

Agri-Food Insights

SIAQ

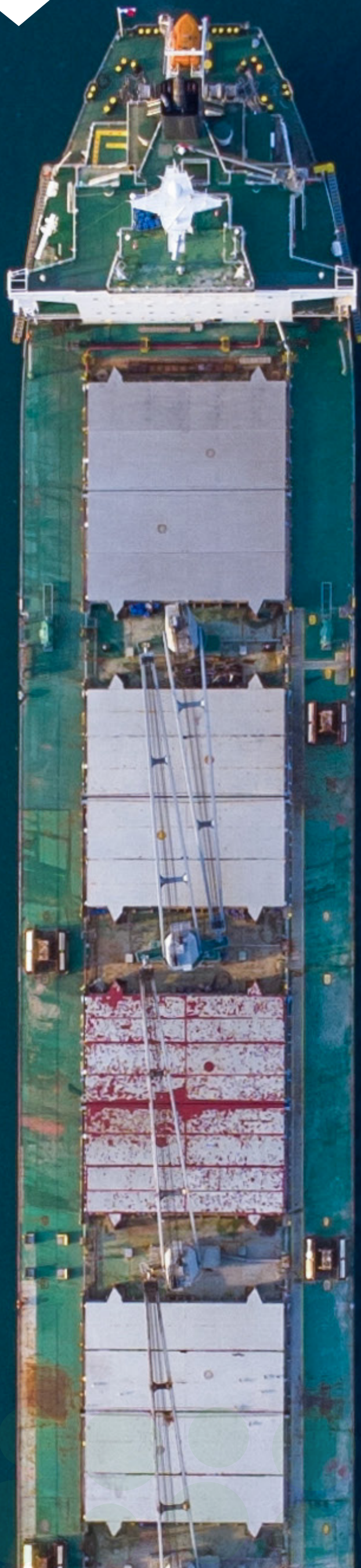
An Informative Annual
Report by SABIL

2025

The Agri-Food Sector ●●
A Continuous Logistics Challenge

**The Geography of
Food Is Shifting** ●●
Grains Between Climate
and Geopolitics

Wheat Dust ●●
A Billion-Dollar Wasted Resource





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KNOWLEDGE SHAPES THE FUTURE

Abdulrahman Al-Owais
SABIL CEO

The grain and agri-food sector is undergoing rapid transformation that extends far beyond traditional production and trade, encompassing technology, climate, geopolitics, logistics, and the circular economy. In this evolving landscape, the ability to anticipate change and understand its implications has become essential to building more efficient, sustainable, and resilient supply chains.

Food security is undoubtedly linked to the availability of essential commodities, but it also depends on the ability of operational systems to adapt to global shifts, embrace emerging technologies, and strengthen partnerships that enhance supply resilience and continuity while improving service quality. This is where knowledge becomes a fundamental pillar for informed decision-making and shaping the future.

Today, food and agriculture are no longer a series of isolated activities, but an interconnected ecosystem that begins with data and ends with value. Artificial intelligence is transforming decision-making; climate and geopolitics are reshaping the global grain landscape; and logistics has become a key driver of supply efficiency and food quality. At the same time, emerging technologies are advancing agriculture toward greater productivity and sustainability, while new industries are unlocking hidden value within crops themselves—turning production outputs into economic opportunities and promising new industries.

At SABIL, we believe our role extends beyond managing and operating grain facilities. It includes contributing to the development of sector knowledge and sharing insights that help stakeholders better understand the challenges and opportunities shaping its future. With this in mind, this publication offers perspectives on key trends and issues influencing the grain sector both locally and globally.

The future of the sector will be shaped by the integration of knowledge, technology, and operational excellence that are more important than ever in strengthening food security and supporting resource sustainability. We hope this publication contributes to enriching professional dialogue, broadening knowledge, and providing readers with deeper insight into the transformations reshaping the global grain sector.



ABOUT SABIL



SABIL is a subsidiary of SALIC Group, a Public Investment Fund (PIF) company. SABIL provides integrated logistics solutions for the agri-food sector through operational excellence, innovative solutions, and strategic partnerships, enhancing supply chain efficiency and contributing to the Kingdom's national food security objectives.

