most operators have not received any formal training which highlights the need for dedicated training programs. The ecosystem also lacks sufficient mechanics and maintenance workshops which is a major constraint in both rice and wheat technology. Weak availability of specialized mechanics, diagnostics, and reliable parts supply increases downtime during peak season.

Weak standards, testing, and after-sales accountability

A recurring institutional constraint is inconsistent quality of locally produced implements and weak enforcement of standards. The current local farm machinery manufacturers (mostly in Punjab) design and build equipment to their own specifications, with little consistency across the market. The result is poor interoperability and even basic components

¹⁶ *State of Pakistan’s Agriculture Report 2023*

¹⁷ *Interviews with service providers*

(fasteners, bearings, fittings) often vary from one manufacturer to the next, so parts aren't easily interchangeable. That turns routine maintenance into a scavenger hunt, thus raising repair costs, increasing downtime during peak seasons, and undermining confidence in local equipment.

Where after-sales service is weak, farmers and service providers respond by sticking to older "known" brands and models with established spare-part ecosystems, even if newer machines would reduce losses.

Suitability mismatches to field conditions and residue management

Mechanization performance depends on soil moisture, field levelling, lodging, and cropping patterns. In transplanted rice areas with damp, clayey soils, heavy combines can struggle with mobility and efficiency and can get stuck in the mud due to heavy weights. This is one of the reasons that, even today, almost all of rice harvesting is performed manually in Sindh. Machine type can also be a major factor in improper residue management as conventional combines used in rice can leave high stubble (around 15 inches), complicating land preparation and increasing incentives for residue burning.



Box: A Tale of Two Machines

Machine 1:
The half-feed harvester (the 'Straw Saver')

A half-feed rice harvester is built like a specialist. It takes the crop, feeding only part of the stalk into its threshing system so that the grain comes out clean while long, intact straw is laid in neat rows behind it. The field is left with relatively low stubble and a clear trail of usable straw that farmers can collect for livestock feed or sell. This type of harvester is designed to cut low while keeping straw intact which is one reason it's often seen as a cleaner, less wasteful option.



Machine 2:
The full-feed combine (the 'Field Mulcher')

A full-feed combine swallows the entire plant. It threshes fast and then chops and spreads straw across the field similarly leaving stubble rooted in the soil. It's often preferred when rice has lodged (fallen over after wind/rain) because it can muscle through tangled crop more reliably.

Why rice machines aren't just smaller wheat machines

Rice fields aren't kind to heavy equipment. They're often damp and soft at harvest, therefore big, heavy combines can get stuck, lose efficiency, and damage output quality. Purpose-built rice harvesters (often with tracks/crawlers) handle muddy conditions more easily than heavy wheat-oriented machines.

The real plot twist: "good" residue can still end up burned

On paper, the half-feed harvester should reduce burning because it leaves straw in a collectible form and cuts lower. But in the field, operators often raise the cutting head to avoid damage when land is uneven or poorly levelled, thus leaving much higher stubble than intended which complicates land preparation for the next crop and nudges farmers toward burning when time is tight.

So what's the "right" ending for the straw?

There are two smart endings, and both need the right tools:

1. **Soil-first ending:** Incorporate residue back into the soil (disc harrow/rotavator), turning it into organic matter and improving soil health over time.
2. **Value-first ending:** Collect the chopped straw from full-feed machines with a baler and move it into livestock feed markets or industrial biomass uses (crop residues are being used for energy generation, especially in the textile sector).

Punjab has experimented with solutions that let farmers seed the next crop without burning, such as happy seeders (no-till planter that cuts and lifts the rice straw, sows the wheat seed, then drops straw back as a protective layer of mulch) distributed on subsidy for residue management in rice areas.

Moral of the story: it's never just the harvester

The right machine only works as promised when it arrives on time, runs on suitable horsepower, has the right implements behind it to prepare the land properly, and operates on fields prepared well enough to let the operator cut low without fear. Mechanization isn't just a machine purchase. It's an ecosystem.



Opportunities and Future Prospects

If Pakistan's mechanization story has been about tractors and harvesters, the next chapter is about something bigger: building a mechanization services ecosystem where the right machine shows up on the right day, with the right operator, and the right spare parts.

That shift is where the largest productivity gains, and the biggest inclusion opportunity for small farmers lie.

Custom hiring already runs the system; now make it reliable, denser, and better equipped

Pakistan doesn't need to introduce mechanization rentals. For most farmers, that's already how mechanization is accessed. The opportunity is to shift custom hiring from an informal, seasonal patchwork into something closer to dependable local infrastructure: more machines per area, better machine quality, predictable availability during peak windows, and clearer service standards. This matters even more now as the latest agriculture census reveals that average farm size is shrinking further.

The "next wave" is about precision in timing, not just power

The biggest productivity gains won't come from simply adding tractors. They'll come from upgrading services for operations where timeliness determines yield, losses, and the next crop's planting window: harvesting, residue handling, seedbed preparation, sowing/transplanting, and spraying. When these services are late, farmers lose money; when they are on time, farmers gain a full season's momentum.

