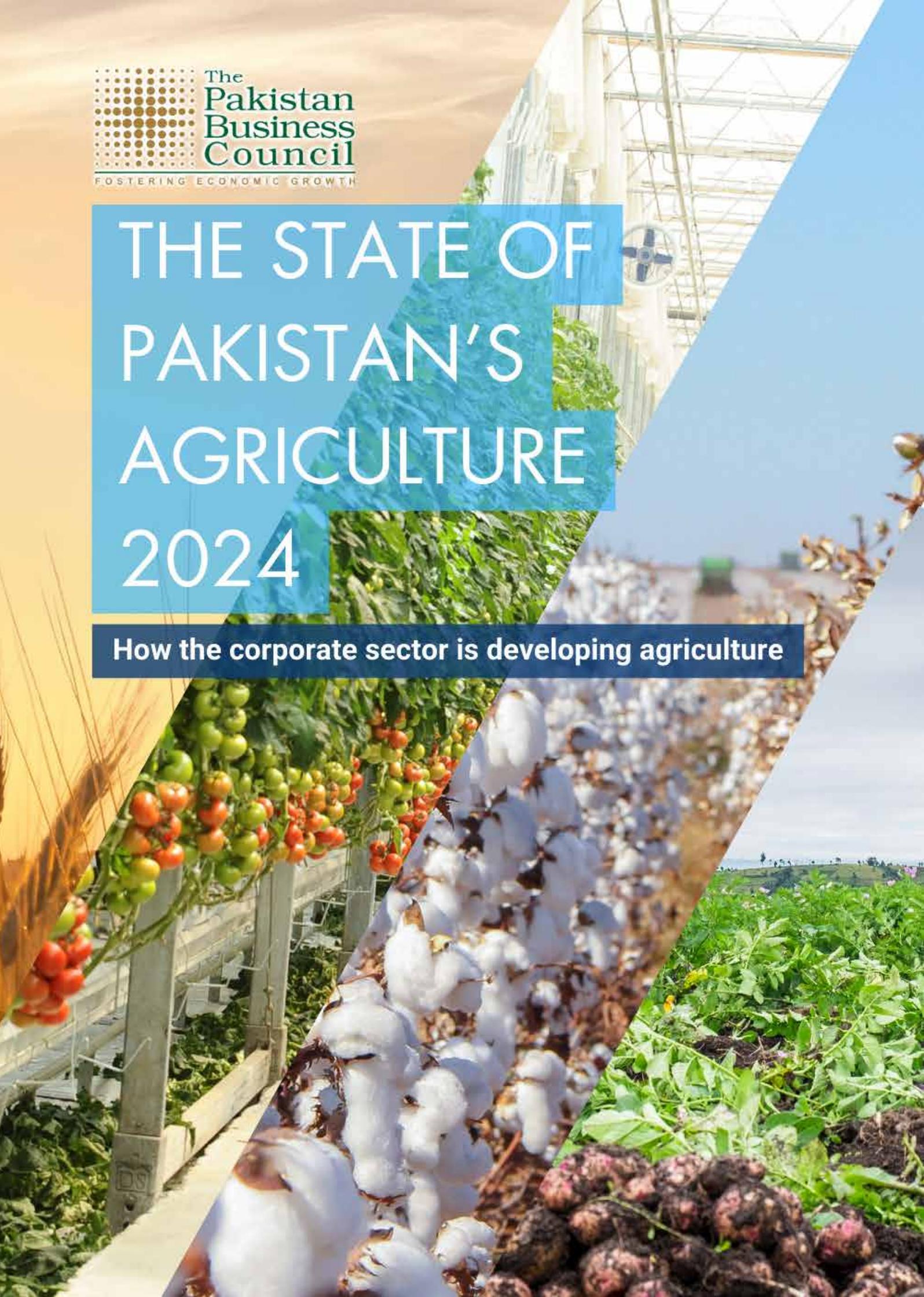


THE STATE OF PAKISTAN'S AGRICULTURE 2024

How the corporate sector is developing agriculture





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Kazim Saeed, Shan E Ahmed and Rabia Zulfiqar

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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).

The Pakistan Agricultural Coalition (PAC) is Pakistan's leading source of commercially scalable business models and policy/strategy advice for growth in Pakistan's agriculture sector. PAC is supported by 20 of Pakistan's leading business and financial groups representing a diverse range of sectors and a combined revenue of over US\$ 10 billion. PAC's vision for Pakistan's agriculture sector is that it should be private sector-led, technology-driven, entrepreneurial, and globally competitive with higher grower profitability. (www.pac.com.pk).

The Pakistan Business Council

An Overview

The Pakistan Business Council (PBC) is a business policy advocacy platform, established in 2005 and now composed of over 100 of Pakistan's largest private-sector businesses and conglomerates, including multinationals. PBC businesses cover nearly all sectors of the formal economy.

The PBC is a not-for-profit entity, registered under Section 42 of the Companies Ordinance 1984. It is a pan-industry advocacy group, not a trade body, nor does it advocate for any specific business sector. Rather, its key advocacy thrust is on easing barriers to allow Pakistani businesses to compete in regional and global arenas. The PBC conducts research and holds conferences and seminars 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.

The PBC works closely with relevant government departments, ministries, regulators and institutions, as well as other stakeholders including professional bodies, to develop consensus on major issues which impact the conduct of business in and from Pakistan. It has submitted key position papers and recommendations to the government on legislation and other government policies affecting businesses. It also serves on various task forces and committees of the Government of Pakistan as well as those of the State Bank, the SECP, and other regulators with the objective to provide policy assistance on new initiatives and reforms.

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The major objectives of the PBC as stated in its founding documents are:

- To provide for the formation and exchange of views on any question connected with the conduct of business in and from Pakistan.
- To conduct, organize, set up, administer and manage campaigns, surveys, focus groups, workshops, seminars and field works for carrying out research and raising awareness in regard to matters affecting businesses in Pakistan.
- 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.
- 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.
- 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 is a Section 42 not-for-profit Company Limited by Guarantee. Its working is overseen by a Board of Directors. More information on the PBC, its members, and its workings, can be found on its website:

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The PBC Affiliates



Table of Contents

Executive Summary	1
Seed to table: National Foods and tomatoes.....	8
Producing more with less: Fatima Group in wheat and cotton	15
Re-defining end-to-end integration: PepsiCo Lays and potatoes.....	19
How K&N's built the poultry value chain	25
Bringing the corporate sector to serve the farmer: HBL Zarai	30
Developing Pakistan's blue agri-economy: AquaHatch International (Garibsons and Jaffer Brothers) and Dhabeji Aqua Foods (AlKaram).....	34
Open sesame: How CMEC is expanding Pakistan's sesame exports to China.....	41
Empowering women to increase dairy productivity: FrieslandCampina Engro	46
Protecting the livelihoods of Pakistan's farmers: TPL Insurance and Crop Insurance.....	52
Regenerative agriculture to protect Pakistan's soils, its water, and its bio-diversity: Thal Industries and its Drawdown Farm	58

EXECUTIVE
SUMMARY

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Executive Summary

This is a time of hope for Pakistan's agriculture sector. The corporate and financial sector is looking at agriculture as a business prospect and the country needs agriculture to turn its macro-economic imbalance around. Yet there are many questions among corporate and financial sector players about how to enter the business of agriculture and its related sub-sectors. To address these questions and apprehensions, this report presents case studies of a mix of corporate players: some that have built their agricultural linkages over decades and others that have begun moving into agriculture in recent years. There are textile players, rice exporters, food companies, input suppliers, bankers, insurers, agri-processors, and a Chinese conglomerate operating under the China-Pakistan Economic Corridor (CPEC). This diverse group is united by the willingness to make bold plays in the agriculture sector whether their driver is the depreciation of the rupee, a commercial need, a diversification strategy or a corporate strategic priority.

The case studies showcase plays across the agricultural landscape by players from across the corporate and financial sector: field crops (wheat, cotton), horticulture (tomato, potato), condiments (sesame), dairy, poultry, fisheries (fish, shrimp), insurance, services to farmers, and regenerative agriculture. They cover Pakistan's largest food converter National Foods opting for import substitution of tomato paste through tomato cultivation; Fatima Group's work on seed development for Pakistan's leading field crops (wheat and cotton); PepsiCo's leadership in maintaining potato farmers' loyalty for its production of Lays crisps; K&N's long history of spearheading the development of Pakistan's poultry industry from breeding of chickens all the way to retail of poultry-based consumer products; HBL Zarai's end-to-end service provision model to benefit farmers; rice export leader Garibsons and agro-chemicals/high-efficiency irrigation services giant Jaffer Brothers teaming up to invest in fish and shrimp seed; textile conglomerate AlKaram investing in a huge shrimp farming and processing facility for exports; Chinese conglomerate CMEC's successful development of sesame exports to China using CPEC, dairy giant FrieslandCampina Engro's empowerment of women dairy farmers; the development of robust and reliable crop insurance by TPL Insurance; and the shining example of regenerative farming by agri-processor Thal Industries.

Snapshots of the case studies

The **National Foods** case study presents a strong example of how to respond to the sharp depreciation of the rupee in recent years. The price of the National Foods market leading ketchup brand came under pressure since the company has been importing tomato paste for its ketchup. National Foods focused on local cultivation of the varieties suitable for tomato paste. But instead of trying to undertake tomato cultivation by itself, National Foods decided to engage professional farm management companies that have emerged in Pakistan in recent years. These companies have emerged as a strong foundation for building this business for the future. The results have been positive with much higher tomato yields achieved than expected without compromising National Foods quality standards and at a cost that is acceptable in the current operational scenario.

Fatima Group has made the bold decision of targeting the sharp depreciation of the Pakistani rupee and the associated macro-imbalances. Their approach is that if wheat and cotton yields across Pakistan increase to a reasonable level, billions of dollars of imports can be avoided and exports can possibly be enhanced—hence bolstering the rupee. But Pakistan's lax implementation of intellectual property rules means that the more common (openly pollinated) seed varieties from traditional breeding are not easy to protect from piracy. That is why hybrid seed has succeeded so much in maize, rice, and vegetables. The potential breakthrough is that Fatima Group has been conducting trials with hybrid wheat seeds which is great prospect for Pakistan since these can be used by farmers for two to three seasons. For cotton, Fatima Group has been working with early maturing varieties which can deliver a harvest before the deadly monsoon sets in. And Fatima Group is among the leading participants developing corporate agriculture investments under the SIFC umbrella.

PepsiCo's achievement of indigenizing their entire potato cultivation needs by bringing the Lady Rosetta seed variety to Pakistani farmers is the fulcrum of their end-to-end integration of the potato value chain to deliver a quality crisp to the consumer. The PepsiCo case study presents an answer to a question many corporates ask: how do you maintain farmer loyalty? PepsiCo achieved this by providing the seed to farmers and by standing as a trustworthy (but quality conscious) off-taker at farms around the cities of Depalpur, Kasur, and Multan in Punjab. In this role, PepsiCo incentivizes its farmers to adopt better agricultural practices and better technologies (e.g., drip irrigation) mainly through pricing.

The **K&N's** case study demonstrates how a Pakistani company can achieve similar end-to-end integration of a value chain. Over the last six decades, K&N's has been at the forefront of poultry breeding, the introduction of new technologies in poultry farming, poultry processing, and new approaches in retailing of poultry-based consumer products while maintaining food safety and Halal certification by hand-slaughtering rather than stunning despite the cost and effort involved. Through research, commitment to quality, and customer education, K&N's has also managed to build loyalty among consumers.

HBL Zarai takes the same end-to-end approach and applies it to the provision of services to farmers. HBL Zarai's creation is based on the belief that the corporate sector's intervention is crucial for realizing the potential of Pakistan's agriculture and give a fair deal to the farmer. So, HBL Zarai is creating an eco-system of reputable input suppliers and service providers (including basic financial services) to serve farmers plus corporate off-takers all of whom are brought to the farmer through HBL Zarai's deras (farmer service centers) starting in Punjab's Districts Vehari and Sahiwal. The key is that the deras do more than arranging for the farmers' inputs, services, supply chain management, and off-take. Their teams offer agronomic advice and handholding to farmers with farmer profitability as a key performance indicator.

Garibsons and **Jaffer Brothers** have travelled a good distance through AquaHatch towards the development of an eco-system for freshwater fisheries—a sector for which a systematic commercial approach has been long awaited. Good quality seed and feed are critical to the success and profitability of fish farming. The consortium's fish feed company AquaHatch is emerging as a pillar of the freshwater

fisheries industry. Traditional fish farms in Pakistan yield 1.5 tons of fish per acre while high-yielding varieties (e.g., Tilapia, Pangasius) yield 4 tons per acre. The modern genetics for these varieties were missing in Pakistan until their hatchery started seed development operations in Sindh's District Thatta.

Al-Karam's Dhabeji Aqua Foods is developing a shrimp farm on 400 acres, which will feature 300 half-acre ponds in Sindh's District Thatta. When completed, it will be one of the largest shrimp farms in the region employing an intensive shrimp farming model. Shrimp farming holds massive potential in Pakistan for exports, particularly with the country's extensive 1300 km coastline along Sindh and Balochistan. Therefore, Al-Karam is also exploring options for establishing its shrimp processing operations for export.

CMEC, one of China's largest conglomerates, evaluated many options for export of agricultural products to China—a major prospect for Pakistan. They identified sesame as not only having high demand in China but also a supply breakthrough with the opening of exports of sesame to China through the free-trade agreement signed under CPEC. This breakthrough changed sesame from a marginal crop for Pakistani farmers to an export crop. And, within a couple of years, Pakistan has become the fifth largest exporter of sesame in the world and rising—with CMEC leading the charge using its sesame processing facilities in Faisalabad and Sahiwal. CMEC maintains a market-based engagement with its partner farmers but has gone beyond commercial obligations to bring the right sesame seeds and capacity building to its partner farmers which has significantly improved yields.

FrieslandCampina Engro's dairy interventions have prioritized the empowerment of women farmers. Since the vast majority of Pakistan's dairy animals are with farm families and the women of these households care for the animals. Friesland Campina Engro has worked to build their capacity and integrate them in the dairy value chains with many women receiving their first paid employment ever while increasing milk production. The main interventions to empower more than 4,000 women are about equipping them with skills and opportunities. The vast social impact of these interventions is endorsed by the beneficiary women themselves who report financial independence and freedom of movement.

TPL Insurance has brought a robust mechanism for crop insurance to Pakistan purely in the private sector. The aftermath of the 2022 floods, particularly impacting Sindh, highlighted the urgent need for strong climate-resilient mechanisms to address these risks and help Pakistan's farmers adapt to the changing climate. But Pakistan's farmers have little protection from the serious financial impacts of these disasters. After crop insurance schemes introduced by the federal and provincial governments, the private sector led by TPL Insurance has demonstrated with insurance pay outs in three pilots (in Districts Sheikhpura, Pakpattan, and Rahim Yar Khan) that robust crop insurance is now available in Pakistan.

Thal Industries has established Drawdown Farms in Punjab's Thal Desert (District Muzaffargarh) to demonstrate that regenerative agriculture can show results in the short-run without prohibitively large new investments. A major challenge to Pakistan's agriculture is the degradation of its soils (average

organic matter at 0.3% when it should be at least 2%) and water through decades of over-use of synthetic fertilizers, crop protection chemicals, etc. Regenerative practices at Drawdown Farms have improved soil health and saved water while enhancing crop yields, biodiversity and sustainability. Drawdown Farms has also begun to market its own biologically enhanced products to allow other farmers to adopt regenerative agriculture.

The key themes emerging from these case studies include some cutting-edge priorities for agricultural growth such as sustainability, use of new technology and mechanisms, and solutions tailored to local conditions. Other emerging themes are familiar issues always highlighted for corporate investment in agri value chains, e.g., quality seed, incentives for investment in rural areas, tax policy and regulatory compliance, regulatory uncertainty, and agri-transport constraints.

■ Sustainability

Many companies are adopting practices that reduce environmental impact, such as regenerative agriculture, eco-friendly production methods, and efficient resource use. The case studies emphasize the importance of sustainability: PepsiCo and FrieslandCampina Engro are working with farmers to reduce carbon footprint and becoming more efficient (less water use per acre, more milk per animal, solar installations, etc.). Thal Industries' Drawdown Farm is completely focused on regenerative agriculture. PepsiCo Pakistan's Positive Agriculture is all about sustainable sourcing, regenerative agriculture, and improving farmer livelihoods.

■ Use of new technology and mechanisms

Innovative techniques and technologies are central to the success stories. FrieslandCampina Engro, AquaHatch, Dhabeji Aqua Foods, and Drawdown Farm all incorporate advanced technologies and novel approaches to enhance productivity and sustainability. Examples include the use of biofertilizers, drones, modern irrigation systems, modern intensive shrimp farming equipment, modern fish hatchery systems, modern dairy supply chain equipment, etc. K&N's has long been the vanguard of introducing new technology in the poultry sector like controlled sheds. TPL Insurance has adapted Area Yield Index-based Insurance to Pakistani conditions to help small farmers as well as corporate farming operations.

■ Solutions tailored to local conditions and challenges

Each company addresses specific regional issues, whether it is harsh climatic conditions (TPL, Thal Industries), contract farming arrangements (NFL, PepsiCo, CMEC), adapting to the local environment (shrimp farming in Southern Punjab due to brackish water, poultry, artificial insemination for improved breeds), etc. Fatima Group's choices of hybrid wheat seed and early-maturing cotton varieties are all about fitting globally available solutions to Pakistan's unique context and challenges.

■ Quality seed

Quality seed emerges as the factor that made many of these corporate forays into agriculture possible. National Foods brought quality tomato seed to its farm management partner companies—specifically, the seed variety that is suitable for producing tomato paste. PepsiCo brought the famous Lady Rosetta variety to its partner farmers—the variety that is suitable for crisps rather than for table consumption and french fries. Fatima Group sees the highest bang for its buck and the highest return for the country in the development of reliable, higher-yielding seeds for wheat and cotton. In poultry, K&N's introduced imported parent stock with its own breeding program to bring the best genetic material to Pakistan. For fish farming, the consortium of Garibsons and Jaffer Brothers started AquaHatch with a fish seed business.