SABIL operates 14 grain silo branches across Saudi Arabia, through which it also provides investment opportunities for private-sector partners. Its operational approach is built on four key principles: availability, reliability, accessibility, and efficiency. These principles aim to create economic impact through product availability, social impact that supports people's well-being, and environmental impact that promotes resource sustainability.

Guided by its slogan, "Enabling Today for a Sustainable Tomorrow," SABIL believes that collaboration with its partners and a strong spirit of teamwork are fundamental to creating meaningful impact across the agri-food sector and serving the nation through sustainable, value-adding contributions.



Transportation and Storage Among Its Biggest Challenges

AGRI-FOOD SECTOR A CONTINUOUS LOGISTICS CHALLENGE

Food may appear to be a simple product that arrives at the store ready for consumption. Yet behind every box of fruit or shipment of grain lies a complex network of transportation, storage, cooling, and coordination among multiple stakeholders. Food does not deteriorate simply with time, storage quality and plays an equally critical role.

Agricultural supply chains are different from most others. They do not move static goods, but sensitive products affected by temperature, humidity, and time. Even a minor disruption along the journey can result in significant losses before the product reaches the consumer.

This highlights a range of challenges facing the transportation and storage of agricultural products.

A Long Chain... Without a Single Center

Agricultural products pass through multiple stages: farmers, aggregators, transporters, wholesalers, processors, and retailers.

As the number of parties increases, so does the potential for delays and coordination, particularly for small-scale producers with limited access to advanced logistics networks.

Food Cannot Wait

Agricultural products, particularly fresh produce, are highly sensitive. Even slight changes in temperature or humidity can accelerate deterioration and reduce nutritional quality and taste.

Effective management of time and distance is therefore essential to preserving food quality throughout the journey.



Cold Chain: The Weakest Link

In many regions, refrigerated trucks and temperature-controlled storage facilities remain insufficient, particularly near production areas. Without smart monitoring during transportation, products travel with limited assurance that their quality will be maintained.

Food Without Traceability

When the origin of a product and the conditions under which it was transported cannot be traced, identifying contamination or deterioration becomes more difficult. This can weaken consumer confidence and complicate product recalls when necessary.

The Cost of Preserving Quality

Refrigeration, specialized packaging, energy consumption, and rising fuel costs all increase transportation expenses. At the same time, shortages of trained personnel add another layer of complexity to handling sensitive agricultural products.

Rising Transportation Costs

Agricultural products often require specialized transportation to preserve their quality. However, limited availability of suitable vessels and trucks, particularly during crises and peak seasons, can significantly increase transportation costs.

Combined with higher fuel prices and operating expenses, this raises the cost of bringing products to market, placing additional pressure on supply chains and affecting the efficiency with which food reaches consumers.

The Road Before the Market

Congested roads and ports, along with inadequate rural infrastructure, can extend transit times. For perishable products, delays translate directly into food loss. Loss does not occur only at the store; it can happen along the way.

Climate Travels with the Supply Chain

Extreme heat, floods, and drought can disrupt transportation and storage while affecting crop quality, making logistics planning increasingly complex in a changing climate.

Before the Journey Begins

A significant share of food loss can occur immediately after harvesting due to inadequate sorting, packaging, and pre-cooling, before the truck even begins its journey.

From Traditional Markets to Data-Driven Markets

ARTIFICIAL INTELLIGENCE IS LEADING SUPPLY CHAINS

Markets: From Intuition to Algorithms

Supply chains are no longer simply about transportation and storage, they have evolved into intelligent, predictive ecosystems.

Today, decision-making is shifting from reaction to anticipation, and from relying solely on human experience to analyzing millions of signals in real time.

Artificial intelligence has not only improved efficiency; it has fundamentally transformed the way operations are managed.

From Managing Operations to Managing Possibilities

The growing complexity of global networks, multiple suppliers and ports, and the continuous flow of data from operational systems and sensors have made human decision-making alone insufficient. AI now provides an integrated, real-time view of the entire supply chain, helping organizations identify and make better-informed decisions.

What Has AI Actually Changed?

01.

Demand Forecasting

AI analyzes historical data and external factors to anticipate demand, helping reduce both shortages and excess inventory.

02.

