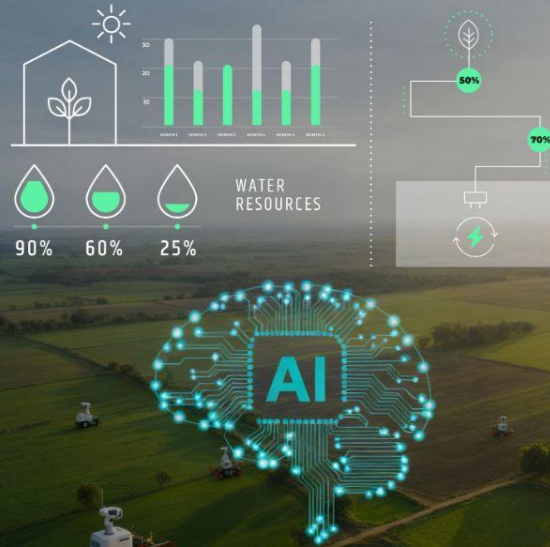


THE CODE TO CERTAINTY: HOW AI CRACKED THE AG SUPPLY CHAIN AND FUTURE-PROOFED GLOBAL BRANDS



\$400 BILLION DOWN THE DRAIN - WHY YOUR SUPPLY CHAIN CAN'T AFFORD TO GUESS ANYMORE

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Executive Summary

The global food ecosystem is facing an existential crisis: extreme climate events, geopolitical friction, and rising regulatory demands have turned agricultural procurement into a domain of profound uncertainty, costing global economy hundreds of billions in losses annually.

By leveraging AI-powered platforms, supply chain leaders can move beyond reaction, gaining end-to-end visibility, proactive risk modeling, and automated decision-making. This transformation replaces costly mis forecasting with granular foresight, leading directly to optimized inventory, guaranteed compliance, drastic waste reduction, and the stabilization of procurement costs, securing both resilience and profitability in an era of chaos.

For CPG and retail leaders, relying on historical averages is a strategy for failure. This whitepaper introduces the concept of Predictive Intelligence as the non-negotiable solution.



The Volatility Imperative:

Understanding the Global Threat



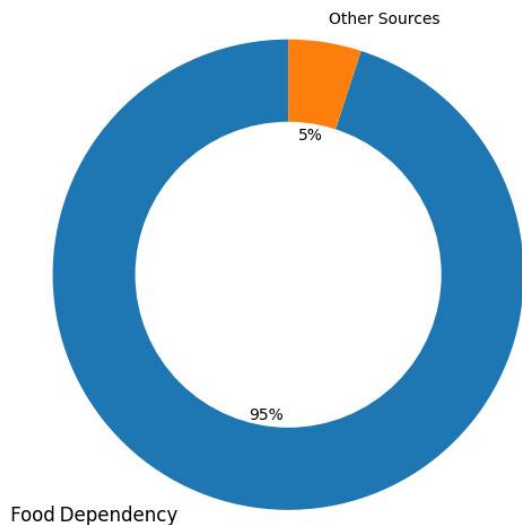
Reality Check: The Finite Resource & Growing Demand

The **agrifood system** is the planet's most critical engine, resting on **arable land that supports 95%+ global food production** and provides essential ecosystem services.