■ Tax policy and regulatory compliance

Typically, sales tax is found applicable to all entities choosing to operate in the formal sector while those operating in the informal sector are able to avoid sales tax. This is a major constraint for a company like K&N's many of whose competitors operate in wet livestock markets and informal grain markets. In fact, any restaurants, hotels, or caterers who are reluctant to show their complete sales to circumvent full tax exposure choose to avoid procuring chicken from K&N's since K&N's pursues full tax compliance. On the regulatory side, the level of regulatory compliance required by the authorities from formal sector dairy players is not matched at all by the focus of authorities on the informal milk vendors. The tax and regulatory regimes need to improve by bringing the informal agri vendors into the tax and regulatory net as well so that companies that are supplying hygienic and quality product are provided a level playing field.

■ Incentives to invest in rural areas

There should be tax holidays and sales tax exemptions for agri investment projects in rural areas since they can generate more revenue and jobs than traditional agriculture. Given that the tax-to-GDP ratio for the industry is significantly higher than the country's average of 10%, such incentives could stimulate growth and jobs in the sector. The farm manager at AquaHatch's fish seed operation in District Thatta, a young graduate of the University of Sindh Jamshoro from the local community, exemplifies how sophisticated fish farming can provide employment opportunities for educated locals.

■ Regulatory uncertainty

The arbitrary soybean import ban of 2022 negatively impacted poultry sector to a level that chicken prices rose in Pakistan—all for the ban to be reversed later. The government's role in facilitating a predictable regulatory environment is essential to enable private sector growth and enhance overall agricultural productivity across the country.

■ Agri-transport constraints

AquaHatch says that when a shipment of shrimp seed leaves Karachi and takes over 20 hours to reach a shrimp farm in Punjab, the delays could lead to high mortality rates (and high loss), since the duration is so close to the maximum limit for safe transport of shrimp. When a container of fish seed is delayed at Hyderabad for over ten hours due to a protest, the result is more than 50% seed mortality. Similarly, CMEC says that a key constraint following the harvest of sesame seeds is the in-land transportation for its exports to China. The associated costs and risks of moving large volumes of sesame from CMEC's factories in Faisalabad and Sahiwal across the country to a port—a journey that takes about three days on average—are a challenge for exports. Further, the transportation costs are not uniform, which impacts the overall production cost. Additionally, the duration of the trip exposes the produce to various risks, such as climatic disasters, theft, and pilferage.

Overall, the corporate sector's forays into agriculture bring economic benefits by adopting new strategies: improved yields, cost savings, access to better market opportunities, etc. And their emphasis on the economic and health benefits of sustainable practices, both for consumers and the environment, are a boon for Pakistan. These prospects merit replication and scaling up for the growth of Pakistan's agriculture.

A black plastic crate filled with ripe, red cherry tomatoes. The tomatoes are densely packed and have a vibrant red color with some yellowish-orange highlights. The crate's perforated sides are visible at the top and left edges.

SEED TO TABLE:

NATIONAL
FOODS AND
TOMATOES

Seed to table: National Foods and tomatoes

In recent years, the sharp depreciation of the rupee has put the end-consumer prices of many import-based products under pressure. National Foods decided to meet this challenge by cultivating tomato varieties locally that are suitable for tomato paste to produce their market-leading tomato ketchup.

Import challenge

National Foods has been a part of the national landscape for the past 52 years, and has also been exporting its products for over 30 years. As a food processing company, National Foods relies heavily on food items that are imported (like tomato paste) or procured locally. During a recent period of significant economic distress, characterized by a negative balance of payments, trade deficits, inflation, and a rapidly depreciating rupee, the company faced escalating import costs. The restrictions on the availability of dollars became a trigger. In response, National Foods launched the Seed to Table project. This initiative aimed to reduce reliance on imported tomato paste by improving the quality of locally sourced tomatoes. By addressing these supply chain challenges from the ground up, starting with the seed, National Foods sought to ensure their products met the required standards, hence the name, "Seed to Table".

Background

National Foods has a diverse portfolio of brands spanning ten major categories, including recipe mixes, basic spices, seasonings, pickles, ketchup, mayonnaise, salt, jams and jellies, desserts, and pastes and chutneys. National Foods is a market leader in six of these ten categories: recipe mixes, basic spices, pickles, ketchup, salt, and jams and jellies. For a food exporter like National Foods, maintaining product quality is a major priority. The company faces significant hurdles in exporting food items due to non-compliance issues within the food industry. With annual procurement encompassing more than forty crops and over seventy percent of its raw materials being agriculture-related, National Foods has encountered substantial challenges in its sourcing in recent years.

The agricultural products procured through middlemen often fail to meet the stringent specifications required for National Foods' end-products intended for both local and international markets. This inconsistency is particularly problematic because stable input supply and pricing are essential for building and maintaining a reliable brand in the local and global markets.

Tomato ketchup, National Foods' second-largest product category after spice mixes, best exemplifies these challenges. Despite holding more than fifty percent of the market share in ketchup, National Foods has been heavily reliant on imported tomato paste. The economic turmoil in the country, marked by trade deficits, depleting foreign reserves, rising prices, and most importantly for National Foods, a rapidly depreciating rupee, exacerbated the situation, making imports increasingly expensive and unreliable. Without a stable supply of tomato paste, National Foods faced a serious challenge to its market leadership, as shutting down production of its second-biggest product would have severely impacted the brand and resulted in a loss of market share, which is extremely difficult to regain.

Price volatility in the procurement of tomato paste and red chillies further complicates National Foods' operations. The prices of tomatoes and chillies fluctuate on average by as much as sixty to eighty percent within a year, creating significant instability. This high variability in input costs prevents National Foods from establishing a foothold in export markets, where other brands are more cost-competitive. Such fluctuations undermine National Foods' ability to maintain a consistent and affordable product line internationally.



In response to these challenges, National Foods launched the Seed to Table project with the vision of “localizing agricultural value chains within Pakistan while ensuring the production of high-quality products.” The initial focus of this initiative is on tomatoes, which are essential for producing tomato paste, a key ingredient in National Foods' second-largest product, ketchup. To meet its requirement of a single ton of tomato paste with a brix content of 28% (concentration of soluble solids), National Foods needs to procure nearly six tons of fresh tomatoes annually. The Seed to Table project aims to ensure that these tomatoes are cultivated to exact specifications, thereby reducing dependence on imports, stabilizing prices, and maintaining the high quality necessary for National Foods' products.

Partnerships and collaborations

National Foods developed a partnership and collaboration model by bringing in expertise across various segments of the tomato value chain for its Seed to Table project. This collaborative approach involved partnerships with farm management companies such as Indus Acres, Kevlaar, Ibtida Ventures, and Vital Green, which played a crucial role in managing the farms and ensuring optimal agricultural practices. Each farm management entity was engaged under a distinct contractual arrangement; some operated under formal contract farming agreements with varying degrees of financial support from National Foods, while others functioned solely as aggregators.

Recognizing the need for suitable paste tomato varieties, National Foods partnered with Syngenta to introduce these varieties into Pakistan. This partnership began around the end of 2022, and focused on studying the value chain and identifying commercially available varieties that could be successfully grown locally. The R&D phase was pivotal in securing a tomato variety with high brix content and near-paste quality. After evaluating various options, a Syngenta tomato variety was selected for its suitable characteristics, particularly its high brix content. National Foods negotiated with Syngenta to supply the seeds and provide free agronomy support to farmers, which was essential as many farmers lacked the expertise to manage tomatoes independently. This agronomic support also included crop protection measures to meet the standards required for international markets.

To ensure proper farm management and optimized yields, National Foods employed advanced technologies, including satellite and drone imagery provided by agri-tech companies like FarmEvo and Farmdar. These technologies enabled precise monitoring of farm activities, facilitating data-driven decision-making. Additionally, crop insurance was provided to mitigate risks and ensure financial stability for farmers.

Despite significant technological advancements, the human element remained vital in the Seed to Table project. Farm managers and aggregators played key roles in interpreting data and managing farm operations effectively. The real game-changer for National Foods was partnering with farm management companies that manage farms professionally. These companies, part of the formal sector, run professional operations and can act as a bridge between processors and farmers. They function either as contract farmers or aggregators, relaying processors' requirements and ensuring growers deliver the needed quality.

Previous experiences of other processors attempting backward integration showed that farmers often reneged on contracts when market prices increased. To mitigate this, National Foods attempted this collaborative approach and provided inputs to farmers (agronomic support, as well as actual inputs) and maintained direct involvement in farm management. This involvement included monitoring and support to achieve better conversion rates and color values of the tomatoes. National Foods, in collaboration with its logistics and processing partner, Al-Rahim Agri Processing, also provided crates for packing and managed logistics.

National Foods' partnerships with farm management companies included various financing models, ranging from partial to full financing by National Foods and farm-level aggregation by the farm management companies. The aim was to provide each farm a return on investment of over twenty percent. The collaboration with Al-Rahim included a toll manufacturing model, where Al-Rahim processed the tomatoes into paste for National Foods. Toll manufacturing refers to an arrangement where one company processes raw materials for another company, in this case allowing National Foods to leverage Al-Rahim's processing capabilities while maintaining control over the quality and supply chain.

Challenges and how they were tackled

One of the primary issues was the inability of local suppliers to meet quality parameters, particularly regarding color and tomato-to-paste conversion rates. The specific tomato varieties suitable for high quality paste production were not available in Pakistan, whereas lower-quality tomato paste, made from substandard tomatoes, was sold to tier 2 and tier 3 companies. National Foods, therefore, had to work with Syngenta for the introduction of new suitable varieties and had to get the processing of the tomatoes done by itself to ensure tomato paste supply.

Farming was also not National Foods' core strength, as the company had not previously pursued agricultural ventures. Key questions included whether to purchase land, engage in corporate farming, how to determine suitable locations, how to manage logistics, and how to oversee farm operations. The diverse agro-ecological zones and varying soil quality across different regions of Pakistan further complicated matters. Managing multiple farms across these regions would be highly challenging, given National Foods' diverse crop requirements. Therefore, it made the most sense to engage with farm management companies (or FarmCos) under varying levels of control as described earlier.

Another significant challenge was dealing with the variability of different farms. Each farm had unique conditions, such as soil type, water access, labor expertise, and farm management practices, leading to varying yields in terms of quality and quantity. National Foods invited bids from FarmCos, asking how much they could produce and at what price. However, the volatile nature of tomato prices made it difficult to establish a stable agreement. If market prices soared, farmers were likely to renege on their contracts, claiming crop losses or wastages while selling their produce in the open market. This year as well, while some farms adhered to their agreements with National Foods, others (especially farmers under aggregators) found it more profitable to sell at higher market prices. This challenge is yet to be resolved in a comprehensive manner as even the companies that did stick to the agreement were reluctant to get into a binding agreement the following year as they could be potentially forgoing four to five times the profits that they could have earned had they not fulfilled their contract.

Logistics also posed a significant challenge. Typically, green tomatoes that are nearing ripening stage are harvested and transported and by the time they hit the shelves, they are ready for consumption. However, National Foods required only red tomatoes that had ripened on the plant, which drastically reduced their shelf life and demanded seamless logistics. However, the processing facility was far away in Khairpur. Transporting ripe tomatoes almost 400 kilometers from Thatta to the processing facility resulted in additional wastages. The complexity of ensuring timely and efficient transportation added to the logistical hurdles. Establishing a processing facility near the tomato production region will bring down the transportation costs significantly.

Technical support was another area where the project faced difficulties. Although companies like Farmdar and FarmEvo were involved in drone and topology mapping, the data provided was not sufficiently actionable. There was a lack of comprehensive reporting, key performance indicators, and

analytical insights necessary for effective farm management. The data was there, in many cases, but without adequate analytics on the data, it served little to no purpose. Primarily, the reason for this seems to be that companies working on farming data have focused on field crops rather than on horticulture crops like tomatoes.

National Foods had also intended to manage inputs like pesticides and fertilizers through partnerships with companies like Syngenta and Engro, but some of these arrangements fell short. The proposed system of reimbursing farmers for inputs proved problematic, as there were no checks to prevent misuse. A more transparent system, involving direct purchase and distribution of inputs, coupled with technology such as sensors to measure soil nutrients (to make sure that the inputs have actually been applied), would be more effective in managing resources and ensuring accountability.

Crop insurance, at eight percent of the total sum insured, was built into the cost of the project, although the parametric insurance did not trigger. The cost of insurance was relatively high and protects mostly against anomalous weather events and is still unable to cover for diseases or other biological reasons for yield losses.

Results

The Seed to Table project achieved significant milestones in its first season. By the end of March 2024, despite facing a 40-day delay in the season due to adverse weather conditions, a hundred percent of the targeted tonnage was achieved for tomato paste, showcasing the success of the project's strategies.

In Pakistan, the average yield for tomatoes is typically around eight to nine tons per acre. However, most FarmCos participating in the project set ambitious targets of achieving yields between fifteen to twenty tons per acre. Remarkably, these expectations were exceeded, with some farms achieving yields of thirty-five to forty tons per acre.

The tomatoes produced through the Seed to Table project were of superior quality, with color and taste of the processed tomato paste significantly better than that of imported paste. Additionally, the cost of tomato paste was twenty percent lower than that of tomato paste imported from China. National Foods' strategic focus on quality and efficiency provided a competitive advantage, as the locally produced paste, although more expensive than local alternatives, offered better quality and a higher AB value. The AB ratio is a color measurement used primarily in the food industry to assess the quality and visual appeal of tomato products, such as tomato paste and ketchup; a higher AB ratio indicates a more intense red color. This quality was achieved while remaining economically competitive against imported products.

Looking ahead, National Foods anticipates further cost reductions with future expansion. The cost of fresh tomatoes could decrease by another 9% with increased yields. The tomato conversion cost can be reduced by 16% by adjusting the quality to meet food safety standards rather than exceeding them. Additionally, locating manufacturing plants closer to farms could result in a 91% reduction in transport costs.

National Foods plans to replicate the model on other crops, starting with red chili cultivation in Kunri, followed by ginger and garlic production. The partnership with Syngenta will continue to be crucial for seed supply and agronomy support.

Conclusion

The Seed to Table project by National Foods has proven to be a ground breaking initiative in localizing agricultural value chains within Pakistan, particularly for the production of tomato paste. Faced with economic instability and the challenges of importing raw materials, National Foods took a strategic leap to ensure self-sufficiency and maintain the high quality of their products. The project not only addressed the immediate threats to their supply chain but also laid a sustainable foundation for future growth and competitiveness.

The success of the project is attributed to the innovative partnership and collaboration model National Foods developed. Engaging with farm management companies, seed suppliers, and agri-tech firms, National Foods was able to harness expertise across the entire tomato value chain. The use of advanced technologies such as drone monitoring and high-quality imaging, combined with hands-on agronomy support, ensured that the tomatoes produced met the stringent quality standards required. The superior yields and quality achieved, significantly better than the national average, underscore the effectiveness of these partnerships and the potential for future cost reductions.



A hand is shown holding a cluster of white cotton bolls. The background is a field of golden wheat and cotton plants, with a bright, hazy sky. The text is overlaid on the image in three stacked rectangular boxes.

**PRODUCING
MORE WITH LESS:**

FATIMA GROUP
IN WHEAT AND
COTTON

Producing more with less: Fatima Group in wheat and cotton

What happens when a leading conglomerate thinks about making a bold attempt to address Pakistan's macro-economic imbalances on the strength of its standing in agriculture? Fatima Group is making such a bold attempt with a focus on increasing wheat and cotton yields.

Thinking beyond the bottom-line

Established in 1936, Fatima Group is one of Pakistan's most diversified and rapidly growing conglomerates with three fertilizer plants producing 2.6 million metric tons. Fatima Group's experience in fertilizer sales has provided them with the foundation to expand into the agro-industry and tackle national agricultural challenges. The foundation of Fatima Group's recent activities in agriculture is the company's commitment to addressing Pakistan's food security and trade deficit challenges. The most notable result is the group's dedication to leveraging key crops like wheat and cotton to bridge this gap. Cotton and wheat are Pakistan's expertise, they say, but we are importing them. With these two crops, they believe the food security and economy issues can be solved. Fatima Group is now focusing beyond growth projections to address these macro level issues by going to the root of the problem: the seed.

Targeting Seed Innovation

Fatima Group aims to leverage seed technology to significantly increase yields and exports along with import substitution. At present, Pakistan produces about 28 million tons of wheat at an average of 32 maunds per acre with about 22 million acres of land under wheat production. Through seed innovation and fertilizer management alone, the per acre yield can increase to over 55 maunds resulting in another 20 million tons of wheat. This additional wheat is the first domino in unlocking the solution to the country's food security and trade deficit problem.

The Fatima Group has been designing ways of doing more with less. Any increase in yields stemming from the same area of land will allow Pakistan to use any additional land that may be freed up without a loss to yields and revenues. Fatima Group believes that hybrid seeds are the key to unlocking wheat's cascading potential. Fatima Group's hybrid wheat seeds have shown promising results; for instance, in 2022, over 200 acres in Khanewal planted with the hybrid F1 wheat seed variety achieved an average yield of 55 maunds per acre compared to the country average of about 32 maunds per acre. The company is confident based on its pilots using these F1 varieties, that are reusable for 2-3 crop cycles, that the additional millions of tons of wheat at the national level could be the answer to the country's trade deficit problem.

The Fatima Group has leveraged its networks to research and develop these innovations and pilots with F1 wheat varieties have been operational for 3-4 years with technical assistance from scientists at the University of Sydney, Australia. Last year, these seeds were planted at the commercial level and this year about 80 farmers are working with the seed. The Fatima Group believes that the resulting increase in yields will allow for flexibility of a few million acres of land being available in the winter season for oil seeds and early cotton varieties.