Inventory Allocation

It identifies where products are needed and when, enabling inventory to be redistributed according to market demand.

03.

Route Optimization

AI identifies the most efficient routes in terms of cost and time based on real-time traffic and operating conditions.

04.

Predictive Maintenance

It detects early signs of equipment failure and enables maintenance to be scheduled before disruptions occur.

05.

Risk Anticipation

AI analyzes global signals to identify potential disruptions before they affect the supply chain.

Global Applications



Walmart 

Predictive Selling Instead of Reactive Selling

Walmart analyzes consumer behavior, weather patterns, and seasonal events to anticipate inventory needs and replenish products before they run out, helping maintain availability without excessive inventory.





Logistics That Thinks on the Move

DHL uses AI to optimize routes, predict shipment delays, and operate warehouse robotics, enabling logistics plans to adapt dynamically as conditions change.



The Factory That Anticipates Failures

Toyota uses predictive models to support equipment maintenance and production scheduling based on anticipated demand, helping reduce downtime and improve manufacturing efficiency.



سابك
SABIC

A Supply Chain Driven by Data-Based Decisions

SABIC leverages big data platforms and predictive analytics across its value chain to enhance forecasting, production planning, asset reliability, and decision-making across supply and distribution. This contributes to greater operational efficiency and faster responses to changing operating conditions.

The Geography of Food Is Changing

GRAIN SECTOR BETWEEN CLIMATE AND GEOPOLITICS

Overview

The global grain sector is navigating an increasingly complex environment shaped by sharp market volatility, persistent climate threats, geopolitical risks, and rapid economic shifts. By mid-2025, multiple challenges were converging to affect the production, distribution, and trade of key commodities such as wheat, corn, rice, and soybeans.

Key Challenges and Disruptive Factors

01 Geopolitical Instability

A. Conflicts and Tensions

Wars and geopolitical tensions across several regions are disrupting major trade routes. Restrictions on maritime routes and changes in shipping patterns can create local surpluses while contributing to grain shortages in other markets.

B. Trade Barriers

Rising protectionism, trade restrictions, and export bans are increasing market fragmentation, making supply chains more vulnerable and volatile.

02 Climate Change and Extreme Weather

A. Risks to Productivity

Each 1°C increase in global temperatures could reduce wheat yields by an estimated 6–10%, while corn is particularly vulnerable to days when temperatures exceed 30°C. Extreme weather conditions have already affected crop yields in major producing countries, including Australia, Russia, Brazil, and the United States.

B. Shifting Production Geography

Some regions, such as Northern Europe and Canada, may benefit temporarily from changing climatic conditions. However, lower-latitude countries many of which are already more vulnerable face declining agricultural suitability and greater food security risks.

03 Market and Price Volatility

A. Unpredictable Prices

Extreme weather, export restrictions, and supply disruptions can trigger sharp price fluctuations, complicating planning for producers and buyers and, in extreme cases, contributing to social instability.

B. Rising Input Costs

Fluctuations in energy, fertilizer, and transportation costs continue to put pressure on the margins of farmers and traders.

04 Supply Chain and Logistics Disruptions

A. Transportation and Storage Bottlenecks

Conflicts, crises, and operational disruptions including port closures and labor shortages can increase costs and delay the movement of grain from farms to markets, particularly in import-dependent countries.

B. Global Chokepoints

Heavy reliance on critical shipping corridors, including the Red Sea, Black Sea, and Panama Canal, combined with growing demand for storage and handling capacity, increases supply chain vulnerability.

05 Declining Stocks and Food Security Risks

A. Lower Global Stocks

Declining global wheat and corn stocks can increase the risk of supply shortages, particularly for import-dependent countries. Government stockpiling and export restrictions in producing countries may further intensify these pressures.

B. Nutritional Impact

Higher atmospheric carbon dioxide levels may reduce the protein and micronutrient content of some grains, potentially increasing the quantities required to compensate for reduced nutritional value.

06 Structural and Technological Challenges

A. The Digital Transformation Gap

The rapid digitalization of markets and logistics is outpacing the ability of some grain traders who continue to rely on traditional, relationship-based business models.