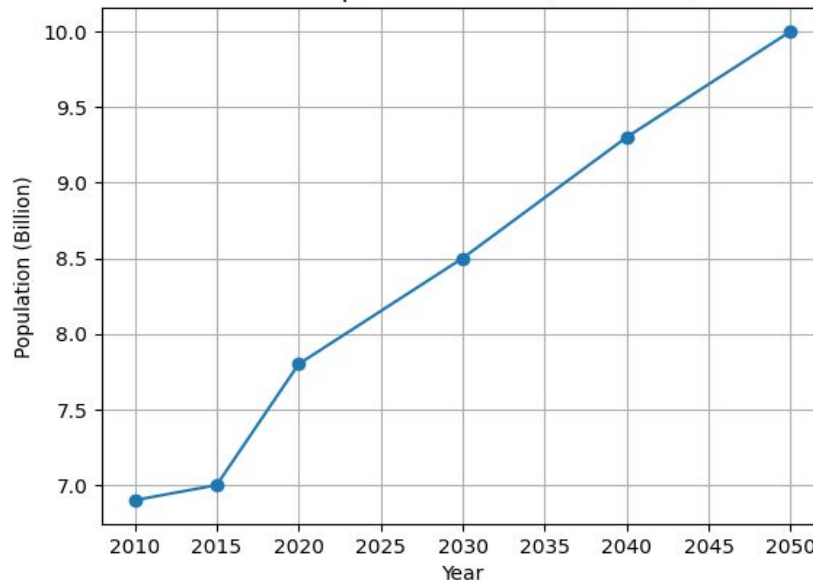
Yet, this finite resource is facing unprecedented pressures that degrade its capacity while the global population continues to climb and is projected to reach **~10 billion by 2050**.

This systemic fragility is compounded by climate volatility turning into economic turmoil disrupting fresh food retail shelves.

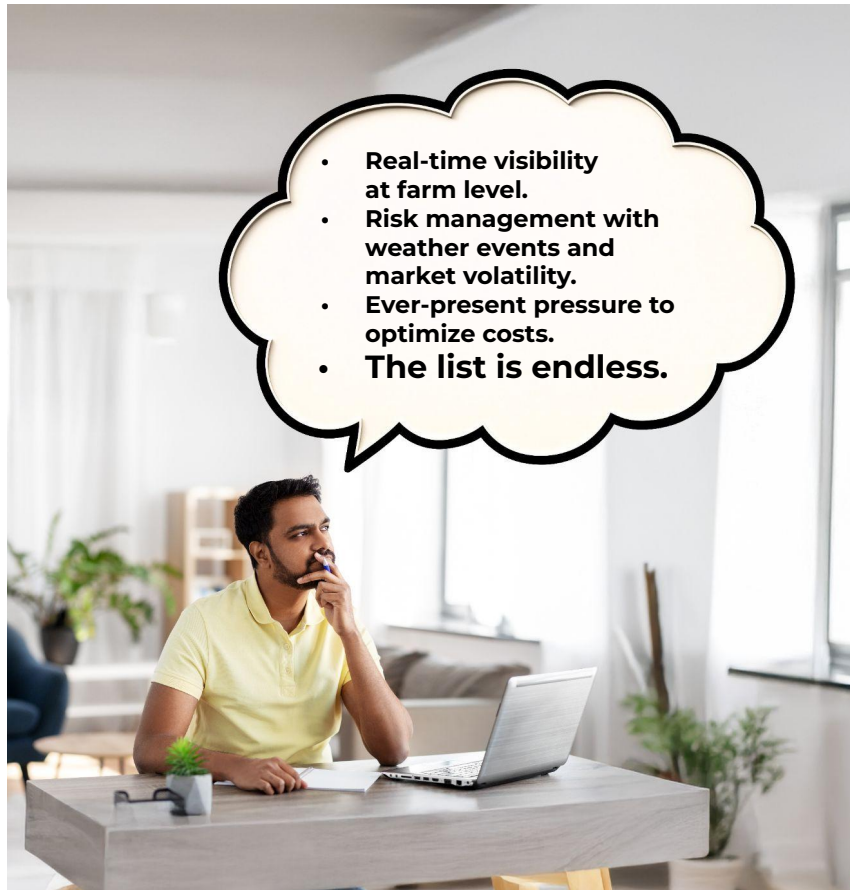
Global Food Production Dependency on Arable Land



Global Population Growth (2010-2050)



The Procurement Leader's Daily Challenge



- **Real-time visibility at farm level.**
- **Risk management with weather events and market volatility.**
- **Ever-present pressure to optimize costs.**
- **The list is endless.**

For procurement leaders in CPG and Retail, the supply chain crisis is not an abstract concept—it is a daily operational reality. You constantly struggle to execute strategic planning and data-driven decision-making in the face of profound uncertainty.