Agriculture cannot outwit nature and its patterns, of course. The crop cycles must follow the season's rules or suffer poorly. Wheat and oil seeds are competing crops, i.e., they share the same cropping season. And the availability of land that may be able to accommodate oil seeds without impacting wheat output could be a game changer. F1 hybrid wheat varieties allow for bringing an interesting player with immense export potential into the mix: edible oils. Canola seeds can be planted in November on the land that could be freed up during the wheat season. The crop cycles of canola and early cotton are such that the early cotton variety can be planted following canola harvest in February. The implications of planting canola on such volumes are far reaching for the country's USD 4-5 billion oil import bill.

Currently, the country is earning about USD 20 billion from textiles, but with innovation, this figure could double. To achieve this, the cotton industry must graduate beyond the current figures of production of 7-8 million bales to an achievable 14 million bales. The Fatima Group is concentrating on research and development in seed technology to close the yield gap in cotton as well. In March 2023, Fatima's early cotton varieties yielded 35 maunds per acre, demonstrating the benefits of advanced seed technology and optimized planting schedules. This early cotton variety is being planted has the potential for even higher yields potentially doubling the country's cotton exports. The early maturing varieties have the potential to save the crop from the deadly monsoon impacts as well.

There is also international interest, particularly from African countries, in exploring these hybrid seed varieties that can serve as the entry point to scaling this up at a corporate level where it is bound to contribute most at a significant scale. At present the company is aiming to get the F1 hybrid wheat seed to farmers and corporate players through a corporate collaboration on about 1 million acres. Improved wheat productivity could free up land for export-oriented crops, contributing to both import substitution, increased textile exports and bolstering food security.

Developing an environment for corporate farming

Weather, water and land are God's bequest and we have to do the right things to leverage them. With this guiding principle, the company recognizes the urgent need to bring the 18 million acres of fallow lands into productive use and mitigate water scarcity through innovative farming practices. The main challenge lies in water management. Currently, Pakistan's irrigation system loses 30% of the water it draws from the Indus River Basin through inefficient practices like flood irrigation on farms. Corporate farming offers a solution by implementing advanced irrigation technologies and efficient water management practices through its collaborative nature and appetite. By reducing water wastage and

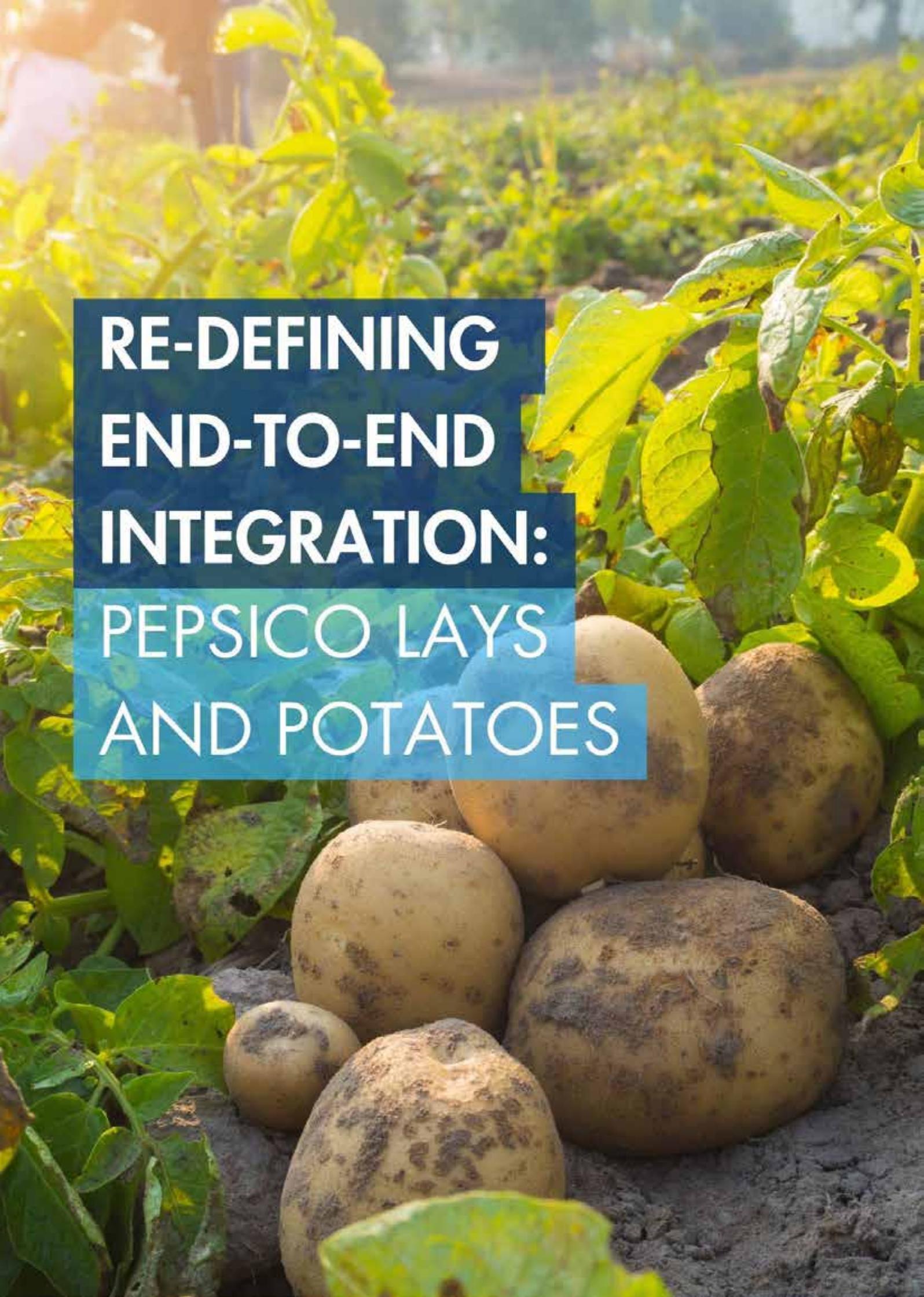
optimizing production costs, corporate farming can significantly enhance agricultural productivity and sustainability demonstrating the true business potential of agriculture.

The Fatima Group has been a leading advocate for policies conducive to corporate farming and a secure investment environment. The challenge now is to create an enabling environment that makes corporate farming possible. Policy support is essential for this transformation. To address this, the Special Investment Facilitation Council (SIFC) and the Ministry of National Food Security and Research (MNFSR) are collaboratively developing a comprehensive document. When large SIFC projects are implemented, they must be bankable, ensuring that investments are secure for the long term.

The agricultural sector in Pakistan urgently needs skilled professionals in both agricultural techniques and IT. Currently, meeting these demands often requires hiring expertise from abroad which comes with significant costs. Developing local talent is essential not only for cost efficiency but also for long-term sustainable growth. Infrastructure development and supportive environmental policies are also crucial for the success of corporate farming initiatives. The government's role in facilitating these aspects is essential to enable private sector growth and enhance overall agricultural productivity across the country.

Looking Forward

Fatima Group's commitment to innovation, seed research and development, corporate farming, and high-value crops demonstrates its potential to transform Pakistan's agriculture sector. By leveraging research and development, optimizing resource use, and advocating for supportive policies, the company aims to address food security challenges, boost exports, and drive economic growth.



**RE-DEFINING
END-TO-END
INTEGRATION:
PEPSICO LAYS
AND POTATOES**

Re-defining end-to-end integration: PepsiCo Lays and potatoes

How does a company produce crisps in Pakistan for which the correct potato variety did not exist before 2006? And how does it maintain farmer loyalty while implementing its global commitments for traceability and sustainability? PepsiCo Pakistan has achieved both.

Crisper crisp

Since it started a snacks operation in Pakistan in 2006, PepsiCo Pakistan has introduced comprehensive agricultural programs for potato production in Pakistan, transforming local potato cultivation. Before PepsiCo's involvement, only table potato varieties were grown in the country. Today, there are also some varieties suited to the production of french fries. But table varieties and french fries varieties are not suitable for the production of crisps. The company introduced its crisp varieties, expanding operations to about 35,000 acres, with 100% of its potato



PepsiCo team monitoring potato production

requirement now fulfilled locally. The potato farmers partnering with the company typically comprise of land owners committed to the company's mandate of growing potatoes in compliance with PepsiCo's globally adopted sustainable practices. For their commitment and adherence to the company's values and practices, PepsiCo has instituted a tailored approach to ensure grower loyalty: two-thirds of the growers that are part of PepsiCo's network at present have been with the company from the very start of its operations in Pakistan. Here's how the company achieved this.

Understanding Potatoes

PepsiCo Pakistan began its potato operation in Pakistan in 2006 with an express focus on developing the crisp varieties in the country. Prior to this, Lady Rosetta—the leading crisp potato variety—was not grown in Pakistan; the table variety potato usually used for general consumption was the only kind of potato under cultivation. Lady Rosetta is a publicly available crisp variety and is now grown across Pakistan. This also meant that there was an established ecosystem and network of potato production that the company was able to leverage for its crisp variety penetration.

PepsiCo Pakistan used to import the mini tubers for its crisp variety. This was not a cost-effective method of supplying this variety to contracted farmers directly and the company worked to multiply its crisp potato variety seed bank for a few years beginning in 2004 so economies of scale could be achieved ahead of going into commercial production. At present, 100% of the company's potato seeds are also grown locally for the Lady Rosetta variety. Using the potato life cycle, PepsiCo instituted a 5-year seed growing period to find the right balance between quality and supply.

Operating like a seed company

The farmer is bound to the company through contracts from the point of seed issuance to the delivery of the harvested potato. Once the seeds have been issued, PepsiCo continues engaging with its contracted farmers through its network of its field team. Each year the company runs internship programs whereby agriculture university students apply to participate in the September-March potato cycle; they are vetted through tests, shortlisted, given assignments, interviewed and then hired with competitive compensation to facilitate potato farmers in the field throughout the season. About 200 interns are hired to work with farmers on-farm and to complement the company's mobile field labs for quality testing. The program not only helps the university student to get hands-on experience of the field but for the farmer community to receive advisory services from field agronomists. The program also helps to ensure traceability of all the practices and ensure implementation of Good Agriculture Practices at the farm level.

The farmer's capacity is built on optimal crop management practices: crop monitoring, pest management, yield assessment, quality assurance, etc. PepsiCo has also introduced geo-mapping of farmer's scattered plots and GIS-linked plot-level monitoring of the crop. The PepsiCo Agro field team along with interns also aid in building the season's potato database feeding information on all parameters into PepsiCo's standardized system contributing to traceability efforts: PepsiCo's potato value chain is 100% traceable.

Off-taker role

Once the crop is ready, mobile field teams under the quality assurance department run under the supervision of experienced managers visit each farm and conduct live testing prior to accepting the potato batch. The live testing at the farm also contributes to farmer accountability as batch payments are contingent on the potato batches clearing these tests. Once a batch load has cleared testing, three copies of the load testing report are generated: one for the farmer, one for the field team, and one is sent to the PepsiCo finance department to process the farmer's payment within two weeks.

Logistics, storage and quality control

PepsiCo operates its farm engagements in three main regional zones: Depalpur, Kasur, and Multan. The company has set up its plants and collection points centred around its regional production areas in such a way that once the remote labs notify that a harvested batch of potatoes has been cleared for pick up,

trucks arrive to collect the harvested potatoes from the farmer's doorstep. This is crucial as potato is a live organism and highly sensitive to its environment. Delays at this stage would result in costly post-harvest losses and impact the quality of the end-product. PepsiCo uses temperature-controlled stores owned and operated by vendors who are required to maintain potato quality.

The treatment of the potato from seed, through its growth cycle, to its treatment once harvested is extremely important given the nature of the vegetable. Monitoring its health and ensuring factors that contribute to changes in potato health are imperative when it comes to ensuring global quality compliance for Lays chips. It is for this very purpose that the Lays production lines installed in all Pakistan plants have automatic checks at various stages of production.

Forging farmer loyalty

On average, the acreage of a PepsiCo farmer is about 60-70 acres with a maximum of about 200-300 acres set as an informal cut off point. This is to cultivate more homogeneity in the treatment of the contracted farmers. Adaptability and protocols are the foundation of how PepsiCo has managed to engage with the same farmers over a period spanning almost two decades and weathered the tests of price fluctuations, crop yield fluctuations and a changing climate and socio-economic environment.

Among the three main types of growers: land owners, land owners who have contracted their land out and those farmers who have leased land, PepsiCo has clear categories in terms of farmer loyalty based on its historical engagement with farmers. The first two categories have conventionally been the most receptive to new initiatives the company launched, and these farmers were eager to support the company in adhering to the checks, balances and accountability measures implemented. The support of interns is viewed by farmers as a capacity building tool. Much of the principles of the knowledge gained on pest management, crop tending and general best practices can be applied across different value chains and so is an added benefit to the farmers. Another element that is deemed instrumental by the agro team at PepsiCo is the uniformity in the company's management of its contracted farmers. Farmers talk amongst themselves and are clear on the unequivocal focus the company places on adhering to laid out best practices.

Positively sustainable

Positive Agriculture is at the root of PepsiCo's business and is one of the key pillars of the company's PepsiCo Positive (pep+) sustainability agenda. PepsiCo aims to source crops and ingredients in a way that accelerates regenerative agriculture and strengthens farming communities in the local food system while making local agriculture practices more resilient, efficient, and inclusive.

PepsiCo is leveraging High Efficiency Irrigation Systems (HEIS), high-yielding varieties, and innovative agricultural technology transfer to enhance capacity building of the company's affiliated growers. Currently, PepsiCo engages 10,000 acres of farmland through regenerative agriculture efforts in Kasur,

Multan, and Depalpur in Punjab province. Under regenerative agriculture initiatives, PepsiCo is focusing on soil health, watershed health (including through HEIS, laser land levelling, solar tube wells, etc.), biodiversity, and GHG emission reduction/carbon sequestration.

PepsiCo is committed to significantly lowering the company's water footprint, especially in agriculture. The company has conducted multiple stakeholder sessions to keep increasing the number of agriculturists who are fully involved in PepsiCo's water conservation targets. The company increased water-use efficiency by 17 percent in PepsiCo's potato crop in 2023 by using HEIS on 2,370 Acres. The main lever for this is pricing premium offered to farmers who use drip irrigation. Further to this agenda, PepsiCo is also encouraging the implementation of best practices and delivered laser levelling of land and water channel lining on 21,040 acres. Introduction of high yielding varieties is further improving the water usage efficiency.

Improving women's empowerment and farmer livelihoods

PepsiCo is working with existing partner growers to create an empowering ecosystem for the well-being of women agricultural workers. These farms prioritize the inclusion and empowerment of women by providing adequate rest and sanitation facilities. Three day-care facilities are developed in Kasur and Depalpur for the female labor engaged in field activities during potato crop season. Around 430 female farm workforce was provided with technical training to upskill them to contribute in farm profitability while new roles have been identified for female workers at farms which includes digitization of farm records. Ten smart schools are currently operating in partnership with Institute of Rural Management (IRM) with an enrollment of 300 students with an ultimate objective to enroll these children to a regular student after two years.

PepsiCo is also working to introduce technology in agriculture, which can enable the farmers to make the right decisions, build resilience in crop management and deliver better yield. The company has deployed 12 micro weather stations in Kasur, Depalpur and Multan to improve grower resilience by providing them proper tools to improve farmer practices through informed data-driven decision-making. Micro Weather stations provide weather forecasts, temperature, moisture, relative humidity & wind speed / direction, early warning system for crops with about ten disease predictions, early warning prediction for frost, etc.