B. Farmer Capacity and Business Continuity

Declining profitability driven by rising costs, price volatility, and increasing competition threatens smaller producers and may accelerate consolidation across the sector.

From Cost to Production and Consumption

WHEAT ECONOMICS IN GLOBAL MARKETS

Wheat is no longer simply a staple food crop; it has become an important component in the broader equation of economics and sustainability. As climate challenges intensify and global markets become increasingly volatile, wheat is evolving from an agricultural commodity into an economic driver connecting energy, the environment, and supply chains.

Today, the value of wheat is measured not only by production or consumption volumes, but also by its potential to improve resource efficiency, reduce waste, and enable new industries built around the full utilization of its components. As agricultural technologies and bio-based industries expand, wheat is entering a new phase as part of the green economy, where agriculture moves beyond food production toward creating sustainable value.

Global Wheat Production Map



Global Production

Projections for the 2025/2026 season indicate that global wheat production is approaching

800

million tons



Largest Producers

China, the European Union, India, and Russia are among the world's largest wheat producers, with their production shares playing a major role in regional self-sufficiency.



Global Stocks

Global wheat stocks are closely monitored, as even small changes in the stocks-to-use ratio can significantly influence price sensitivity.

Who Consumes Wheat?

Food

Around two-thirds of global wheat use is allocated to human consumption, including bread, pasta, and noodles, with per capita consumption remaining stable or increasing slightly across many regions.



Feed and Industrial Uses

Demand for animal feed and industrial applications including starch and ethanol production in some markets absorbs additional wheat supplies and can shift rapidly in response to prices and policy changes.



Prices and Market Signals

Futures and Cash Markets

In mid-September 2025, wheat prices ranged around \$5.2–\$5.7 per bushel, with daily movements influenced by weather conditions, crop reports, and export sales.



Drivers of Volatility

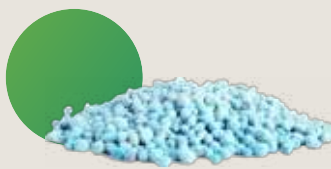
Weather conditions particularly heat and drought during the growing season along with maritime transportation and geopolitical risks, especially in the Black Sea region, are among the key short-term drivers of market volatility.



The Cost–Production Equation

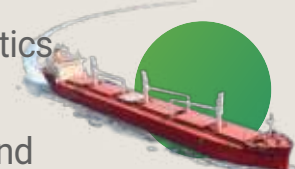
Fertilizers and Energy

Fluctuations in fertilizer prices, including notable increases in 2025, raise production costs per hectare and may put pressure on farmers' margins or lead to lower application rates.



Other Costs

Fuel, seeds, labor, and logistics add further cost variability, influencing planted areas and productivity differently across regions.



What Drives Global Grain Trade?

Exporters and Importers

Russia, Australia, Canada, the United States, and European Union countries are among the world's leading grain exporters. Many countries, however, rely heavily on imports, making them more sensitive to price movements and contracting conditions.



Policies Shaping Trade

Export restrictions, tendering practices, and biofuel requirements in major markets can rapidly redirect trade flows and influence global prices.



Global Wheat Market Outlook

Global wheat production is expected to see modest growth during the 2025/2026 season, while prices are likely to remain sensitive to weather conditions, input costs, and geopolitical developments.



Markets will continue to closely monitor agricultural reports, international forecasts, and energy and fertilizer markets to assess future trends.



From a Loaf of Bread to
the Materials of the Future

WHEAT.. WHEN IT BECOMES AN INDUSTRIAL CROP

Wheat has long been associated with food, but today the world is discovering another dimension to one of the most widely used crops in human life. Wheat is no longer simply a grain to be milled and baked it is becoming a versatile industrial resource, with applications spanning construction, energy, advanced materials, and animal feed.

Every Part of the Plant Holds Value

Straw, bran, starch, and even ash can be transformed into industrial products that reduce waste and create new sources of income for the agricultural sector.

This shift reflects agriculture's transition from producing food alone to creating broader value. Fields are becoming part of the circular economy, contributing to lower carbon footprints and the development of more sustainable alternative industries.



Wheat Enters Industry

Manufacturing is no longer dependent solely on petroleum or wood as raw materials. Agricultural crops are increasingly being explored as alternative feedstocks, with wheat among them.