Key Challenges Include-

- **Grappling with real-time data scarcity, especially at farm level, which undermines precise forecasting.**
- **Risk management is a constant, urgent concern directly impacted by unpredictable weather events, geopolitical conflict, and market volatility.**
- **Immense pressure to optimize costs while rigorously maintaining high quality and sustainability standards.**
- **The traditional playbook fails to provide timely, granular data. Result - achieving these goals becomes nearly impossible.**

The Crisis in Facts: The Foundational Challenge



Approximately **14% of the world's food**, valued at an ~**\$600 billion**, is lost annually between harvest and the retail market draining profits and straining resources.

Beyond this, **global food production witnesses a loss of 25-30%** due to broader inefficiencies and unpredictable weather patterns, from farm-level issues to early supply chain hurdles.

Five Factors Disrupting the Agricultural Supply Chain

- ➡ **Climate Variability & Extreme Weather:** Changing rainfall patterns, higher frequency of droughts, floods, and heatwaves actively reduce predictability, disturbing crop calendars and severely impacting yield volume and quality.
- ➡ **Pest & Disease Devastation:** Climate chaos accelerates pathogen outbreaks, leading to up to 40% annual crop loss, devastating specific value chains (e.g., cocoa) and costing the global economy hundreds of billions annually.
- ➡ **Geopolitical Risk & Trade Friction:** Conflict, trade embargoes, new tariffs, and disruptions in major shipping routes restrict supply, inflate global commodity costs, and stress worldwide food security.
- ➡ **Regulatory & Compliance Burden:** Evolving, stringent rules on traceability, sustainability (carbon, deforestation), and food safety impose heavy compliance costs, risking penalties, market access loss, and reputational damage.
- ➡ **Logistical & Infrastructure Challenges:** Failures in infrastructure (port congestion, cold chain breaks, rising transport costs) cause significant spoilage and waste for perishables, leading to unpredictable delivery and retail uncertainty.

RESULT:

- Sourcing Volatility
- Missed Shelf fill rates
- Revenue Losses
- Cost Pressure
- Food Waste
- Poor Quality
- Forecasting Failures
- Food insecurity

Crafting Undisrupted Retail Shelves: The Predictive Intelligence Solution



1. Strategic Procurement & Fill Rate Surety

Challenge: Relying on historical averages leads to high forecast error (15-20%), resulting in missed fill rate targets, and late, costly procurement.

Solution: AI-driven yield prediction, crop stage identification, rotation cycle tracking, and harvest time estimation for effective procurement planning.

Value: Maximized on-time delivery, optimized inventory buffers, and consistent achievement of fill rate targets.

2. Near-Real-Time Intelligence & Global Foresight

Challenge: Lack of granular, real-time data on production estimates, quality, and global trends prevents strategic decision-making.

Solution: Cropin Cloud's near-real-time monitoring offers clear data-driven insights at 5X5 km grid levels, supplemented by regional performance insights and acreage trend analysis for global visibility.

Value: Enhanced accuracy in forecasting, ability to correlate data, diversify procurement strategy, and anticipate global market shifts.

3. Proactive Risk Mitigation & Supply Surety

Challenge : Unpredictable climate volatility and pest/disease outbreaks necessitate reactive logistics, expensive emergency sourcing.

Solution: Risk assessment tools and microclimate monitoring (Pin code level) provide early warnings (e.g., Cropin DEWS) and enable immediate remote, rapid extreme weather impact assessments.

Value: Proactive steps to avert supply chain disruptions, swift realignment of sourcing strategies, and guaranteed supply surety even during volatile seasons.

4. Quality Control & Wastage Prevention

Challenge: Lack of farm-gate quality tracking leads to high rejection rates, transit spoilage, and reduced sell-through.

Solution: Remote monitoring and advanced AI/ML models contextualize crop health to identify the optimal harvest window maximizing shelf life.