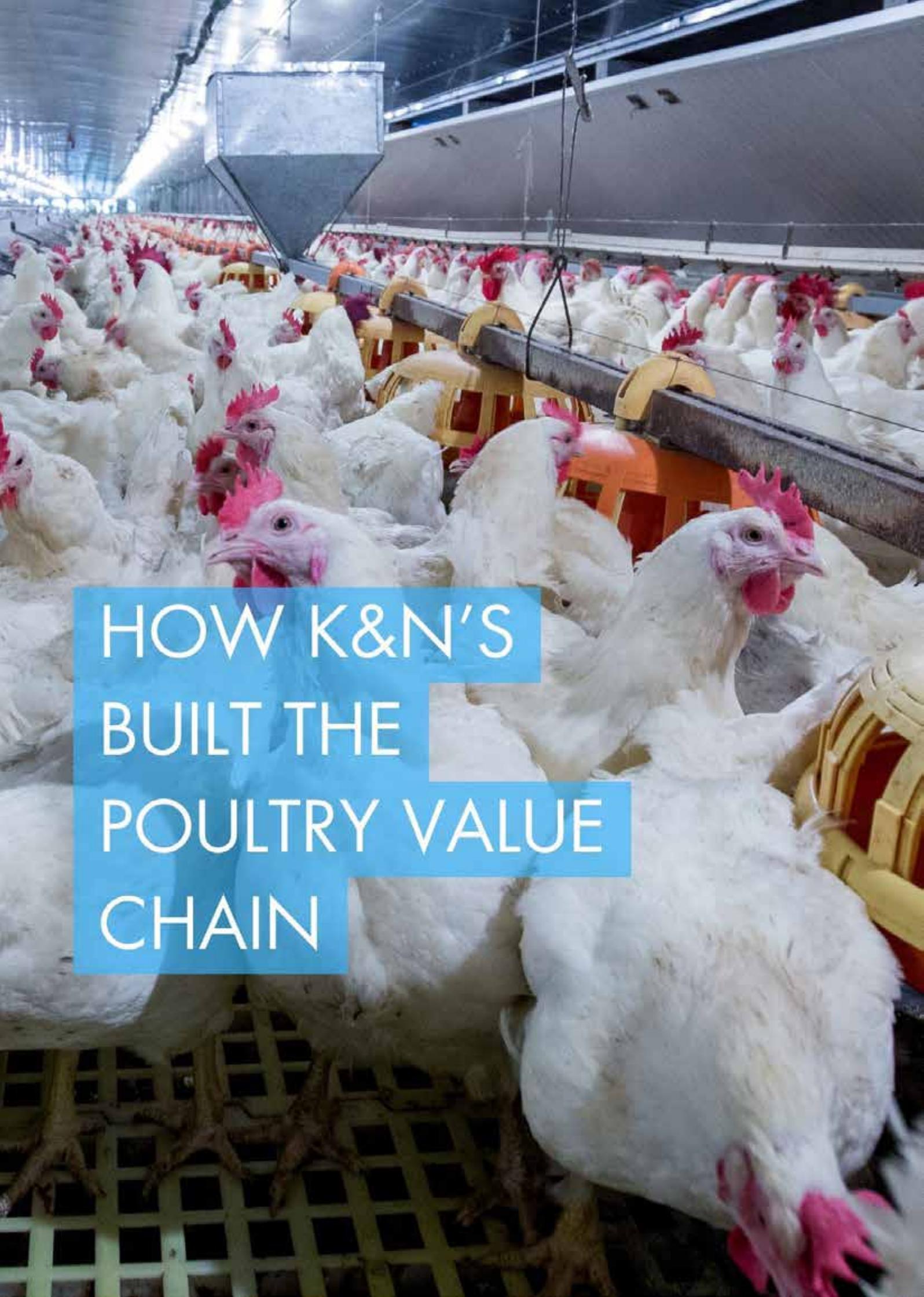
Looking Ahead

While the company is making strides in its pursuit of sustainable agriculture practices through its potato value chain, a significant appetite for macro-level reforms is also revealed through the farmers' needs and demands. There are exclusive PepsiCo varieties which can give better results but are not being introduced due to intellectual property constraints. Finally, PepsiCo has its proprietary FritoLays varieties whose potatoes



PepsiCo Lays introductory presentation

ensure an international-class Lays taste but are not being introduced in Pakistan for the same reasons. The majority of the landowners PepsiCo works with have expressed interest in modern farm machinery that may aid in sowing and harvesting processes. Many have shown interest in adopting drip irrigation if service providers are available. There is also a palpable demand for solar-powered turbines, tube wells and machines. All this highlights a clear demand from the grower community, which has been aggregated into formal groups by private sector companies like PepsiCo, for both the public and private sectors to rally together and serve.



HOW K&N'S
BUILT THE
POULTRY VALUE
CHAIN

How K&N's built the poultry value chain

Pakistan's poultry sector is a rare success story on the agricultural landscape. K&N's has led this success story from the front over the past few decades meeting national and international milestones. This story is a study in innovation, transparency, and leadership.

Pakistan is the eleventh largest producer of poultry in the world, with 1.2 billion broilers that have quadrupled over the past 15 years. In 2023, the poultry sector produced 22.5 billion eggs and about 2 million tons of poultry meat. The *State of Pakistan's Agriculture 2023* report highlights the rapid growth of the poultry industry, attributing it to advancements like controlled sheds and the introduction of hybrid maize. This case study focuses on the journey of K&N's, a major poultry producer, who has been a beacon for Pakistan's poultry industry for six decades, and has significantly contributed to the sector's rise and achieved end-to-end value chain integration.

K&N's was established in 1964 with the vision of providing a cheaper source of protein to bridge the protein gap and address malnutrition in Pakistan. K&N's has successfully integrated its operations along the poultry value chain, managing the entire production process from breeding to final product distribution. This comprehensive control ensures consistent quality and efficiency throughout the supply chain. K&N's story demonstrates how the company leveraged technology from abroad, developed a complete value chain, and helped establish ancillary industries.

Founding and Early Growth

K&N's began its journey in 1964 with a simple setup of 1,000 chicks in a family oil mill warehouse. By 1966, the company had acquired 10 acres of farmland through a government lease program, marking the beginning of its expansion. As the company grew, it diversified its operations. By 1970, K&N's was manufacturing poultry equipment as well and was helping the whole industry raise its game.

In 1971, the company established Kays Poultry Feed, ensuring a reliable and high-quality feed supply for its poultry. The company continued to innovate by building its first environment-controlled breeding house in 1981. This step was pivotal in maintaining consistent and optimal conditions for poultry breeding which significantly enhanced productivity. By the mid-2000s, there was inadequate supply of parent stock, so K&N's started the production of the Cobb500 parent stock, for its own breeding program, and for supplying other parent stock/breeding companies, further solidifying its position in the market.

K&N's pursuit of innovation led it to introduce soybean meal as a protein source in poultry feed in the 1980s, gradually replacing the traditional cottonseed oilcake—which was found to be harmful to the chicks. This change improved the nutritional value of the feed and reduced instances of gossypol

poisoning, a common issue with the use of cottonseed. Such innovations not only improved poultry health but also set new industry standards.

Product Innovation and Diversification

The company was among the first to offer packaged poultry meat in Pakistan, a significant shift from the traditional wet markets. K&N's has also introduced innovative read-to-cook and ready-to-eat products, including frozen seekh kababs and chicken chapli kababs. In addition to expanding their product range, K&N's implemented a successful consumer loyalty program over a decade ago. This program offered digital cards with various membership tiers, providing privileges, and discount vouchers to loyal customers.

Changing consumer perceptions about food safety and Halal certification has been a significant focus for K&N's. Traditionally, Pakistanis have purchased meat from wet markets (and most Pakistanis continue to do so), which often have extremely unhygienic conditions. K&N's offers a cleaner, safer alternative with their processed poultry products. The company used various media, including documentaries shown at public places like Daewoo bus terminals and airports, to educate consumers about their Halal practices. Unlike many exporters to the Middle East, where a significant portion of poultry is machine-slaughtered and not considered truly Halal by some, K&N's ensured all their birds were hand-slaughtered without stunning.

In 1976, the company established K&N's Advisory Services, providing a comprehensive support system for the entire poultry industry. This initiative included technical and extension service centers where veterinarians and other technical staff were readily available. They published technical bulletins and brochures, conducted seminars, and offered free vaccination and de-beaking services. K&N's also sent staff abroad for training and conducted local technical training programs for veterinarians and technical staff. These efforts not only supported K&N's operations but also contributed significantly to the development of the poultry industry in Pakistan.

K&N's aggressive growth strategy included expanding to new production locations across the country, which inspired other businesses to enter the poultry industry. However, this rapid expansion of the industry brought challenges, particularly in the form of persistent diseases that threatened poultry health and productivity. To address these issues, K&N's established the Poultry Diagnostics and Research Institute. This institute worked in close coordination with K&N's Advisory Services to provide comprehensive research and extension services, ensuring the sustainability and health of the poultry industry.

K&N's has established a strong retail presence with one of the country's largest company-operated chain of stores across Pakistan. K&N's ensures control over quality and service.

Global expansion, recognition, and awards

K&N's has become Pakistan's largest exporter of poultry products to the Middle East. In 2013, K&N's took a significant leap by establishing a US entity which owns and operates a production plant in the United States for hand-slaughtered Halal chicken products. This strategic move not only allowed them to cater to the growing Muslim population in the US but also facilitated exports to Canada from their US manufacturing location.

K&N's participated in a prestigious global sausage and cold-cuts competition held in Germany every three years. Competing against companies from around the world, K&N's showcased their expertise and product excellence and won five gold medals, two silver medals, and one bronze medal in various categories. K&N's had to navigate a complex EU regulatory landscape to obtain the necessary permissions to bring their sausages into Germany from Pakistan, even for a competition.

In 2011, Harvard Business School (HBS) conducted a detailed case study on K&N's which was presented at the annual agri-business seminar held at HBS every January, where K&N's was featured alongside other prominent companies such as Marine Harvest, Fonterra, and PepsiCo. The Harvard case study involved a comprehensive review of K&N's operations, including visits to their facilities and interviews with their staff. The case study was also presented at other prestigious institutions, including HBS Shanghai, UCD Michael Smurfit Graduate Business School and Cornell University.

Challenges

K&N's faces significant challenges stemming from regulatory issues that impact their operations and competitiveness. One major hurdle is the import of genetically modified (GMO) soybean, a crucial component in poultry feed. In 2022, for example, some shipments of GMO soybean were blocked at the port due to regulatory scrutiny and a lack of clarity on the import policies for genetically modified commodities. This disruption led to an acute shortage of poultry feed, making local feed more expensive which led to a fall in the supply of poultry and subsequently drove up meat prices. The government needs to establish a consistent policy with regards to the import of such soybean as inconsistent policy causes major upheavals in the whole poultry industry.

Additionally, K&N's is confronted with inconsistent sales tax policies that further complicate their business environment. Companies that are part of the documented sector, such as K&N's, have to pay sales tax on all transactions, whereas the wet market does not allowing them to offer lower prices. This disparity creates a significant price differential, making it difficult for K&N's to compete fairly. Any restaurant, hotel or caterer reluctant to show complete sales to circumvent full tax exposure will avoid procuring chicken from K&N's, adversely affecting K&N's market position. While more than 95% of poultry in Pakistan is grown on commercial farms which are mostly equipped with modern technology, the poultry retail segment is mostly in the informal sector. The regulatory regime needs to improve by bringing the informal poultry vendors into the tax net as well so that companies that are providing

hygienic and quality product are provided a level playing field.

Another significant challenge for K&N's has been changing customer perceptions about Halal practices. As mentioned earlier, K&N's produced documentaries to educate customers showcasing their operations, emphasizing their commitment to traditional Halal methods.

The poultry processing industry in Pakistan faces structural challenges that hinder its growth. High startup costs and substantial investments are required to enter the industry, making it difficult for new players to emerge. K&N's competes with the vibrant wet market sector in the informal market, where every street has a chicken shop operating with minimal costs. These informal vendors can sell at lower prices due to their minimal overheads, posing a significant challenge for K&N's, which operates with substantial overheads and adheres to stringent quality and safety standards. Additionally, Pakistan's typical cooking practices, which involve overcooking food to kill germs, make consumers less concerned about the hygiene of their poultry sources, further entrenching the informal market's position. To address this issue and to promote the development of the formal sector poultry industry, there should be tax holidays and sales tax exemptions for such investment projects in rural areas since they can generate more revenue and jobs than traditional agriculture. Given that the tax-to-GDP ratio for the industry is significantly higher than the country's average of 10%, such incentives could stimulate growth and development in the sector.

Conclusion

From its humble beginning over six decades ago, K&N's has been driven by its fundamental reason to exist of providing better nutrition through poultry for the health and happiness of the nation, which enabled it to become a leading poultry enterprise in Pakistan with an end-to-end operation. The company's integrated value chain, from breeding to final product distribution, has allowed it to maintain high standards and adapt to market demands effectively. The challenges K&N's has faced, particularly in regulatory issues and market competition, highlight the need for a supportive policy environment.

K&N's story offers valuable lessons for the broader industry. Their success underscores the importance of innovation, transparency, and adherence to quality standards. By investing in research, development, and customer education, K&N's has managed to build trust and loyalty among consumers. The company's emphasis on traditional Halal methods and commitment to hand-slaughtered poultry, despite the cost and effort involved, illustrates the significance of staying true to core values.



**BRINGING THE
CORPORATE
SECTOR TO SERVE
THE FARMER:
HBL ZARAI**

Bringing the corporate sector to serve the farmer: HBL Zarai

How can the nationwide reach of a leading financial house be brought to serve the farmer? HBL Zarai is a new business model that takes multiple services to the farmer with a panoply of solutions, corporate linkages, and the prospect of higher incomes.

HBL Zarai, a non-financial subsidiary of Habib Bank Limited (HBL), epitomizes an innovative approach in Pakistan's agricultural sector. Established with the aim to integrate corporate expertise, financial resources, and a leading bank's established network, HBL Zarai aims to address the multifaceted challenges faced by Pakistani farmers. This case study explores how HBL Zarai has leveraged its breadth of interfaces with the agricultural sector to provide comprehensive solutions, enhancing farmer productivity and profitability.



HBL Zarai Burewala Dera

Context and Purpose

HBL launched HBL Zarai to extend beyond traditional banking services and directly impact the agricultural sector. Agriculture is Pakistan's largest industry by employment, yet it remains undercapitalized and under-served by the corporate and financial sectors. HBL Zarai's inception is rooted in the belief that the corporate sector's intervention is crucial for realizing the potential of Pakistan's agriculture. This initiative originally signified a shift from considering agriculture as a mere CSR activity to integrating it into HBL's core business strategy. Today, this initiative that was born inside HBL's core business has become a separate entity with its own business model.

Dominated by small landholdings, farmers often face difficulties in accessing credit and markets. Traditional banking systems have not adequately catered to these farmers due to the lack of collateral and high risk associated with agricultural loans. At the HBL Zarai *Dera* established at Burewala, a group of farmers shared that the general consensus toward formal banking procedures and protocols among the farming community was that of an entity best avoided. Engagement with the banks typically involves undue delays and fatigue for farmers. Recognizing these challenges, HBL Zarai aims to bridge the gap by providing holistic support that goes beyond mere financing.

The traditional mandi system, dominated by “aarhtis” or middlemen, has long been the primary channel through which farmers sell their produce. While this system offers immediate cash, it comes with significant drawbacks. Aarhtis often exploit farmers by offering low prices for their crops and charging high-interest rates on informal loans. This exploitative relationship has kept many farmers in a cycle of debt and poverty, unable to break free and achieve financial stability.

Agricultural lending by banks in Pakistan is only 3% of their private sector lending portfolio, compared to an estimated 19% in India and 21% in Bangladesh. Traditional bank loans in Pakistan are secured against the farmer’s land and crop. However, crop failures lead banks to commence default proceedings, whereas the aarhti, despite their notorious practices, maintains high customer loyalty and outstanding collections from farmers. In fact, in focus groups, farmers often defend their aarhti’s due to their deep-rooted relationships. Despite their influence, aarhti’s lack the capability to enhance productivity or investment, limiting farmers’ growth potential. This is where outfits like the HBL Zarai *Dera* (farmer service center) come in. HBL Zarai introduces a cash-flow financed model that addresses both on-farm activities and the off-take process, reducing farmers’ dependence on aarhti’s while easing access to agricultural financing at an unprecedented level. By delivering transparency and fairness, HBL Zarai cultivates trust within the agri-economy, a sector historically plagued by mistrust. With its access to HBL’s nationwide coverage, HBL Zarai effectively connects various value chains, advancing the agricultural agenda on a national scale.

HBL Zarai’s operational model

HBL Zarai’s model is centered around the Zarai *Deras*—agricultural hubs established in key farming districts. The HBL Zarai *Dera* is a one stop shop for farmers of nearby villages for the full gamut of their cropping season needs. At present, having kicked off its first *Dera* at Burewala, the HBL Zarai *Deras* are focused on rice, maize and cotton in Burewala, maize, rice and potato in Sahiwal, and potato, maize and rice in Pakpattan. The *Deras* offer the following services:

- **Agronomic Advisory:** Agronomists stationed at the *Deras* offer guidance to farmers throughout the cropping season. This includes advice on fertilizer application, pest control, crop rotation, and the use of high-yield seed varieties.
- **Financial Services:** Farmers can open bank accounts, access credit facilities, and receive same-day payments for their produce, addressing the liquidity constraints that traditionally plague small farmers. HBL Zarai’s financial services are designed to be inclusive, offering products tailored to the unique needs of the agricultural sector.
- **Sale of farmer’s harvest:** HBL Zarai acts as a primary buyer for the farmers’ outputs, offering competitive prices and immediate payments, which are rare in the conventional mandi system. By aggregating the produce and selling directly to processors, HBL Zarai hopes to eliminate the need for intermediaries, ensuring farmers receive a fair price for their crops. This direct procurement model also ensures traceability and quality control, benefiting both farmers and buyers. This is perhaps the most difficult pillar of HBL Zarai’s business model as emerged in the last wheat season.
- **Supply Chain Management:** The *Deras* also function as centers for managing the supply chain of

agricultural inputs. They stock essential items such as seeds, fertilizers, and pesticides based on crop plans developed from historical data. This ensures that farmers have timely access to the inputs they need, reducing the dependency on local intermediaries who often sell substandard products at inflated prices. While stocking inventory in this manner does present a degree of risk for the Dera, the certainty communicated to the farmer that the Dera will cater to any farming need that may arise is valued more.