Construction

Wheat straw can be transformed into insulation panels and building materials with a lower environmental impact.



Paper

Wheat straw is a non-wood source of pulp used in paper production.



Bioplastics

Wheat starch and gluten can be converted into biodegradable materials.



Biofuels

Wheat straw can be used as a feedstock for bioethanol production.



Animal Feed

Wheat and its by-products are used in feed for poultry, livestock, and aquaculture.

An Economy Without Waste

The real value lies in utilizing the entire crop. What was once considered agricultural waste can become a valuable raw material reducing waste, increasing economic returns, and creating new industries around the agricultural sector.

This transformation, however, is not without challenges. Some industrial applications may compete with food uses, while processing requires investment and advanced technologies.

INNOVATIVE TECHNOLOGIES DRIVING AGRICULTURAL SUSTAINABILITY

Grain farming, a vital component of global food security, is undergoing rapid technological transformation. Advanced solutions are helping make agricultural operations more efficient, sustainable, and profitable while reducing their environmental impact.

Precision Agriculture and the Internet of Things (IoT)

01

Technologies such as GPS, IoT sensors, and data analytics enable farmers to monitor soil fertility, moisture, nutrient levels, and crop health in real time. This allows inputs such as fertilizers and water to be applied only when and where needed, improving productivity while reducing waste.

A. IoT Sensors:

Monitor soil moisture, nutrient conditions, and local weather patterns.

B. Drones and Satellite Imagery:

Monitor fields to detect pests, diseases, and water stress, enabling targeted intervention.

C. Automated Equipment:

GPS-enabled tractors and harvesters perform planting, spraying, and harvesting operations with greater precision.



Robotics, AI, and Automation

Agricultural machinery powered by robotics and artificial intelligence can perform labor-intensive tasks with exceptional precision. Autonomous tractors, harvesters, and sprayers reduce reliance on manual labor, improve the timing of farming operations, and increase overall efficiency.

A. AI-Powered Analytics:

Forecast yields, predict disease outbreaks, and optimize resource use.

B. Autonomous Machinery:

Fleets of robotic tractors and harvesters can operate with minimal human intervention.

Innovations in Grain Handling, Drying, and Storage

Preserving grain quality after harvest is critical. Modern drying systems, handling equipment, and remote monitoring technologies help maintain grain quality and safety for longer periods, reducing losses and increasing market value.

A. Automated Drying Systems:

Control temperature and moisture levels to maintain optimal storage conditions.

B. Remote Condition Monitoring:

Enables early detection and management of risks such as pests and mold.

Blockchain and Supply Chain Technologies

Blockchain solutions can help trace grain from farm to consumer, increasing supply chain transparency and strengthening food safety. Technology can also help combat fraud and build consumer confidence by providing secure and verifiable records of grain origin.



**A Market Expected to Exceed
\$2 Billion by 2032**

WHEAT DUST: AN UNTAPPED BILLION-DOLLAR RESOURCE

What Is Wheat Dust?

Wheat dust consists of fine particles generated during the harvesting, cleaning, handling, milling, and storage of wheat grain. It is primarily composed of microscopic starch particles, wheat fragments, husks, and outer grain layers, and may also contain various organic and inorganic materials such as soil particles, fertilizer and pesticide residues, as well as microbial contaminants including bacteria, fungal spores, and insects.

Its chemical composition may include proteins, fibers, ash, pentose sugars, and glycoproteins, reflecting the nutritional and botanical complexity of wheat itself.

Dust with Value

Nutritional Value

Wheat dust contains starch, proteins, and fine fibers, allowing it to retain part of the grain's nutritional value. Its composition may enable its use as an additional ingredient in animal feed and as a fermentation substrate in bio-based industries.

Environmental Value

Diverting wheat dust from waste disposal can reduce waste associated with grain milling operations. Its reuse also supports circular economy approaches and broader efforts to reduce the carbon footprint of agriculture.

Economic Value

Efficient collection of wheat dust generated during storage, transportation, and milling can create additional revenue streams and enhance value across the supply chain. Its utilization can therefore form part of circular economy models within the grain sector.