Value: Significant reduction in transit losses, guaranteed contractual quality fulfillment, and maximized sell-through targets for short-shelf-life commodities.

5. Triangulated Quality, Cost Control & Pricing Stability

Challenge: Operating under immense pressure to optimize costs without compromising quality, especially during supply imbalances.

Solution: Leverages near-real-time insights on crop quality, expected shelf life, and regional costs to execute "best price" strategies.

Value: Stabilized sourcing costs, ability to balance supply and demand, and maximized ROI by eliminating overstocking or shortages.

6. End-to-End Traceability & Compliance

Challenge: Proving compliance and origin for consumers and meeting stringent regulatory demands (e.g., deforestation and food safety).

Solution: Seamless data integration (farm-level to packhouse) via APIs and a unified platform ecosystem that connects all stakeholders for improved visibility and audit trail data.

Value: Guaranteed compliance for global markets, mitigated brand reputational risk, and a streamlined, efficient supply chain operation.

7. Operational Efficiency

Challenge: High labor costs and reliance on manual data collection and offline supplier coordination.

Solution: Automated monitoring and field digitization replace costly manual checks and eliminate dependence on offline coordination for rapid weather impact assessment.

Value: Reduced field operational expenses, faster decision cycles, and immediate ROI on data collection infrastructure.

8. Proactive Readiness & Strategic Expansion

Challenge: Limited foresight to identify future cultivation geographies or buffer zones against chronic yield underperformance.

Solution: Advanced yield estimation models and zone sampling enhance analytics with historical and predicted data, enabling foresight and strategic identification of new cultivation geographies.

Value: Essential first line of defense; allows for strategic preparation and expansion before climate-induced challenges materialize.

9. Geopolitical Risk Mitigation & Rapid Sourcing Realignment

Challenge: Geopolitical conflicts and trade tensions can suddenly make entire production regions irrelevant or unviable. The Russia–Ukraine crisis disrupted the global flow of wheat and maize almost overnight, and shifts in US–China trade made soybean exports less lucrative. Unlike manufacturing, agriculture cannot relocate quickly, identifying new sourcing regions, validating crop performance, and assessing mid- to long-term viability is slow, complex, and risk-prone.

Solution: Cropin accelerates this process by analyzing historical, current, and future weather patterns; local farming practices; real-time crop performance; and past, present, and future yield predictions. This intelligence enables agri-food companies to rapidly evaluate alternative sourcing geographies and develop resilient production and procurement strategies backed by deep, data-driven insights.

Value: Enables CPGs, food retailers, and commodity suppliers to quickly shift sourcing strategies when geopolitical shocks hit, ensuring continuity, minimizing exposure, and building a stable mid- to long-term supply plan with confidence.

10. Supply Chain Stability in a Volatile Geopolitical Environment

Challenge: Sudden geopolitical disruptions; trade restrictions, export bans, currency volatility, forced shifts in sourcing regions create unpredictability in crop availability, procurement timelines, and margins.

Solution: Cropin's real-time production monitoring, multisource intelligence (weather, satellite, soil, and crop models), and early warning systems enable continuous visibility across global sourcing geographies. Predictive models forecast shocks before they hit, allowing procurement teams to dynamically rebalance sourcing and build alternative supplier networks.

Value: Ensures uninterrupted supply of key commodities, protects margins, and strengthens resilience by reducing exposure to region-specific geopolitical shocks.

Implementation and Impact: Realizing ROI

Partnering with Global Leaders.