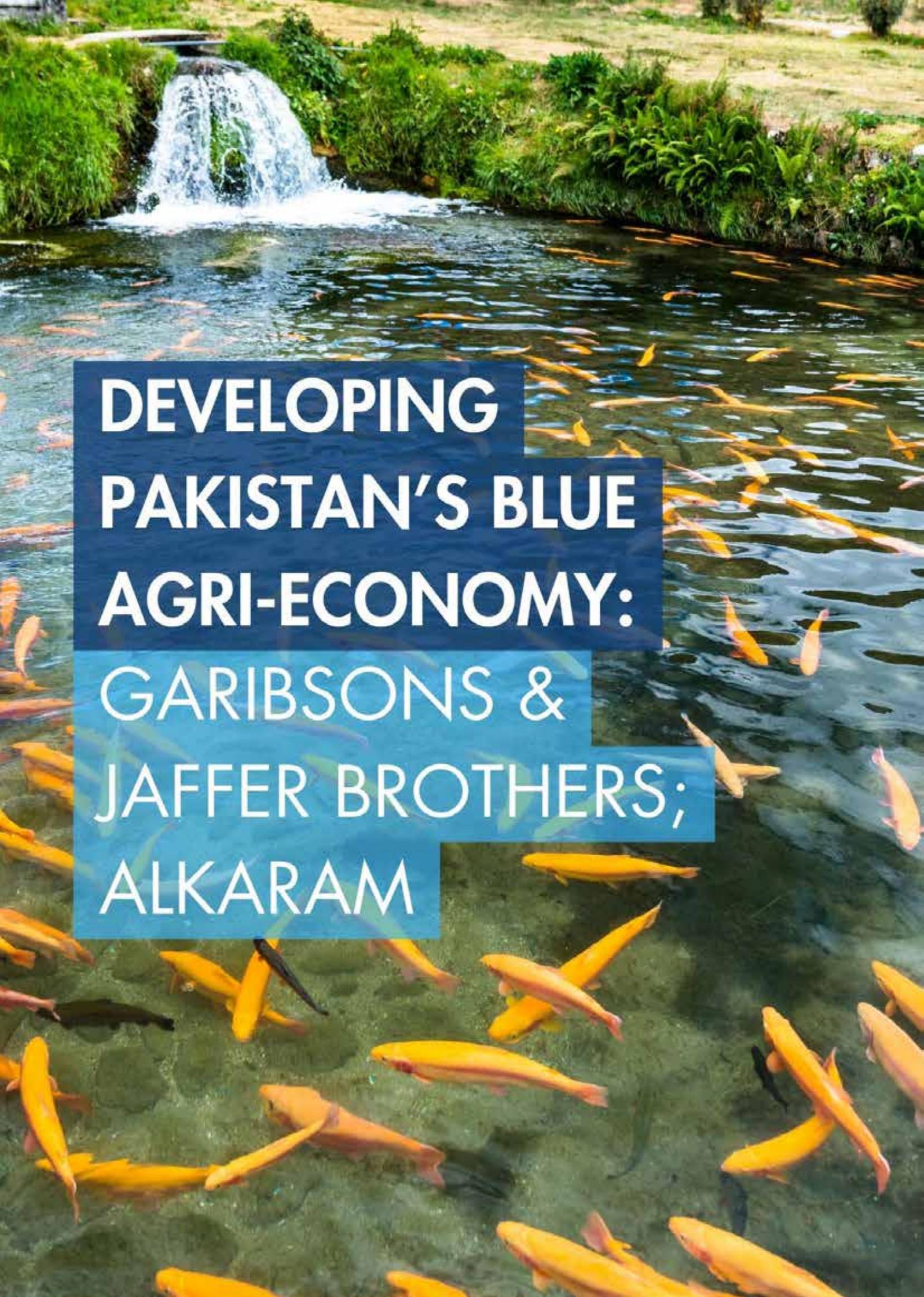
- **Mechanized Services:** Partnerships with companies that provide farm machinery-based services like Jaffer Brothers/Garibsons and Guard facilitate access to farm mechanization, enhancing farming efficiency. Farmers can rent machinery for planting, harvesting, and other farming activities at subsidized rates. This mechanization not only increases productivity but also reduces labor costs and the time required for farming operations.
- **Digital Solutions:** HBL Zarai leverages agri-tech to provide weather forecasts, crop monitoring, and market information to farmers. Through mobile apps and SMS services, farmers receive timely updates that help them make better decisions regarding planting and harvesting. Digital tools also enable better record-keeping and financial management, helping farmers build credit histories and access larger loans in the future.
- **Management Approach:** The structure of the Zarai model revolves around placing the farmer at the core of its success. From a management standpoint, this is guaranteed by making farmer profitability a key performance indicator for each district's Dera team. This way, a primary goal of HBL Zarai is to enhance farmer yields. Initial pilots revealed a 20% increase in yields and a 100% increase in small farmers' incomes. This success has been validated by independent assessments, including a study by researchers associated with Princeton University.

Scaling up the model

Expanding the model to other regions requires significant investment and coordination. HBL Zarai plans to overcome this through strategic partnerships and leveraging its first-mover advantage. The establishment of more Deras in collaboration with agricultural universities and research institutions will facilitate wider reach along with ensuring a competent and capable crop of agriculture experts, agronomists and managers in the coming years. Having the vice chancellor of the University of Agriculture Faisalabad on its board signals the type of partnerships HBL Zarai is invested in.

Navigating the regulatory landscape to establish a non-financial subsidiary required considerable effort. HBL engaged intensively with the State Bank of Pakistan and the SECP to get the necessary approvals. Ongoing compliance with regulatory requirements remains a challenge, but HBL Zarai's operations have set a positive precedent.

HBL Zarai's model showcases how a corporate entity can effectively engage with the agricultural sector to bring about substantial improvements in productivity, financial inclusion, and farmer welfare. This initiative demonstrates the potential of private sector-led development in transforming Pakistan's agricultural landscape, offering a replicable model for other regions and sectors.

A vibrant scene featuring a small waterfall cascading into a pond. The pond is teeming with numerous goldfish of various sizes and colors, including bright yellow, orange, and some darker ones. The surrounding area is lush with green plants and grass. The overall atmosphere is peaceful and natural.

DEVELOPING PAKISTAN'S BLUE AGRI-ECONOMY:

GARIBSONS &
JAFFER BROTHERS;
ALKARAM

Developing Pakistan's blue agri-economy: AquaHatch International and Dhabeji Aqua Foods

Pakistan's blue agri-economy is seeing major investments in the development of high-quality fish and shrimp seed and in shrimp farming and processing. Two companies are at the cutting edge of this: AquaHatch International (invested by a consortium of Garibsons and Jaffer Brothers) and Dhabeji Aqua Foods (invested by AlKaram).

AquaHatch, focusing on high-quality seed production of Tilapia and Pangasius, exemplifies the potential for large-scale aquaculture to enhance domestic food security and boost exports. Dhabeji Aqua Foods is currently under construction and when completed will be one of the largest facilities that focuses on high yield production and exemplifies the potential for large-scale aquaculture to enhance domestic food security and boost exports. By addressing



Fish ponds with brood stock

challenges such as seed quality, disease management, and efficient farming techniques in addition to regulatory and taxation structures; these operations set a benchmark for future investments into the sector. Their combined efforts promise substantial economic benefits, job creation, and a strengthened position for Pakistan in the global aquaculture market.

State of fisheries in Pakistan

From 2009 to 2015, the Government of Pakistan's Marine Fisheries Department collaborated with the Food and Agriculture Organization (FAO) to conduct comprehensive fish stock assessment surveys. It concluded that large fishing fleets and unsustainable fishing practices have led to what can be described as "fishing for catastrophe." The principal fish populations in Pakistani waters have been overfished, with their numbers decimated by an alarming 60-90 percent. Anecdotal evidence further supports these findings; for instance, in the late 1990s, Pakistan exported crabs weighing no less than 120 grams predominantly to markets in Japan, Korea, the USA, and Europe. Today, 90% of Pakistan's crabs are only 60 grams and are mostly exported to China, highlighting the drastic decline in size and quality of marine life.

The stark contrast between Pakistan's fishing industry and those of neighboring countries underscores the need for a shift towards sustainable aquaculture practices. While India exports around eight billion dollars' worth of shrimp annually and Ecuador ships shrimp worth approximately 12 billion dollars, Pakistan's shrimp exports languish at a mere 70 million dollars. Additionally, Pakistan's fish consumption per capita is just 2 kg per annum, compared to the global average of 30 kg. This low consumption rate suggests significant potential for growth in domestic fish farming to meet local nutritional needs. Species such as Tilapia and Pangasius offer a cheaper source of protein and can help in import substitution as well.

Good quality seed and feed are critical to the success and profitability of fish farming. Traditional fish farms in Pakistan typically produce around 1,500 kg of fish per acre. In contrast, Tilapia farms using high-quality seed and feed can yield up to 4,000 kg per acre, significantly offsetting the higher initial costs. However, Pakistan faces challenges in this area due to the lack of advancements in fish genetics within the country. Consequently, good quality seed often has to be imported to ensure higher yields and better returns. AquaHatch is a local hatchery working to provide high quality fish and shrimp seed. Dhabeji Aqua Foods is working towards a major corporate shrimp farm for export.

AquaHatch International

As in Pakistan's crop and livestock sectors, the issue of good quality seed is a significant challenge in the country's aquaculture industry. High-quality seed is essential for fish farms to produce high yields and secure better returns on investment. Over a decade ago, Pakistan's Fisheries Development Board initiated the import of 50,000 Tilapia fish seed from Thailand, distributing them to 11 farmers and teaching them how to rear these fish. This initiative quickly expanded, and within two years, the import of Tilapia seed surged to 3 million. Today, Pakistan imports approximately 60 million Tilapia seeds annually, highlighting the rapid growth and acceptance of these species in the local market.

The AquaHatch hatchery is situated in Thatta district, between Gharo and Gujjo, on a 33-acre plot with an additional 164 acres available for future expansion. The hatchery is located in an area populated by numerous fish farms, where the subsoil water is brackish and the soil a little saline, making the land unsuitable for traditional farming. This geographic advantage, coupled with access to fresh water from a nearby main water course, has made AquaHatch an ideal location for aquaculture.

The primary focus of AquaHatch is the production of Tilapia and Pangasius seed. These species were chosen due to their ability to grow to a large size, aligning with the Pakistani market preference for heavier fish. Tilapia, which tends to breed a lot in captivity, is sold as monosex seed to prevent further breeding and to ensure that they grow to nearly 1 kg within about seven months with proper feeding practices. By administering testosterone, the female fish are prevented from developing functional ovaries, thus controlling reproduction. Pangasius, on the other hand, can reach a substantial weight of 2 to 2.5 kg within a year to eighteen months.

Agri-transport challenge

Shrimp farming also holds significant potential in Pakistan. Currently, there are estimated to be approximately 250,000 acres under fish farming in Punjab, though official figures report lower numbers. Converting just 10% of fish farms in Punjab to shrimp farms could boost Pakistan's shrimp exports to a billion dollars. In a 2014 project, importing 10 million shrimp seeds worth almost 10 million rupees took 20 hours to reach the farm, close to the maximum limit for safe transport. Delays could have led to high mortality rates (and high loss), emphasizing the need for a local source.

AquaHatch is actively developing shrimp seed as well to overcome the logistical challenges of importing shrimp. AquaHatch's shrimp seed is adaptable to various water salinity levels, from 28 ppt to 5 ppt (parts per thousand), ensuring survivability. The facility also maintains sea water ponds and brackish underground water reserves to mix and adjust the salt levels as needed.

Building the eco-system

In Southern Punjab, where water is brackish and the land is underutilized, shrimp farming could transform these areas into highly productive zones. Typically, a modern shrimp farmer using 45 shrimp seeds per square meter can yield around 8,000 kg per acre which far exceeds Pakistan's average of 1,450-1,500 kg of shrimp per acre. Typically, 45 shrimp seeds per square meter can yield around 8,000 kg per acre. While initially, high-quality seed and feed were imported, the establishment of AquaHatch and the entry of companies like AMG Thai Union Feed Mill have made these resources available locally. However, more hatcheries, feed mills, processing units, and progressive farmers are needed to support a fish and shrimp farming eco-system in the region.

The demand for shrimp in Lahore alone, driven by high-end restaurants, is worth an estimated \$24 million annually. Marine-caught shrimp often suffer from quality issues due to extended periods at sea, leading to a smell that farmed shrimp does not have. This freshness gives farmed shrimp a significant market advantage.

Water availability

Each shrimp farm should ideally be no larger than 2 acres due to the intensive management required. Water quality is crucial, with parameters like dissolved oxygen, pH, and salinity needing constant monitoring and adjustment. Given the uncertainty of water availability in southern Sindh, AquaHatch has built an 8-foot deep, 3-acre pond as a water reservoir to maintain optimal conditions, changing 10% of the water of fish ponds daily to increase survival rates.

The hatchery ponds at AquaHatch are all 6 feet deep, which is more effective than the 3-foot deep ponds at neighboring farms that struggle with water retention and temperature control. The company ensures that the ponds receive feed exclusively from AquaHatch to maintain quality control. Additionally, AquaHatch collaborates with the Dutch Fund for Climate and Development (DFCD) for technical support.

For its shrimp seed production, AquaHatch imports eggs that hatch into nauplii. There is a phytoplankton lab on-site to support the early stages of shrimp development. Currently, they produce 12 million baby shrimp per month, which grow to 22-25 grams (harvest weight) in about three months meaning that two crops can be taken in a year from these baby shrimp/seeds.

Key challenges and solutions

The absence of a local feed factory providing high-quality feed suitable for shrimp farming was a significant challenge for AquaHatch and other shrimp farmers in Pakistan. This gap was addressed when AMG Thai Union, a joint venture between a Thai company and a local group AMG, established operations to supply high-quality feed for aquaculture farming. The availability of this feed has significantly improved the prospects for successful fish and shrimp farming in the region.

Another major challenge is of bacterial and fungal diseases prevalent among fish, with their incidence largely dependent on water quality, the rate of water change, and the stocking density of fish per unit area. These factors necessitate careful management to prevent disease outbreaks and ensure the health of the fish. Some attention from the government and research centers is also required to work on diseases common in aquaculture.

Transportation of seed also presents unique challenges. Once, AquaHatch had to send 300,000 fish seed from District Thatta to a location farther than Lahore, using a reefer container. However, due to a protest, the container was delayed near Hyderabad for over ten hours, resulting in more than 50% seed mortality. To mitigate such risks, AquaHatch started to use vans with ice boxes installed (after removing the seats), which can travel at high speeds on motorways and have ensured zero-mortality during transport. Although transportation is typically the buyer's responsibility, AquaHatch guides the buyer on exactly how to transport the seed and also plans to develop its own transport solutions to reduce risks further.

Currently, there is no robust insurance product available for aquaculture either. AquaHatch is working with Habib Insurance to develop an insurance product specifically for fish farming, addressing the significant risk factors associated with the industry. The current scale of AquaHatch's operations can provide seed for around 600 acres, but there is a need to replicate this model to meet the demand. Other players must enter the market to provide good quality seed to ensure the industry's growth. A processing facility becomes feasible if it processes around 25 tons per day, highlighting the need for scaling up operations to achieve economies of scale.

The social impact of AquaHatch's operations has been substantial. The farm manager, a young local from the community educated at the University of Sindh, Jamshoro, exemplifies how sophisticated fish farming can provide employment opportunities for educated locals. AquaHatch has also fostered community engagement through intra-community sports, provision of jobs to locals, the construction of a school for local children, complete with hired teachers, and stipends for students. They plan to integrate local boys and girls as interns in their operations, furthering educational and employment opportunities. Additionally, AquaHatch hosts visitors every Saturday, including university students and entrepreneurs, eager to learn about their operations.

Looking to the future

AquaHatch plans to scale up its operations by opening service centers across Pakistan, complete with cold storages. These centers will facilitate buyback arrangements with farmers, with the ultimate aim of exporting the fish. This expansion strategy not only promises to enhance AquaHatch's business prospects but also aims to significantly boost Pakistan's fish and shrimp farming industry and increase farmer income while contributing to the country's economic growth and sustainability.

Dhabeji Aqua Foods

Shrimp farming in Pakistan holds massive potential for exports, particularly with the country's extensive 1,300 km coastline along Sindh and Balochistan. Recognizing this opportunity, Al-Karam, a renowned name in textiles, decided to make a significant entry into the aquaculture industry by forming Dhabeji Aqua Foods. This venture represents a bold step towards harnessing the potential of shrimp farming to boost Pakistan's economy.



Shrimp pond

From farming to processing

Dhabeji Aqua Foods is developing a shrimp farm on 400 acres, which will feature 300 half-acre ponds. When completed, it will be one of the largest shrimp farms in the region. The farm is strategically located by the creek in the Dhabeji area. The primary goal of this large-scale operation is to increase Pakistan's shrimp exports and pave the way for others to invest in the sector. Al-Karam aims to produce enough high-quality shrimp to partially support its own processing operations and to inspire confidence in potential investors by demonstrating the viability of large-scale shrimp farming in Pakistan. The group has put in extensive efforts to improve the taxation structure around the industry in addition to working on regulatory challenges that hindered the development of the industry; including addressing bans on shrimp imports from Pakistan by other countries.

The location is ideal for shrimp farming as it allows for the extraction of seawater, which contains 97% of the minerals required by shrimp. Dhabeji Aqua Foods employs an intensive shrimp farming model, stocking 150 pieces of shrimp per square meter, with the potential to increase to 250 to 300 pieces (as compared to the traditional average of 45 pieces per square meter). This intensive farming approach necessitates a higher investment, with the cost of developing each half-acre pond being more than three times that of a typical one-acre shrimp pond. Currently, the farm has 20 operational ponds, with plans to expand to 100 ponds by February, 2025, and to continue to add 100 ponds each season till it reaches its maximum capacity of 300 ponds.

Al-Karam is exploring options for establishing its shrimp processing operations. Given the seasonal nature of shrimp farming in Pakistan, which is not viable during the winter months due to low temperatures, the processing facility will need to import shrimp for the remaining two months to maintain year-round operations. A typical processing facility has an output of around one ton of shrimp per hour, requiring 1.5 tons of unprocessed shrimp every hour. The fresh shrimp undergoes de-heading, grading by size, peeling, and de-veining, before being prepared for various forms of sale such as frozen, glazed, cooked, or breaded.

Building the eco-system

It is essential to establish other high-quality shrimp farms to meet the processing facility's demand, either through local sourcing or imports and encouragingly other entities have begun to explore the farming space. The processing operations will create approximately 400 jobs, while the farm operations are expected to generate around 750 jobs on the 400-acre site. This development will require significant training for human resources involved in both farming and processing both of which the group can draw on through its local and international partners. The group has previously seen success in helping set up crab processing and upskilling local women workers through training sessions with its foreign partners.

Intensive shrimp farming is susceptible to diseases, requiring meticulous attention to disease management. To address these challenges, Dhabeji Aqua Foods is receiving guidance from international experts to ensure effective disease control and management practices in addition to putting in place the best-in-class biosecurity infrastructure and protocols, thereby safeguarding the health of the shrimp and the success of the operation.

Conclusion

The development of advanced aquaculture operations such as AquaHatch and Dhabeji Aqua Foods marks a significant step forward for Pakistan's fishing and shrimp farming industries. These ventures highlight the immense potential for both domestic consumption and export, addressing critical issues such as high-quality seed production, disease management, and efficient farming techniques. By leveraging modern practices and international expertise, these operations demonstrate the viability and profitability of large-scale aquaculture in Pakistan, showing the path for future investments in the sector.