Upgrade the fleet: stop rewarding machines which create expensive losses

Pakistan's agricultural machinery service sector is built on old machines because they are cheaper upfront, even when they cause higher losses and downtime. The opportunity is to nudge the market toward newer, crop-appropriate equipment (especially rice and maize planting and harvesting equipment) by making it financially rational for service providers to modernize. Bangladesh is a helpful reference point here: it deliberately used duty/tariff choices and targeted incentives to accelerate mechanization (e.g., duty-free import for a certain time, credit support, and growth of local rental service providers).¹⁸

Service hubs: the missing “middle layer” between farmer and machine

The next practical step is the spread of mechanization service hubs, not one-off machines. A hub is simply a place (or enterprise) that bundles:

- a small fleet (often multi-crop, multi-season)
- trained operators
- parts and repair capability
- booking/scheduling
- performance accountability (loss targets, timeliness, service quality)

This approach reduces downtime, increases utilization, and makes it easier for banks and programs to support the business, not just a machine. Business running on this very model have cropped up and are acting as a bridge between the processors and farmers so that the processing industry and exporters can get a better quality of their respective commodity, such as HBL Zarai.

Some processors have also jumped into the mechanized service sector themselves such as rice exporters like Meskay & Femtee Trading, Garibsons, Conwill, etc.

Residue becomes a value chain, not a fire

Mechanization is now inseparable from residue outcomes. With the right equipment packages, residue can either be incorporated to improve soil health, or collected for fodder or industrial use. Residue solutions (such as Happy Seeder approaches) show how the right machinery package can make no-burn transitions feasible for farmers.¹⁹

Better standards and service accountability unlock the whole ecosystem

When implements vary widely in design and parts, the sector quietly bleeds time and money through repairs, downtime, and poor performance. A major opportunity is setting the standards and strengthening testing, evaluation, and certification so the market rewards equipment that performs, lasts, and is repairable.

¹⁸ https://bangladesh.ifpri.info/files/2024/03/IFPRI_TAC-Mechanization-Meeting_02-28-2024_FINAL.pdf

¹⁹ Bakhtiar, et al. *Agricultural Mechanization Policy in Bangladesh - International Food Policy Research Institute 2025* <https://cgspace.cgiar.org/server/api/core/bitstreams/4ce57cee-5d92-4b92-911b-cd1728d4b4e4/content>

Recommendations



1. Use the tax-and-duty system to pull the market toward better machines

Differentiate duties by quality and condition

- Reduce duties and taxes on new, efficient, crop-appropriate machinery and critical spare parts.
- Tighten rules and increase the cost of importing old/reconditioned machines that systematically drive losses and breakdowns.
- Import controls that treat “used/reconditioned” goods as restricted unless allowed under specific conditions.
- Third-party inspection/certification requirements for used capital machinery shipments.
-

Quantify losses, then legislate against them

- Do a simple national exercise: estimate annual losses from (i) old harvesters (grain loss + breakage + impurities + delayed harvest) and (ii) downtime and missed crop windows.

Then treat duty/tax reform as a fiscal efficiency measure, reduce private cost of good machinery, and raise the cost of loss-making machinery.

2. Fix finance so serious service providers can scale

Move from “one machine per beneficiary” to “fleet financing”

- Redesign financing schemes so established service providers can finance multiple machines (fleet logic), not just single units. This is how reliability is built: backup capacity, multi-crop coverage, and predictable peak-season availability.

Enable machine-backed lending (auto-lease model for agricultural machinery)

- Create a clear “machine-as-collateral” regime for agricultural equipment, similar to car financing, where financed machinery is registered, uniquely identified (serial/VIN-equivalent), insured, and trackable, allowing lenders to treat the asset itself as the primary security. This would unlock leasing and term finance for serious service providers (especially formal-sector operators) who may lack land collateral but have strong cash flows, while also reducing lender risk through enforceable repossession/transfer rules.

Create leasing products tied to seasonal cashflows

- Pair leasing with basic machine booking records. Bangladesh’s experience highlights how credit support and SME repair ecosystems can power a rental market.

3. Scale what already works: professionalize custom hiring instead of reinventing it

Co-finance mechanization service hubs

- Support hub creation through matching grants or concessional leasing conditional on operator certification, basic workshop capability, parts inventory, and service coverage commitments (peak-season scheduling).

4. Level the playing field between formal and informal service providers

Rationalize the tax burden on mechanization services

- Stakeholders often argue that formal service providers face a double compliance cost (income tax + sales tax on services) while competing with informal providers who can undercut prices. A phased compliance model can also be considered with preferential rates for certified mechanization service providers, or temporary tax credits linked to fleet modernization and training.

5. Make quality non-negotiable: standards, certification, training

Establish machinery testing/certification capacity and enforce it

- Make testing, evaluation, and certification a market entry requirement for key implements, and link subsidies and finance eligibility to certified equipment.

Launch operator and mechanic certification at scale

- Treat training as an industry backbone and certify operators, certify workshops, and make certification a condition for participation in hub financing.



Contact Information:
8th floor, Dawood Center,
M. T. Khan Road, Karachi.

Telephone: 021-35630528-29
<https://www.pbc.org.pk/>