When Dust Enters the Economy

Animal Feed

Wheat dust can be blended with bran or other milling by-products for use in animal feed, contributing protein and carbohydrates for livestock and poultry.

Bioenergy Production

Due to its organic content, wheat dust can potentially serve as a feedstock for anaerobic digestion to produce biogas or for bioethanol production. It may also be blended with crop residues to produce biomass pellets.

Food and Bakery Applications

Following appropriate cleaning and processing in accordance with food safety standards, suitable recovered material may potentially be incorporated into certain flour products or used for functional purposes in processed foods.

Soil Improvement

When composted appropriately, wheat dust can contribute organic matter to soil and support regenerative agricultural practices.

Industrial Applications

Research is exploring the potential use of wheat dust as a raw material for biodegradable plastics, adhesives, and packaging materials, as well as in the production of enzymes and ethanol.

Investment Landscape and Future Outlook

Market Size

The global market for specialized grain dust collection systems was estimated at approximately \$1.2 billion in 2023 and is projected to reach around \$2.1 billion by 2032, representing a compound annual growth rate (CAGR) of approximately 6.1%.

Global Trends

Europe and North America are investing in pilot projects and research and development related to biofuels and biopolymers derived from agricultural residues, including wheat-based materials, driven by the transition toward a circular bioeconomy.

Economic Viability

Investment requirements include dust collection, drying, and processing systems. These costs may be offset by lower waste-disposal expenses and the creation of new revenue streams from derived products.

Global Players

Although investment in this field remains relatively limited, several global industrial companies are involved in developing technologies for grain dust management and utilization.



The Future Rises from Dust

Sustainability and Carbon Reduction

Utilizing wheat dust in energy and material applications can help reduce the carbon footprint associated with the wheat industry, supporting ESG principles and modern sustainability frameworks.

Technological Innovation

Advances in biorefinery technologies and AI-enabled materials science are expanding the potential quality, range, and applications of products derived from wheat dust.

Policy and Regulation

Governments can encourage investment in the agricultural sector by developing appropriate regulatory standards and facilitating safe-use pathways for applications in food and animal feed.

Strategic Role of Agricultural Investment Companies

Large agricultural investment companies are well positioned to lead circular grain-processing initiatives that combine profitability with sustainability while strengthening regional leadership.

Regional Opportunities: MENA and Saudi Arabia

Saudi Arabia's significant wheat imports and domestic milling operations generate considerable quantities of wheat dust, creating potential investment opportunities in animal feed, waste-to-energy solutions, and advanced biomaterials.

Large agribusiness companies in the Kingdom are well positioned to capture new value through innovation partnerships and integrated processing models.

WHY SIAQ?

Mubarak AlDujain

Executive Director of Corporate Communications

Specialized communication is no longer a luxury; it has become essential in vital sectors facing rapid change and growing challenges. As the landscape becomes increasingly complex, the need grows for professional content that explains these developments, places them in the right context, and helps build a deeper understanding of the issues shaping the sector's future.



With this in mind, SABIL launched SIAQ as an annual knowledge publication that provides specialized insights and analysis to enrich professional dialogue around the grain and agri-food sector and contributes to a deeper understanding of the issues and trends influencing its future.

We chose the name SIAQ, meaning “context,” because issues cannot be understood in isolation. They are part of an interconnected landscape shaped by economic, technological, environmental, and operational factors. SIAQ therefore brings together complementary topics that help readers see the bigger picture and better understand the connections shaping the sector locally and globally.

SIAQ is one of the initiatives under SABIL's Corporate Communications Strategy, built on the belief that communication goes beyond sharing news and achievements. Its role extends to building knowledge, sharing expertise, and developing specialized content that serves the sector, its partners, and those interested in its future. We hope SIAQ will become a knowledge platform that encourages the exchange of ideas, raises awareness of the challenges and opportunities facing the grain and agri-food sector, and adds meaningful value to specialized content in this field.

As we conclude this issue, we extend our sincere appreciation to the Studies Department at SALIC Group for its cooperation and support in providing materials and knowledge resources that enriched this publication. This collaboration reflects the spirit of integration and knowledge-sharing across the Group, supporting the development of specialized knowledge and enhancing the quality of content presented to our readers.



Enabling Today ..
Sustaining Tomorrow

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