The economic and social impacts of these projects are also substantial. AquaHatch's commitment to expand its operations along with Dhabeji Aqua Foods' ambitious plans to boost shrimp exports and create employment opportunities, underscore the transformative potential of aquaculture. As Pakistan continues to navigate its economic challenges, the success of these pioneering efforts can serve as a catalyst for broader industry growth. These initiatives promise not only to enhance food security and generate significant revenue but also to position Pakistan as a competitive player in the global aquaculture market.

The image features two wooden spoons filled with sesame seeds. The spoon on the left is filled with white sesame seeds, while the spoon on the right is filled with black sesame seeds. The background is a dark, textured surface, possibly a wooden table, with scattered sesame seeds. The text is overlaid on a blue, semi-transparent background that follows the shape of the spoons.

OPEN SESAME:

HOW CMEC IS

EXPANDING

PAKISTAN'S SESAME

EXPORTS TO CHINA

Open sesame: How CMEC is expanding Pakistan's sesame exports to China

Agri-exports to China are an enormous prospect as well as a huge challenge for Pakistan. The agri team of CMEC, one of China's largest conglomerates, evaluated many options and picked sesame as the best option and met with great success. This is the story of how CMEC is creating a breakthrough.

China Machinery Engineering Corporation (CMEC) began its involvement in Pakistan as part of a broader effort to strengthen the economic and strategic ties between the two countries as part of the China-Pakistan Economic Corridor (CPEC) initiative launched in 2013. Facilitated by robust diplomatic relations, CMEC's early projects aimed to address Pakistan's infrastructure needs by leveraging Chinese expertise and investment capabilities. CMEC's role within the CPEC



CMEC sesame model farm visit: sesame under cultivation

framework was primarily focused on energy production and infrastructure development, addressing Pakistan's energy shortages and laying the groundwork for sustained economic growth. Over its decade of operations in the country, the company was quick to identify where else potential existed in Pakistan, particularly in the agriculture sector. Today, in only its second year of exporting sesame, Pakistan is the fifth largest exporter of sesame in the world--a feat that has both surprised and delighted the farming community.

Venturing into the agri-space in Pakistan

Initially, CMEC worked on chilli production with six supply partners which included some multinational companies and leading local companies. The criteria were high standards and high quality, however, the Chinese food industry did not seem to respond too well to red chillies. This coupled with the comparison to other value chains (e.g., wheat with better prices) meant that other export options needed to be explored and sesame was the best choice.

The reasons for this choice had to do with both demand and supply. Sesame enjoys high demand in the Chinese market. Sesame seeds are a fundamental ingredient in Chinese cuisine and are valued for their health-promoting properties in traditional Chinese medicine. The Chinese food industry imports one

million tons of sesame seeds per year--most of it sourced from the African continent. On the supply side, sesame has traditionally been considered a marginal crop in Pakistan but this has begun to change with the opening of exports to China. In 2023, the country produced sesame on about 1.2 million acres (200,000 acres in 2018) with the districts of Sahiwal and Faisalabad leading in numbers. The primary target of CMEC was to export 20,000 tons of sesame, however, had this target been of 40,000 tons even, the company believes it would have managed to accommodate the demand given the response of the local farming community and the production capacity CMEC enjoys. This year, based on seed sales, it is estimated that sesame is being cultivated on 1.9 million acres in Pakistan. CMEC acquired a 20,000 ton sesame production facility in Faisalabad last year and another facility in Sahiwal this year.

Sesame in Pakistan

Pakistan is strategically primed as a sesame producing resource partner for CMEC. Some 85% of the country's sesame is produced in Punjab amounting to a volume north of 400,000 tons. The Sindh province produces 10 to 12% of the country's total sesame volume, while Balochistan exhibits great potential for organic sesame: the region of the Sindh-Punjab-Balochistan border is ideal for the crop's production. In the past year, the country has enjoyed a bumper sesame harvest given the opening of export to China; adequate and well-distributed monsoon rains in the sesame-growing regions of Sindh and Punjab provided the necessary soil moisture for optimal seed germination and growth. In addition to this, Pakistan's relatively close geographical location to China reduces transit time and transportation costs to 10-15 days by sea, making it a convenient and cost-effective supplier of sesame seeds to the Chinese market.

The free trade agreement signed under CPEC greatly increased the volume of exports to China. Under CPEC, the custom duty of 10% previously applied by the Chinese government was waived. Since 2018 the custom duty is 0%. In the first year following this change, some 23,000 tons of sesame was produced in the country. Many local market players did not possess the appetite to absorb such production for processing and export. That is where CMEC stepped in.

Major challenges

Following the floods of 2022, the quality of the sesame crop was negatively impacted resulting in a dwindling of Chinese buyers. The impacted quality also exposed farmers' conventional practices of post-harvest treatment of the sesame seeds—farmers seemed indifferent to the high moisture content, an oversight contributing to a massive waste of the crop's value. Post-harvest losses are a grave concern with sesame production as the primitive practice of conventional threshing poorly impacts the quality of the seed and also results in volume loss. At present, the company has estimated post-harvest losses at about 35-40%, a figure that undermines both quality and sustainability. CMEC plans to introduce new technology for harvesting and threshing of sesame in Pakistan.

A key constraint following the harvest of sesame seeds is the in-land transportation, along with the associated costs and risks of moving large volumes from CMEC's factories in Faisalabad and Sahiwal across the country—a journey that takes about three days on average. The transportation costs are not uniform, which impacts the overall production cost. Additionally, the duration of the trip exposes the produce to various risks, such as climatic disasters, theft, and pilferage. To mitigate these risks, the company is exploring logistical and insurance options.

The Free Fatty Acid (FFA) content of the sesame is a critical quality parameter for sesame seeds, especially in the context of international trade and food safety. For sesame seeds, the acceptable FFA content should usually range between 0.5% to 1.5%. Levels above this range may indicate poor handling, storage conditions, or prolonged exposure to air and moisture. Currently, the FFA levels for Pakistani seeds are around 3%. This figure can be lowered with proper post-harvest handling, including drying the seeds to the appropriate moisture content, storing them in cool and dry conditions, and minimizing exposure to air and light. At present, CMEC is importing machinery to sort, grade, and clean the threshed seeds to ensure minimal adulteration and enhance the quality and marketability thereby strengthening its position as a leading exporter. The importance of reducing post-harvest losses also reveals the appetite in the sesame producing sector for farm mechanization and modern methodologies.

Engaging with local farmers

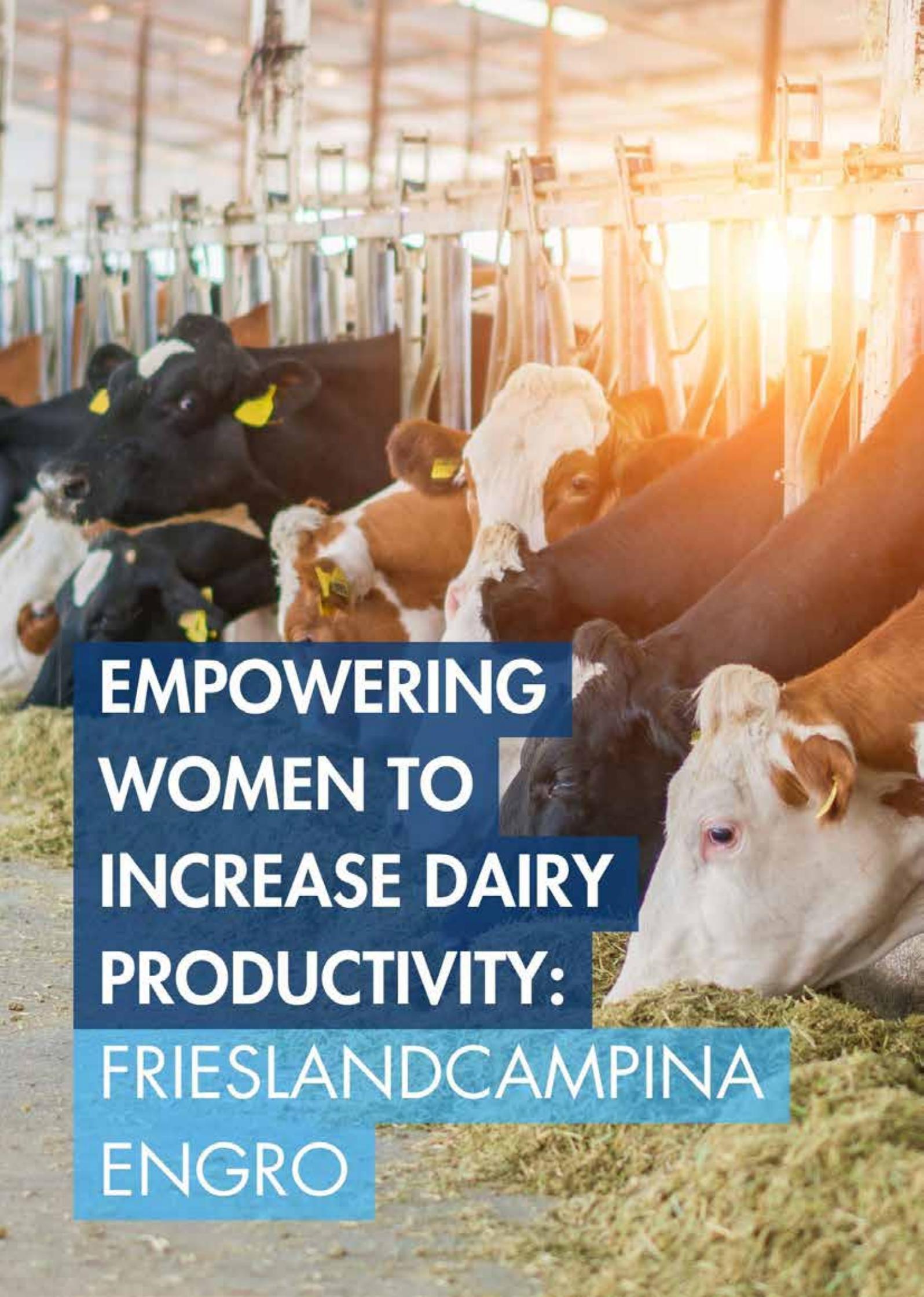
To overcome these challenges, CMEC actively engaged with local farmers on both sowing and harvesting operations. This endeavour was made possible by partnerships with local institutions, suppliers, capacity building of local farmers: recommending the right seed varieties to the farmers, employing the help of regional technical teams to educate and train farmers, setting up over 15 model farms at partner farmers' locations in Punjab all focused on increasing yields of sesame. As a result of this effort, the sesame yields in the country were doubled: CMEC farmers reported yield of 12-15 maunds per acre this last season, almost double the national average of about 7 maunds per acre. In addition to this, CMEC is planning to introduce a model whereby the company will serve as a service provider, supplying modern machinery to farmers with land of 50-acre plots or more for planting, harvesting, etc., with the understanding that those farmers will prioritize selling their produce to CMEC.

At present, CMEC has been careful to not bound farmers to sell their sesame harvest to them. Unlike existing models of farmer engagements with big private sector corporations, the company's aim was centred on social responsibility and a shared vision to improve growing practices, all predicated on the foundation of the wider partnership between Pakistan and China. This entailed having strong linkages with the local ecosystem of the sesame supply chain, partnering with "aarhtis" and having an equally strong base of a reliable farmers in its supply network. The guiding principles of this engagement were those of transparency and market forces: the company would only buy from farmers when they would be satisfied with the market price based on existing conditions, there were no pre-determined contracts or agreements with farmers fostering a sense of healthy competition and fairness.

The company maintains that the farmers in its network are its top priority. Predominantly, it works with large farmers who manage areas of 2,000 to 3,000 acres per farm. Social responsibility is a significant component of the partnership with farmers in Pakistan: if yields are doubled, the company aims to ensure farmers have security in their relationship with the company. While the company does not participate in binding contracts, it still engages with farmers through its model farms. Here, the local community is educated on the use of fertilizers and innovative farming techniques, all with a focus on international export-oriented production. This is important because, for CMEC purposes, sesame is produced for export, and its price is determined in the international market. In addition to this, the partnerships with local academic institutes as well as Chinese institutions contributes the link to research and development. CMEC in turn contributes to facilitating projects through its equipment such as combined harvesters and drones for sprays.

Competition

While its current model of non-binding relationships with farmers could potentially expose CMEC to uncertainty associated with its supply as well as threats from competitors, the company enjoys the unique position of being the biggest producer of sesame in Pakistan. As the biggest exporter to China, CMEC is also uniquely positioned to cater to the Chinese market due to its strong connections in its home country. An additional factor contributing to the company's secure status is the capital and resources available to the company. Often competitors are unable to compete with the capital-oriented nature of the sesame business, while also struggling with ensuring secure and reliable connections within the Chinese food industry and market—CMEC enjoys both. As a China-based company CMEC has leverage compared to other competitors as new players are not trusted easily. A target of 40,000 tons per year of sesame export is easily achievable for a company like CMEC just in its second year!



**EMPOWERING
WOMEN TO
INCREASE DAIRY
PRODUCTIVITY:**

FRIESLANDCAMPINA

ENGRO

Empowering women to increase dairy productivity: FrieslandCampina Engro

Livestock accounts for 61 percent of Pakistan's agri GDP dominated by the dairy sub-sector. And 80 percent of dairy animals are with farm families where the women of the household are most often involved in animal care. This makes it difficult to increase dairy productivity. FrieslandCampina Engro Pakistan has turned this challenge into an opportunity for women empowerment while increasing dairy productivity and farm family livelihoods. Most participating women farmers have received their first paid employment and a role in family decision-making.

Introduction

Pakistan's livestock sector, dominated by dairy farming, plays a vital role in the national economy, contributing approximately 14.63 percent to the country's Gross Domestic Product (GDP) (which is 61 percent of agri GDP) and employing a significant portion of the population. But over 80 percent of the dairy animals are with small farm families where the women of the household are most often involved in animal care. Despite the



Training of farmers

importance of the dairy sector, challenges such as limited access to resources, unequal opportunities, and gender disparities persist, particularly in rural areas where Pakistan's poverty is prevalent.

FrieslandCampina Engro Pakistan Limited (FCEPL) is a prominent Pakistani dairy company and a subsidiary of the Dutch multinational dairy cooperative Royal FrieslandCampina. Originally established as Engro Foods in 2005, FCEPL inaugurated its first production facility in Sukkur, Pakistan, marking the debut of its flagship UHT milk brand, Olper's. In 2016, a strategic partnership with Royal FrieslandCampina was formed, providing FCEPL access to over 150 years of dairy expertise, advanced technology, and extensive research and development capabilities.

With production facilities located in Sukkur in Sindh province and Sahiwal in Punjab province, and a mega dairy farm at Nara in northeastern Sindh, FCEPL operates a supply chain comprising more than 1,100 milk collection centers and a network that includes thousands of farmers. This expansive footprint ensures a sustainable and efficient supply chain, supporting knowledgeable farmers and empowered communities.

Dairy Development Program (DDP)

Central to FCEPL's commitment is its Dairy Development Program (DDP), a comprehensive initiative designed to foster inclusive growth and enhance profitability within the dairy sector. The DDP focuses on sharing best practices in dairy farming, offering training in animal health, housing and barn design, feed and water management, milk hygiene, aflatoxin control, farm economics, calf rearing, and environmental sustainability. Annually, over 40,000 farmers benefit from training sessions that leverage global dairy expertise, including insights shared by Dutch farmers through the Farmer-to-Farmer initiative.

Recognizing the financial challenges faced by dairy farmers, FCEPL provides critical support through subsidized loans from partner banks and interest-free loans to meet operational expenses. The company further demonstrates its commitment to community development by awarding scholarships annually to farmer's daughters under its scholarship initiative, emphasizing women's empowerment and contributing to improved standards of living in rural communities.

FCEPL's dedication to empowering women in rural areas is evident through initiatives aimed at integrating women into the dairy supply chain particularly through FCEPL's Enhancing Women's Income through Dairy Interventions (EWID) program (discussed in detail below). The company employs female veterinarians who train female farmers in best practices, actively engages women as milk collection agents, and focuses on capacity building through continuous training and the provision of modern dairy equipment at discounted rates through partnerships with farm input suppliers.

Operational support for dairy farmers extends to infrastructure development, including technical and financial assistance for the construction of dairy sheds, and the provision of essential farm machinery such as Total Mixed Ration (TMR) mixers, silage machines, and milking machines. A dedicated helpline and advisory SMS service further ensure that farmers receive timely technical assistance and information, enhancing their operational efficiency and productivity.

In alignment with its environmental sustainability goals, FCEPL supports dairy farmers in adopting solar energy solutions to minimize operational energy costs and reduce environmental impact. By subsidizing solar installations, FCEPL facilitated 64 dairy farmers in transitioning to solar energy in 2023. Additionally, the company promotes environmental conservation through tree plantation initiatives at milk collection centers, commercial dairy farms, and its own Nara Farm, planting approximately 15,000 trees annually.

Flagship initiative for women's empowerment: Enhancing Women's Income through Dairy Interventions (EWID)

The Enhancing Women's Income through Dairy Interventions (EWID) initiative by FrieslandCampina Engro Pakistan Limited (FCEPL) aims to empower rural women by equipping them with entrepreneurial skills and opportunities, thereby challenging traditional gender roles prevalent in rural Pakistan. In many patriarchal communities, women bear significant



Training of women farmers and entrepreneurs

domestic and caregiving responsibilities that often go unrecognized and undervalued, leaving them overburdened with farming duties limited to household tasks without access to broader economic opportunities. Through EWID, these women are integrated into the dairy supply chain, enhancing their economic status and positively impacting various social indicators.