Driving Sourcing Agility

Operational Resilience

Supply Predictability

The central graphic features a grid of 12 diamond-shaped logos arranged in a 3x4 pattern. The logos are as follows:

- Row 1: ADM, McCain, FAST RETAILING, Mondelez International
- Row 2: HEINEKEN, pepsico, Loacker, SUCAFINA
- Row 3: Cropin, Walmart, Simplot

Case Study Spotlight: Enhancing Sourcing Predictability for a Global Retailer – Walmart

In an era where unpredictable weather and geopolitical shocks dictate crop availability and pricing, Walmart is reimagining how fresh produce moves from farm to shelf. In a first-of-its-kind deployment, the retail major partnered with Cropin for an AI-powered sourcing framework for grapes and strawberries. This collaboration aims to optimize Walmart's fresh produce supply chain through improved yield forecasting, precise crop health monitoring, and predicting seasonal transitions with greater accuracy. Cropin's models continuously interpret satellite data, growth patterns, and microclimate monitoring to provide procurement teams with a real-time data on supply.

Cropin Cloud platform enables AI-driven:

- **Yield estimation**
- **Monitoring crop health**
- **Crop readiness**
- **Risk analysis**
- **Quality forecasting**

The shift to remote monitoring ensures sourcing decisions are data-driven, agile, and resilient. With this transformation Walmart aims to execute "best price strategies" and curtail wastage. This proactive approach aims to mitigate risks related to extreme weather, market volatility, and supply chain disruptions. The platform will help maximize shelf life, guaranteeing contractual quality fulfillment and improved operational efficiency. By combining predictive yield analytics with climate risk modeling, Walmart can anticipate potential shortages, dynamically manage pricing, secure product freshness and reduce wastage through smarter logistics planning, turning volatility into a competitive advantage.

“

Tech innovation is what drives real-world solutions to move forward a globally resilient supply chain. Collaborating with Cropin enables Walmart to further streamline sourcing practices and better predict yields using their real-time Gen-AI technology. We're always looking for new ways to innovate and Cropin demonstrates our bold innovation goals in the agriculture space.

”

- Kyle Carlyle

Vice President of Sourcing Innovation
and Surety of Supply at Walmart.



Case Study Spotlight: Securing Long-Term Supply and Strategic Expansion (Food Processor)

A major global food processor, popular for potato sourcing aimed to secure long-term supply of high-quality potatoes for required strategic expansion framework in China—the world's leading potato producer. **Cropin Cloud** proved to be an intelligence platform that turned supply chain planning into a science. Using a sophisticated blend of non-invasive satellite imagery, proprietary **Crop Knowledge Grids**, and **dynamic Land Use Land Cover (LULC) data**, and Cropin's conceptualized deep-learning models delivered granular, actionable crop insights. The comprehensive intelligence suite, included **Crop Acreage & Production Analysis, Yield Potential & Crop Suitability, Water Stress & Irrigation Insights, Disease Probability Mapping, Weather Monitoring and more.** Armed with these insights this potato processor could successfully uncover ideal regions for diversification and ascertain the suitability of potato varieties in new, high-potential regions. Beyond proactive readiness through strategic expansion, Cropin enhanced operational efficiency through real-time, remote crop monitoring at a granular 5x5 km grid level. This digital oversight, coupled with pin-code level weather forecasts and advanced disease probability alerts, minimizes reliance on costly manual supplier coordination. By accurately estimating yield potential and managing long-term supply risk, the food processor transformed its sourcing strategy, ensuring stable supply and climate-change resilience.



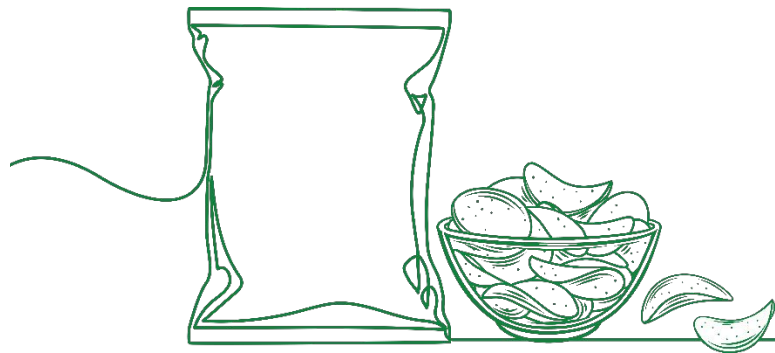
Case Study Spotlight: Digitally Verified Supply Chain and Sustainability (Loacker)