Launched in 2019 with support from the Department of Foreign Affairs & Trade of the Government of Australia, this project operates in districts Vehari and Sahiwal in Punjab province. To date, EWID has trained 4,120 individuals, including 3000 women as basic livestock beneficiaries, 100 as livestock extension workers, and 20 as milk collection agents, alongside 1,000 men who received gender sensitization training. By transitioning from unpaid labor to active participants in the workforce, these women contribute not only to their household income but also improve family nutrition, invest in children's education, enhance healthcare access, and strengthen overall household resilience.

A survey conducted by Pakistan Business Council's Centre of Excellence in Responsible Business (CERB) revealed that the EWID initiative by FCEPL has significantly impacted women and households in rural Pakistan across various dimensions. The following sections provide insights gleaned from this survey.

Impacting women and households

The Enhancing Women's Income through Dairy Interventions (EWID) initiative has played a crucial role in empowering women by providing them with opportunities to engage in income-generating activities and entrepreneurial ventures. This initiative has not only enhanced their economic status but has also improved their decision-making power within their households. Research highlights that economic empowerment translates into greater control over income and expenditure, which is pivotal to reshaping gender dynamics and reducing traditional barriers faced by women in decision-making processes. A substantial 86 percent of participants reported an increase in decision-making power, underscoring the program's success in fostering financial independence and freedom of movement among rural women. Moreover, the initiative has facilitated women's ability to exercise autonomy over discretionary spending, with 94 percent expressing control over how their income is allocated. This empowerment not only supports individual financial autonomy but also contributes to household well-being.

Impacting livelihoods

The impact of FCEPL's EWID initiative on rural women and households in Pakistan is significant across multiple dimensions. Research highlights deep gender inequalities. Traditionally, women's labor in agriculture and dairy farming goes unrecognized and unpaid, further perpetuating economic marginalization. The EWID program addresses these challenges by empowering women through training, financial support, and inclusion in the dairy supply chain as milk collection agents, extension workers, and basic suppliers. Surveyed beneficiaries noted that this program marked their first paid employment, significantly boosting household incomes and improving overall family livelihoods.

Despite financial constraints, women earning through the EWID initiative contribute crucially to family nutrition and expenses. Moreover, training under EWID has enhanced dairy farming practices, leading to increased milk production reported by 71% of respondents. This improvement stems from knowledge in hygiene, animal health, and fodder management, crucial for sustainable dairy operations. Women involved in the program manage both farm and household responsibilities, illustrating their dual burden of work. However, despite increased responsibilities, many beneficiaries find empowerment through financial independence and recognition of their contributions.

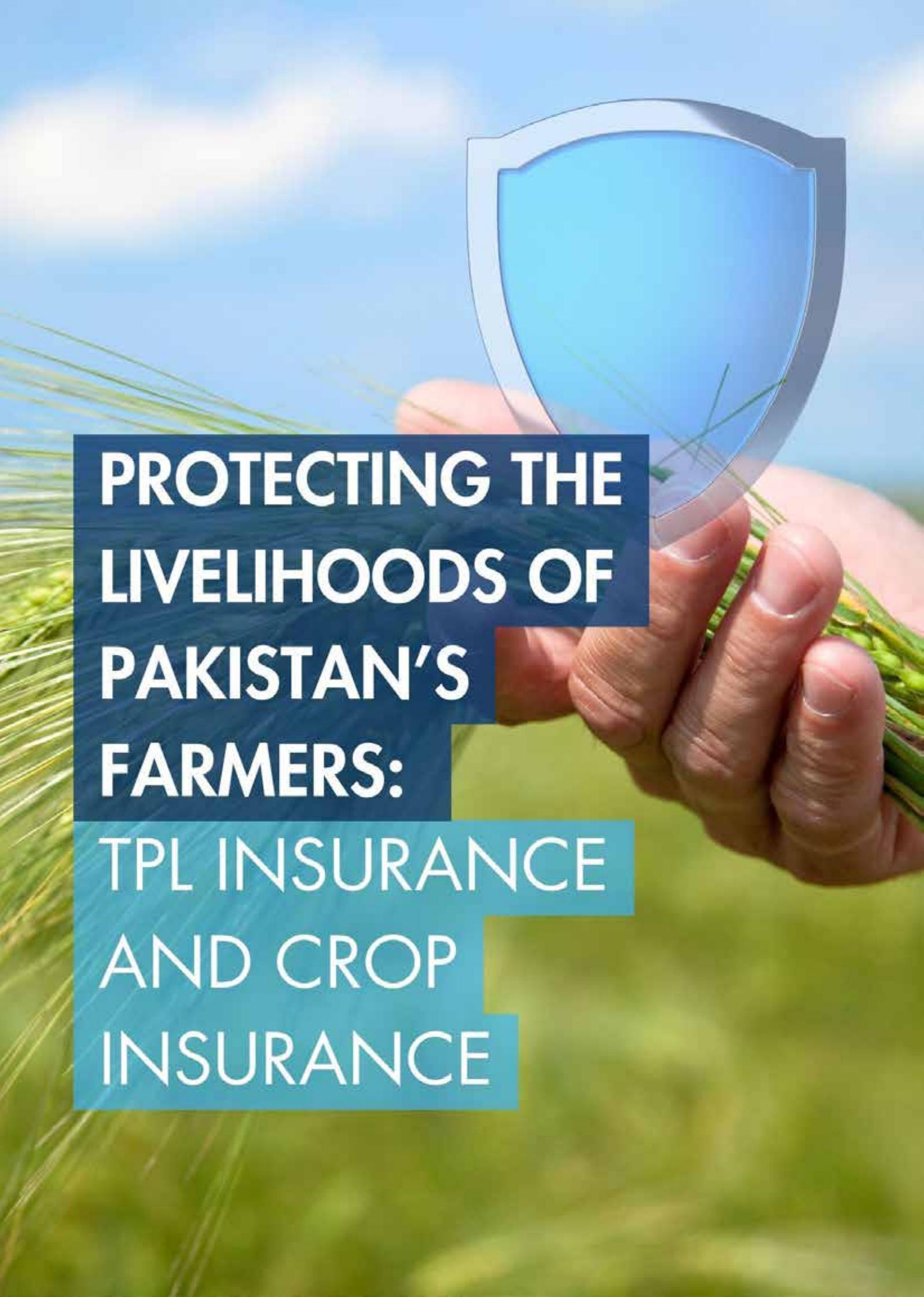
Impacting community

FCEPL's EWID initiative has made significant strides in impacting rural communities, particularly by enhancing capabilities and building resilience towards income shock among women involved in dairy farming. The program has not only empowered women economically but also equipped them with essential skills and knowledge to improve livestock health and increase milk production. A unanimous 100% of respondents reported acquiring valuable dairy management insights and practices, contributing to healthier livestock and higher productivity. Beyond economic gains, the initiative has spurred investments in children's education, reflecting a commitment to enhancing human capital and future opportunities. This strategic allocation of income by women underscores their role in bolstering household resilience against income shocks and other challenges.

Moreover, the EWID program has addressed key vulnerabilities faced by livestock farmers, such as droughts, diseases, and market access constraints. Through comprehensive training on animal health, vaccination, and disaster management, women have not only enhanced their livelihoods but also established veterinary service points within their communities. These initiatives provide critical first aid and support during emergencies, further bolstering resilience against unforeseen events. As highlighted by Tehmina, one of the beneficiaries, this newfound capability has transformed her role within her family, offering hope and stability in times of uncertainty.

The EWID program by FCEPL represents a significant effort towards empowering women in rural Pakistan through economic independence and enhanced decision-making power. By recognizing and remunerating women for their contributions to dairy farming, the program has not only improved livelihoods but also strengthened household resilience against income shocks. Ultimately, EWID demonstrates that women-focused empowerment initiatives can deliver substantial social and economic benefits while laying a foundation for sustainable development in rural communities.

In conclusion, FrieslandCampina Engro Pakistan Limited (FCEPL) has exemplified transformative impact through its initiatives, particularly the EWID program, aimed at empowering women in rural Pakistan. By providing women with economic opportunities in dairy farming, FCEPL has enhanced household incomes and resilience against shocks. It has also empowered women to take active roles in decision-making and community development. This comprehensive approach, supported by training, financial inclusion, and gender sensitization, has not only improved the livelihoods of rural families but also set a precedent for inclusive economic growth. Such success has prompted FrieslandCampina to replicate this model in other countries, showcasing the scalability and sustainability of their empowerment strategies beyond Pakistan's borders.

A hand holding a blue shield over a field of wheat under a blue sky. The shield is a simple, rounded rectangle with a blue gradient and a white border. The hand is positioned in the lower right, holding the shield over the wheat. The background is a bright blue sky with soft white clouds and a field of green wheat in the foreground.

**PROTECTING THE
LIVELIHOODS OF
PAKISTAN'S
FARMERS:**

**TPL INSURANCE
AND CROP
INSURANCE**

Protecting the livelihoods of Pakistan's farmers: TPL Insurance and Crop Insurance

Climate impacts and biological perils have been impacting Pakistan's agriculture with greater frequency. And farmers have little protection from the serious financial impacts of these disasters. After crop insurance schemes introduced by the federal and provincial governments, the private sector led by TPL Insurance has demonstrated with three pilots that robust crop insurance is now available in Pakistan.

What the 2022 floods taught us about crop insurance

In 2022, much of the country experienced record-breaking heat waves, which adversely affected the nation's wheat crop in March and April, followed by catastrophic flooding in July and August, which resulted from 500% of historical average rainfalls and caused large-scale flooding across the provinces of Sindh, Punjab and Khyber Pakhtunkhwa (KP). In the wider context, Pakistan's 7.4 million smallholder farmers face increasing risks due to the impacts of climate change. The changes include flux in average temperature and precipitation as well as increases in the variability of weather and climate events. These changes have been developing for some time. For example, the number of heat wave days per year in Pakistan increased by 31 days from 1980 to 2007, and rainfall in plains and coastal areas decreased by 10% to 15%. The province of Sindh in particular experienced two hundred-year floods in the past fifteen years (2010 and 2022) for which extensive relief and rehabilitation efforts had to be undertaken.

The aftermath of the 2022 floods highlighted the urgent need for strong climate-resilient mechanisms to address these risks and help Pakistan's farmers adapt to the changing climate. In the absence of such mechanisms, not only do farmers suffer, but the government may also end up allocating more resources to post-disaster efforts than would require with appropriate risk-transfer mechanisms. The Government of Sindh allocated significant funds for flood relief efforts: between October 2022 and January 2023, the Sindh Flood Emergency Rehabilitation Project (SFERP) project utilized PKR 5.7 billion to repair critical infrastructure while the Kissan Package announced in late 2022 allocated Rs. 1,800 billion in loans and subsidies designed to reduce the cost of fertilizers and provide loans for farmers affected by the climate events. In addition to this, 1.2 million bags of wheat seed and Rs. 5 billion in interest-free loans were disbursed to landless farmers.

While these efforts were necessary to address the immediate aftermath of the floods, such funding often proves reactive and insufficient in addressing the recurring nature of climate-induced disasters. Proactive measures like crop insurance could potentially offer a more sustainable solution since it transfers the risk associated with climate-related and biological perils from farmers and the Government to the insurance community.

Crop insurance can provide a more effective solution by mitigating the financial risks faced by farmers due to climate-related disasters. But the current state of crop insurance provides inadequate protection to farmers. The Crop Loan Insurance Scheme (CLIS) of the central bank (State Bank of Pakistan, SBP), launched in 2008, made crop loan insurance mandatory for all crop loans issued by regulated banks. The federal government subsidizes the insurance premium for farmers with landholding below 25 acres. But less than 20% of smallholder farmers access formal financing from banks. This Crop Loan Insurance Scheme covers the main perils typically included in crop insurance schemes globally but has two major constraints:

- a) the trigger for insurance pay-out in an area is a declaration of calamity by the government (which can be a subjective decision, not linked to an accepted scientific method), and
- b) the maximum insurance pay-out is capped for each bank at three times the insurance premium paid by the bank (this is usually a very small amount compared to the losses incurred by both farmers and banks).

As a result, in the first fifteen years of this scheme, the insurance pay-out to small farmers is about half of the insurance premium paid out by the federal government for small farmers. The Government of Punjab introduced Area Yield Index-based Insurance scheme titled Punjab Fasal Bema in 2018 but crucial design changes within a couple of seasons made the scheme ineffective as an insurance mechanism to support farmers.

Where the private sector comes in successful pilots The type of crop insurance best suited to protect farmers is Area Yield Index-based Insurance (AYII).

Area Yield Index Insurance (AYII) covers all natural catastrophes, pests/diseases and related perils that could influence the reduction of crop yields. It covers the entire crop period, from sowing to harvesting crops. It is an insurance cover that insures farmers against a published pre-set historical benchmark. The perils covered in this product are windstorm, frost, excessive rainfall, heatwave, hail, flood, drought, pest and diseases.

At the end of the season, trained enumerators' measure yield levels for each area through a method known as crop cuts. This process involves measuring the harvest of sampled representative farmers. If the yields measured on the sampled farms are lower than the historical benchmark, then all the insured farmers in that area receive an insurance pay out.

AYII eliminates the administrative cost of going to each individual small farm for a survey which would be prohibitively expensive in any country. The average yield realized in a season is determined by a third party through modern statistical methods, satellite data, and crop cuts on a random selection of the area's farms.

Area Yield Index-based Insurance (AYII) was piloted purely in the private sector in Pakistan by TPL insurance and the Pakistan Agricultural Coalition in four districts of Punjab in the Rabi season of 2021-2022 on wheat crop. The Bank of Punjab and HBL were the participating banks. Pula Advisors of Switzerland was the insur-tech company which performed on-ground crop cuts and corroborated the data with satellite data. To complete the offering, TPL Insurance had an insurer-reinsurer agreement with SCOR-Re, a global reinsurer to split the insurance risk. The total sum insured in District Sheikhupura was over PKR 47 million, while the premium paid was PKR 1.7 million. No government calamity was declared; however, Pula crop cuts revealed the onset of pseudo black chaff (a bacterial disease that affects the wheat heads and can cause up to 40% loss in yields) in farms in District Sheikhupura. This resulted in wheat yield falling below the designated AYII threshold of 70% of the historic yields in the area and resulted in a pay-out of PKR 306,169. As for government operated insurance programs, no insurance pay-outs were disbursed to wheat farmers.

In accordance with its National Financial Inclusion Strategy (NFIS) policy objectives, the government has experimented with insurance as a mechanism for agricultural risk management and post-disaster loss compensation. A Government of Pakistan task force under the NFIS led by SECP and with representation by all stakeholders (provincial governments, State-Owned Enterprises involved in insurance, private sector experts, etc.) recommended in 2021 that Area Yield Index-based Insurance is the mechanism that should be adopted for nation-wide scale-up of crop insurance for Pakistan's farmers. The task force also recommended that the insurance premium subsidies for small farmers should be shared between the federal government and respective provincial governments.

Having reviewed the existing crop insurance programs in the country, TPL insurance realized that there was a gap that was big enough to accommodate all major insurance players in the market. The company's strategy was always to collaborate with the sector's major players instead of competing, however no other major insurance company was willing to penetrate the crop insurance market purely in the private sector with an innovation like AYII. Given that TPL insurance was backed by an impact investment-oriented management team, crop insurance seemed to be a natural next step for the company. The company leveraged partnerships with the most established and relevant players in the financial and insurance ecosystem with the support of Pakistan Agricultural Coalition and managed to achieve success through its initial pilots for AYII.

The Kharif Season Rice AYII pilot in 2023: The Kharif season AYII pilot involved insuring rice farmers in 2023 in the district of Pakpattan, Punjab province. The total sum insured was just over PKR 59.9 million, while the premium paid was over PKR 2.2 million. Rice yields of 42 farmers were impacted by the heavy rains causing River Sutlej to overflow in addition to the disease known as leaf blight affecting rice crops. While no government calamity was declared to trigger the CLIS-based insurance, the yields fell below 70% of the historic yields resulting in a pay-out of PKR 17.4 million to these farmers of Pakpattan who were Bank of Punjab borrowers. TPL Insurance was the domestic insurer with SCOR-Re as the global reinsurer.

The Cotton AYII project for a corporate farming project in 2023: The corporate cotton cultivation project involved the insurance of the cotton crop for a large farm of over 500 acres in district Rahimyar Khan under a Pakistan Agricultural Coalition project supported by leading textiles players like Mahmood Group, Indus Home, Dynamic Sportswear, and Textile Marketing Company. The total sum insured was PKR 100 million, while the premium paid was PKR 5 million. The project's sponsors are now considering scale-up. No government calamity was declared in the project area under the CLIS arrangement despite a severe white fly attack unseasonably in the month of September. However, since the cotton yield fell below the 10-year average production history (APH) due to the onset of pest attacks (mainly white fly), a pay-out of PKR 10.5 million was triggered based on AYII calculations done by Pula Advisors. Once again, TPL was the local insurer with SCOR Re as the global reinsurer.

Area Yield Index Insurance (AYII) vs Crop Loan Insurance Scheme (CLIS) Historically, AYII provides better coverage, taking account of more perils more comprehensively, and has a higher chance of pay-out compared to other insurance programs. For farmers under climatic catastrophes, timely and adequate payout is the key. The pay out under AYII is timelier and is made within two weeks of the independent advisor, Pula, issuing their report. Whereas in CLIS, the calamity declaration by the Government can take a longer time.

With CLIS as the sole risk mitigator, restrictive payout of 3 times the insurance premium paid is insufficient for farmer support in terms of compensation. Looking at the numbers, the monetary value of the farmers' loss of yield is significantly greater than the CLIS pay out, Hence, AYII (which pay more) is a superior product.

Finally, CLIS is only triggered in mass destructions and catastrophes while AYII triggers for these perils as well as the more frequent perils faced by farmers. The table below lists the perils where CLIS is likely to be triggered in comparison with AYII.

Existing Crop Loan Insurance Scheme		Proposed scheme (AYII)
Risks covered on paper	Is Government likely to declare calamity for this risk?	Is risk covered and is payout likely?
Windstorm	Likely	Yes
Excessive rain	Likely	Yes
Flood or drought	Likely	Yes
Locusts	Likely	Yes
Hail	50/50	Yes
Frost	Unlikely	Yes
Heatwave	Unlikely	Yes
Pests/insects	Unlikely	Yes
Viral/bacterial attacks	Unlikely	Yes

Looking Ahead The recurring pattern of floods in Sindh along with the frequency of cyclones every few years underscores the need for a proactive approach to disaster management. Instead of relying solely on post-disaster relief, which can be both costly and reactive, investing in crop insurance can offer a more resilient and cost-effective strategy for managing climate risks. This approach provides timely support to farmers (pay-outs disbursed typically within four weeks of harvest). Instead of irregular pay-outs by the Government to compensate farmers for such impacts every year, risk transfer mechanisms are now available at a predictable cost to shift this burden to local and global insurers using 21st century tools.

Climate unpredictability is only expected to rise. Climate risks are first and foremost risks to agriculture. With 93% of Pakistan's freshwater resources going to agriculture, climate risks such as floods, droughts, excessive rain, heatwaves, etc., are all risks to livelihoods in agriculture. Based on successful pilots conducted by Pakistan's private sector with global firms for insure-tech services and re-insurance, the Government of Sindh is considering a similar program for crop insurance after the historic floods of 2022. Today, there is also broad consensus in banking and insurance circles that Pakistan's agri-insurance regime needs serious upgrade and scale-up. Therefore, it is imperative that provincial governments and other private sector players collaborate with companies like TPL Insurance and its partners to scale up crop insurance projects as a means to deliver social protection to all smallholder farmers of the country.

Based on the unique experience it has garnered through its pilots, TPL Insurance is now looking to explore the opportunity presented in corporate agriculture as well, and is planning to collaborate with major corporations delving into corporate farming under the SIFC initiative. Under SIFC, Pakistan is also seeking large-scale investments from Saudi Arabia, the United Arab Emirates (UAE), Qatar and Bahrain over the next three to five years for corporate farming, with the aim of cultivating 1.5 million acres of previously unfarmed land and mechanizing the existing 50 million acres of agricultural lands across the country—a prospect TPL Insurance plans to capitalize on.

A photograph of a greenhouse interior. The structure is made of a metal frame with a translucent covering. Rows of green plants, likely tomatoes, are growing in the beds. The plants are supported by vertical stakes. The floor is a mix of dirt and concrete. The text is overlaid on the image in white, bold, sans-serif font, arranged in several lines across the center.

**REGENERATIVE
AGRICULTURE TO
PROTECT
PAKISTAN'S SOILS,
ITS WATER, AND
ITS BIO-DIVERSITY:
THAT INDUSTRIES
AND ITS
DRAWDOWN FARM**

Regenerative agriculture to protect Pakistan's soils, its water, and its bio-diversity:

Thal Industries and its Drawdown Farm

As Pakistan wakes up to the degradation of its soils and the loss of bio-diversity crucial for its agriculture, Thal Industries has taken the lead in demonstrating how regenerative agricultural practices can address environmental challenges and protect our soils, our water, and bio-diversity while improving agricultural productivity. Thal's Drawdown Farm helps shatter the myth that regenerative agriculture cannot show results in the short-run and requires major financing.

Thal Industries has long been a leader in the sugarcane industry and has been working on innovative solutions in Southern Punjab in harsh climatic environments. In these tough environs, Thal Industries established Drawdown Farm at Rahimabad, a regenerative farm on more than 500 acres, exemplifying a pioneering approach to agriculture in Pakistan's Thal Desert. Initially focused on sugarcane cultivation amidst challenging environmental conditions, the farm underwent a transformative journey towards sustainability and resilience. By integrating practices like holistic planned grazing, intercropping, and transitioning to organic methods, Drawdown Farm not only improved soil health and saved water but also significantly enhanced crop yields and biodiversity. Practices such as planting hedgerows, using fungally dominant compost, and developing their own biofertilizers and bio-stimulants has resulted in massive improvements in crop yields, resulted in cost savings, and improved the overall farm ecosystem marking Drawdown Farm as a beacon of sustainable farming practices and innovation in Pakistan.

What is regenerative agriculture?

Plants require holistic nutrition in the correct forms, delivered at the right time, rates, and ratios, combined with active soil microbial communities comprising beneficial bacteria and fungi. When these conditions are met, the results can be astonishing. There are numerous examples worldwide where regenerative agricultural practices have significantly improved yields and reduced costs due to decreased reliance on synthetic inputs. In Pakistan, the situation is dire; the average organic matter content in soils is around 0.3%, with some areas having no organic matter at all. Ideally, soil organic matter should be at least 2%, with good quality soils containing 4% or more. In the wake of climate change disasters and increasing carbon emissions into the atmosphere, regenerative agriculture is also an answer to help sequester carbon. On a global level, it is estimated that if half of all global farmland adopted regenerative practices, it could help sequester excess atmospheric carbon back into the soil, where it belongs.

Contrary to popular belief, organic farming does not necessarily result in lower yields compared to conventional agriculture. Regenerative agriculture encompasses a variety of approaches, much like renewable energy includes solar, wind, hydroelectric, and tidal power (among others). However, unlike a power plant that typically utilizes a single type of energy, a regenerative farm can integrate multiple systems to enhance soil health, biodiversity, conserve water, and overall farm productivity. While one tool may be long gestating, there are many solutions that show very quick results. This case study shows examples of different tools on various crops at Drawdown Farm taken by Thal Industries and their quick yielding results.

The global context for regenerative agriculture

Over the last 60 years, agricultural output has dramatically increased worldwide, largely due to the widespread adoption of synthetic fertilizers and high-yielding seeds. However, this progress has come at a significant cost to the health of our soils, of ecosystems, and ultimately, of human health. Numerous studies indicate that the nutritional quality of staple crops like rice and wheat has declined over the past half-century, ranging between 20% to 70%. Concurrently, there has been an alarming increase in toxic elements such as heavy metals and microplastics in agricultural produce. This degradation of nutritional integrity poses a serious risk to public health and undermines the long-term sustainability of our food systems.

Globally, pesticide use has surged by 60% over the last 30 years. Paradoxically, pest attacks have also risen sharply during this period. Pesticides, which are often non-selective in their impact, have devastating effects on local biodiversity. In the past 25 years, Europe has experienced a 75% decline in its insect population, a phenomenon that scientists largely attribute to the pervasive use of pesticides. This excessive reliance on synthetic chemicals has also disrupted soil biology, decimating the micro and macro-organisms that are crucial for nutrient cycling and soil health. Without these organisms, the soil food web collapses, leading to further declines in soil fertility and crop productivity.

Regenerative agriculture encompasses a variety of practices aimed at restoring and enhancing the health of the soil. Some core practices include the use of cover crops (to protect the soil from erosion, increase organic matter, and provide a habitat for beneficial insects), crop rotation (to break pest and disease cycles, improve soil fertility), integration of livestock (to naturally fertilize the soil with their manure), minimal tillage or no-till farming (to reduce soil disturbance and to preserve soil structure), intercropping, composting, integrating trees and shrubs, and many other such practices, all geared towards enhancing the health of the farming ecosystem.

Why did Thal Industries pursue regenerative agriculture?

Thal Industries has long been a leader in the sugarcane industry, working closely with farmers to provide extension services and help them improve their agricultural practices. Thal has a history of innovation, having introduced sugar beet farming in Pakistan and installed a sugar beet processing facility, which has

resulted in better sucrose recovery and is a model for others to follow. Sugar beets also require less time on the land and consume less water than sugarcane, offering significant benefits for farmers and the environment alike.

In response to increasing climate challenges, Thal Industries began experimenting with regenerative agriculture in 2016. Thal established Drawdown Farm at Rahimabad Estate in District Muzaffargarh, near Head Lanju, within the Thal Desert. The name Drawdown Farm hints towards regenerative agriculture's potential for carbon sequestration. The farm is currently on more than 500 acres. Before adopting regenerative practices, the farm primarily grew sugarcane and had some mango and citrus orchards, along with small areas dedicated to fodder crops and wheat. Some portions of the farm were left barren due to harsh climate conditions and unproductive soils. Since 2016, Thal Industries has been transforming this landscape through regenerative practices into a more productive and sustainable agricultural system.

The philosophy at Drawdown Farm emphasizes the integration of modern technologies, such as center pivots, drip irrigation systems, and drones, with regenerative practices. For example, Center pivots use 50-60% less water for sugarcane compared to the conventional flood irrigation method. And drones can apply bio-stimulants and biological inoculants, which not only increase crop yields and resilience to pests but also enhance the plants' photosynthetic capacity, leading to larger leaves, longer roots, and a more robust soil food web. The denser the soil food web is in terms of bacteria, fungi, and nematodes, the better as all of it becomes carbon (poops and dead matter) and builds the soil.

The Drawdown Farm journey

Adopting regenerative agriculture practices as a holistic approach to farming was a learning curve for Thal Industries as they were drawing on the experiences of experts from other countries who have practiced regenerative agriculture for years. The farm staff had to unlearn traditional farming methods and embrace new techniques. The initial steps included installing center pivots on previously barren parts of the land. The farm now has three center pivots growing sugarcane and has also added drip lines to the orchards. Additionally, the farm began producing its own fermented biologicals, such as fish hydrolysate and compost extracts, which can be fertigated (i.e., liquid fertilizer delivered through the irrigation lines) and sprayed on crops. The main purpose of adding these products is to fulfill the micronutrient requirements of the plant for healthy growth.

A key focus has been building soil carbon to further reduce water requirements. Studies show that for every 1% increase in organic matter in the top six inches of soil, the soil can hold an additional 27,000 gallons of water per acre. This approach could create natural reservoirs of water in soils across Pakistan, maintaining soil performance during droughts and preventing farm flooding during heavy rains. Thal also started adding mulch to improve moisture retention and prevent soil degradation. Evidence from a study in Peru showed that mulched sections of an orchard on drip irrigation consumed 40% less water compared to un-mulched sections. Mulch also suppresses weeds and increases soil organic matter as it ultimately degrades and becomes part of the soil.

Among the several regenerative practices adopted at the farm includes the planting of hedgerows and trees around fields to increase biodiversity and foster beneficial insects. Although there are no studies on this topic in Pakistan yet, a UK study showed that every dollar invested in hedgerows yields a fourfold return. These hedgerows also provide leaves for composting and attract pollinators and beneficial insects. Recently, Thal Industries planted chilies on the farm, a crop that conventionally requires pesticide applications every 7 to 10 days. However, due to the presence of beneficial insects and healthier soils, no pesticides were needed for the entire seven-month crop cycle, saving approximately thirty-five to forty thousand rupees per acre compared to conventional farms growing chillies.

A product used commonly enough in regenerative farming is bio-organic phosphate (BOP) for which there is a regulated standard by the government as well. However, there is a huge range of quality of BOP available in the market. To address variability in the quality of BOP available in the market, Thal Industries developed its own biologically enhanced BOP. It is made from rock phosphate and nitrogenous organic materials and includes other materials like microbial inoculants and pH regulators.

A trial of this proprietary BOP was conducted on a silage maize crop, utilizing three trial plots on the same center pivot at Drawdown Farm. One-third of the plot received only the recommended dosage of DAP, another third was treated with only BOP, and the final third received a mix of half-dose DAP and BOP. All other fertilization practices remained consistent across the plots, with the only variation being the phosphate treatments. The results were remarkable: the plot that received the mixed dosage of DAP and BOP achieved a 21% higher yield compared to the DAP-only plot, and at 33% lower cost!

Encouraged by these results, Thal Industries selected a similar product from Australia and conducted trials on a sugarcane farm managed by a progressive farmer who supplies cane to their sugar mills. This farmer, already achieving high yields of around 1100 maunds per acre, saw his yields increase to approximately 1350 maunds per acre with the introduction of the new product. This significant improvement underscores the potential of integrating innovative regenerative products into conventional farming practices.

Intercropping

Another common regenerative practice is intercropping, which reduces competition for soil nutrients, increases soil cover, and enhances microbial diversity. However, the choice of crops for intercropping must be made wisely so that the crops do not compete with each other. At Drawdown Farm, sunflowers were intercropped with sugarcane, and the results showed a significant improvement in the sugarcane crop. Sunflowers were also grown as a monocrop in a trial, and the intercropped sunflowers were found to perform significantly better. A rough calculation indicates that if 50% of Pakistan's sugarcane crop were intercropped with sunflowers, yielding an average of 25 maunds per acre, the country could produce an incremental 525,000 tons of sunflower oil. This would be a substantial benefit, considering Pakistan imported \$3.6 billion worth of edible oil last year.

All of the orchards at Drawdown Farm are now completely organic and regenerative, with no synthetic inputs. The farm manages pest pressure by improving plant health, supporting French scientist Francis Chaboussou's theory that healthy plants can be immune to pests. This approach has been particularly successful in the sweet lime orchard, where the quality and taste of the limes has improved significantly and the production has increased by 50%.

To integrate livestock into regenerative agriculture, Drawdown Farm implemented a trial on a ten-acre plot with a sprinkler irrigation system, growing multi-species perennial and annual grasses like Rhodes grass and Mombasa grass, mixed with herbs. The sandy soil, initially with almost no organic matter, was transformed through holistic planned grazing. In this method, animals are clustered together in one area and allowed to graze only that specific part. Once the animals have grazed the land, they are moved to another paddock. This rotation allows the initial paddock to regenerate before the animals return. By grazing in this manner, the grass is not eaten down to the roots and is given enough time to recover, enabling rapid regeneration. The animals also contribute to soil fertility through their manure and urine. Adding compost or other soil additives can further accelerate this process. As a result, the ten-acre plot's desert sand turned into deep, chocolate-colored brown soil.

Another fundamental principle of regenerative agriculture is increasing biodiversity by integrating multiple crops. Drawdown Farm aimed to grow bananas in certain zones to enhance biodiversity, despite skepticism about their success in the harsh Thal Desert environment. Contrary to expectations, the banana plants thrived and grew healthily. Similarly, a ginger trial was conducted this year. Ginger requires soil rich in organic matter, so it was grown under black shade tunnels in soil enriched with fungally-dominant compost. This attracted native earthworms, whose castings further enriched the soil. Earthworms also naturally till the soil, creating tunnels that allow air and water to reach plant roots. Since ginger is mostly imported in Pakistan, this successful trial demonstrates the potential for local cultivation, contributing to import substitution.

Cost-saving

Thal Industries is also exploring other cost-saving measures. One such trial involves growing sugarcane from seedlings instead of cane sets. Trials have shown that growing sugarcane from seedlings can reduce costs by 60%. This method is advantageous for both mills and farmers, as the land typically used for growing cane seeds can be utilized for more sugarcane production.

A recent study by the Boston Consulting Group on regenerative agriculture globally highlights the need for processor companies to support farmers initially, as it takes a few years for the results to materialize. However, the study does not consider the diverse regenerative tools available, each with different gestation periods. The transition strategy of each farm determines the outcomes. Many regenerative tools provide higher yields and cost savings from the outset. An analogy can be made to a chronically deprived human being who sleeps 4 to 5 hours a day, and consumes unhealthy food, and who suddenly starts consuming healthier food, sleeps better, and starts exercising. A massive change can be observed

in the physical and mental health of the person in just a few days even as some of the strategies employed for improving this person's health take their time to show results.

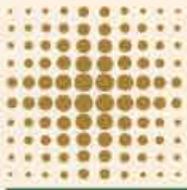
Future outlook

Implementing regenerative agriculture at Drawdown Farm is a constant learning exercise, requiring continuous adjustments to find the right fit for the farm's unique conditions. For instance, the compost used so far has been predominantly bacterially dominant, which is not the ideal option for the farm. A fungally-dominant compost is preferred and the farm is working to produce it. This illustrates a key challenge for regenerative agriculture in Pakistan: while the products underpinning what is now considered conventional agriculture (e.g., chemical fertilizers, pesticides, weedicides, etc.) are readily available from reputable manufacturers and agents, the products that can underpin regenerative agriculture in Pakistan are generally not available.

To address this challenge, Thal Bio Ag Corporation, a subsidiary of Thal Industries, is set to bring its products to the wider market, aiming to assist all kinds of farmers in improving their yields. The company will offer three main categories of products: bio-fertilizers, bio-stimulants, and microbial inoculants. These products are designed to enhance soil and plant health, leading to better yields while promoting sustainable farming practices.

The farm team members are constantly expanding their knowledge about the type of nutrition to give to plants and the best methods for delivering it. In addition to improving soil and plant nutrition, the farm is focused on increasing tree cover by planting more and more trees. Several studies indicate that increased tree cover can influence rainfall patterns, and in line with this, a two-acre Miyawaki forest is being planted on the farm. This initiative aims to create a dense, native forest that can contribute to the local ecosystem and climate resilience.

Drawdown Farm by Thal Industries represents a transformative example of how regenerative agriculture can mitigate environmental challenges and protect our soils, water, and bio-diversity while improving agricultural productivity. Through innovative practices and continuous learning, the farm has not only revitalized soil health but also diversified crop production and enhanced sustainability. By introducing methods like holistic grazing, intercropping, and biological inputs, Drawdown Farm sets a precedent for sustainable land management in Pakistan. The biggest myth that this example shatters is that regenerative agriculture cannot be successful from the onset and that it needs to be financed. Some of the low hanging fruits like the use of bio-fertilizers and other such inputs can provide immediate returns. Thal Industries and Drawdown Farm made a major national advance for regenerative agriculture by seeding the launch of the Pakistan Alliance for Regenerative Agriculture at Pakistan Agricultural Coalition's Agri-Connections 2024 event at Lahore Expo Center in April 2024. As they prepare to introduce their agricultural products to wider markets, Thal Industries is poised to further advance sustainable farming practices nationwide, contributing to a more resilient and productive agricultural sector.



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