For **Loacker**, the iconic Italian wafer brand, sourcing premium hazelnuts sustainably was critical to brand integrity and compliance. For the **“Italian Hazelnut Groves Project,”** Loacker partnered with Cropin to digitize its entire value chain, connecting over 80 growers across six regions into a single intelligent ecosystem. Using the Cropin platform, Loacker achieved end-to-end traceability from orchard to final grading. The system tracks adherence to agronomic protocols, flags major pest threats (such as the invasive stink bug), and enables real-time quality control at collection centers. This shift created a fully traceable, digitally auditable supply chain, successfully processing over **2,000 tonnes of hazelnuts**. The result is a circular economy model built on precision and accountability, which not only improves grower incomes but rigorously guarantees every batch meets the brand’s exacting quality and sustainability compliance standards.



Case Study Spotlight: Localized Foresight and Supply Certainty : PepsiCo

For **PepsiCo**, sourcing potatoes for its **Lay's** brand from thousands of smallholder farmers across South Asia presented a complex challenge of fragmented data, unpredictable monsoons, and rising production risks. Traditional inspection methods were inadequate for managing shifting weather cycles at scale. To address this complexity, PepsiCo partnered with Cropin to deploy the **Lay's Smart Farm**, a unified AI platform that leverages satellite imagery, remote sensing, and decades of historical field data. This system delivered end-to-end visibility by monitoring climate variabilities, disease risks, and crop maturity in real time. Farmers received timely advisories to optimize inputs, while PepsiCo's sourcing teams accessed predictive dashboards that forecast yield, volume, and quality long before harvest. This model demonstrated how early intelligence and localized foresight can neutralize volatility before it hits the supply chain, ensuring predictable supply despite global climate stress.



CONCLUSION

HERE IS A CLEAR AND LOUD MESSAGE :
THE OLD SOURCING PLAYBOOK NO LONGER WORKS



A New Era of Certainty and Surety of Supply

The agricultural supply chain is defined by volatility, driven by climate shocks, geopolitical conflict, and growing compliance mandates. The traditional procurement model, relying on delayed data and reactive measures, is no longer viable. The case studies of Walmart, PepsiCo, and Loacker demonstrate that the future of procurement lies in AI-powered predictive intelligence. It replaces the guesswork, with granular, real-time data-driven insights, and converts uncertainty to foresight. Cropin's deployments across continents prove that resilience and profitability can go hand-in-hand. Today, intelligence is vital for sourcing, allowing major brands not to react to crises but to anticipate them, adapt faster, and build supply chains that are truly resilient and future-ready.

The Future of Sourcing: The adoption of deep learning and predictive analytics is no longer an option; it is the non-negotiable foundation for operational certainty. For CPG and Retail leaders, this proactive approach to sourcing is the key differentiator for growth and competitiveness, guaranteeing quality supply, stabilizing costs, and securing consumer trust in an increasingly unpredictable world.





Founded in 2010, Cropin is the world's most advanced AI Platform for Food and Agriculture. Cropin Cloud, the world's first industry cloud for agriculture, has computed 10% of the world's cultivable lands. Implemented by over 250+ enterprises, Cropin empowers stakeholders to make informed decisions that enhance farming efficiency, productivity, and sustainability. Our teams are spread across India, the United States of America, Italy, the Netherlands, and Brazil. We have digitized 30 million acres of farmland and positively impacted over 7 million farmers worldwide. Our crop knowledge graph, spanning 400+ crops and 10,000+ varieties in 103 countries, powers the Cropin Cloud. We are at the forefront of uniting agribusinesses, development agencies, international organizations, and governments to leverage Agtech systems to transform global food systems and attain climate goals. Cropin is backed by Google, Bill & Melinda Gates Foundation, ABC Impact, and Chiratae Ventures, among other notable investors.

