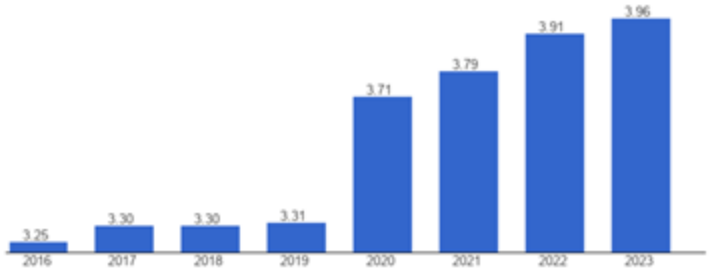
Cropin

A Digital Revolution in Mexican Agriculture: Bridging the Gap for Smallholder Farmers

Mexico's agricultural heartland is beating stronger. Contributing 3.96% to the nation's GDP in 2023, the sector provides livelihoods for over 50% of its rural workforce. Government support has been instrumental in this growth.



Source: *Contribution of agriculture to Mexico's GDP*

Yet, beneath the surface of this vital industry lie significant challenges: the growing shadow of climate change, declining yields, and outdated farming practices that lag behind developed economies by 12-15 years – a gap the Government of Mexico was determined to bridge.

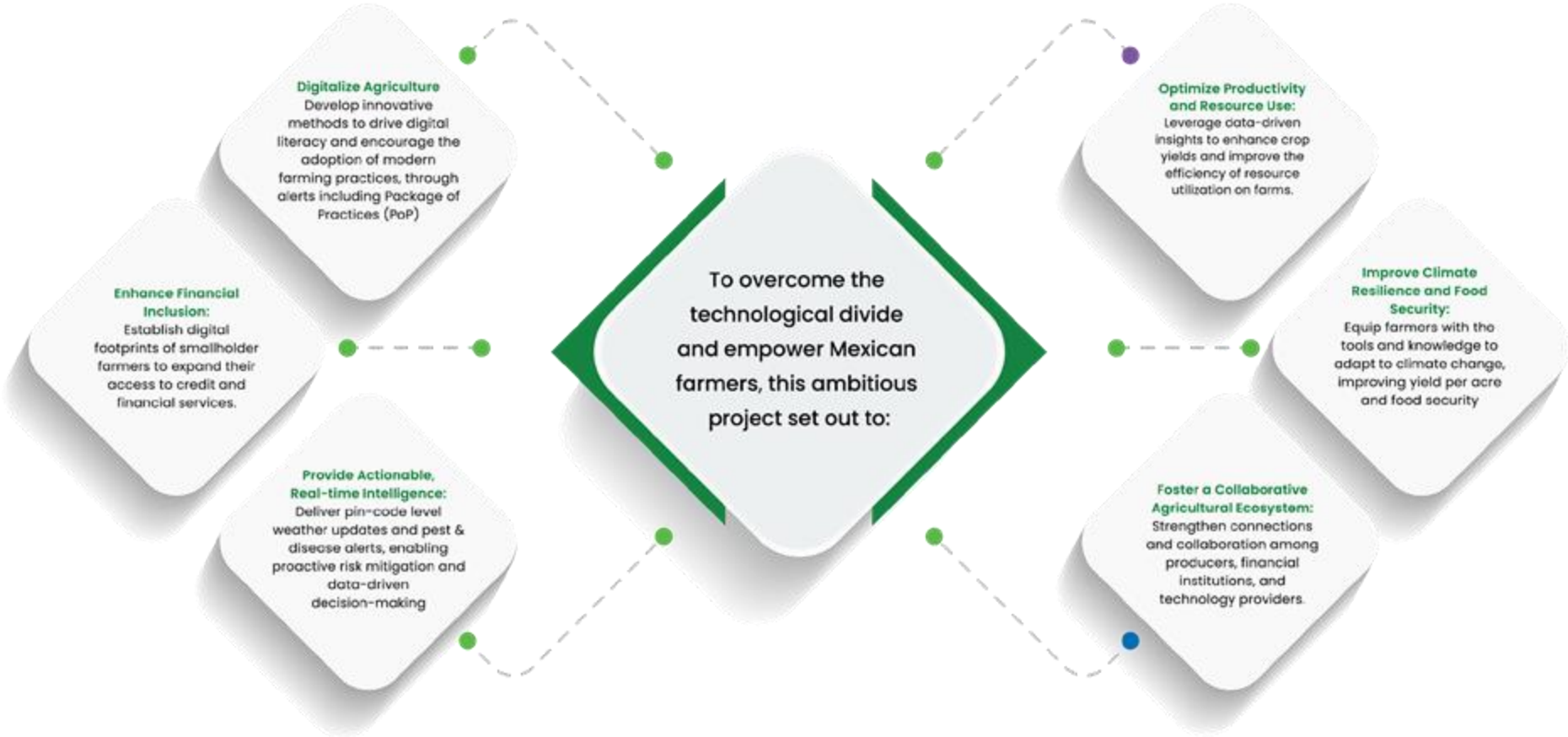
Limited access to finance, a lack of technical know-how, and restricted market access creates significant barriers to progress. Coupled with the increasing volatility of climate change, these factors contribute to low productivity, diminished incomes, and food insecurity.

Their vision?

To empower Mexican smallholder farmers with cutting-edge agricultural technology. To realize this ambition, the Government turned to the Trust Funds for Rural Development (FIRA), a cornerstone of Mexican agricultural support since 1954. Tasked with providing credit, technical assistance, and technology transfer, FIRA recognized the transformative power of digital innovation.

FIRA's mandate was clear: promote financial inclusion and drive technological innovation, thereby boosting productivity and efficiency across agricultural value chains.

Their goal was to empower smallholder farmers and cultivate sustainable agricultural growth through strategic partnerships with the private sector. FIRA recognized the potential of technology in this journey to transform agriculture.


To overcome the technological divide and empower Mexican farmers, this ambitious project set out to:
Digitalize Agriculture
Develop innovative methods to drive digital literacy and encourage the adoption of modern farming practices, through alerts including Package of Practices (PoP)
Enhance Financial Inclusion:
Establish digital footprints of smallholder farmers to expand their access to credit and financial services.
Provide Actionable, Real-time Intelligence:
Deliver pin-code level weather updates and pest & disease alerts, enabling proactive risk mitigation and data-driven decision-making
Optimize Productivity and Resource Use:
Leverage data-driven insights to enhance crop yields and improve the efficiency of resource utilization on farms.
Improve Climate Resilience and Food Security:
Equip farmers with the tools and knowledge to adapt to climate change, improving yield per acre and food security
Foster a Collaborative Agricultural Ecosystem:
Strengthen connections and collaboration among producers, financial institutions, and technology providers.

A Digital Platform for Farmers

In rural Mexico, many smaller-scale farmers are isolated from technological innovation, and the adoption of new technologies is slow and limited. To address this barrier and empower Mexican farmers, the project had to provide vital information directly to FIRA partners: the producers, producer groups, and financial intermediaries. This required a user-friendly online digital platform that was:

Simple and Scalable: Easy to adopt and capable of expanding to a large user base

Dynamically Responsive: Adaptable to evolving information and production needs.

Technologically Versatile: Compatible with various mobile devices within a unified architecture.

Cost-Effective: Priced competitively to ensure accessibility for a large volume of users.

The Partnership: Building a Farmer-Centric Solution

FIRA envisioned a seamless user experience powered by a robust subscription platform model. To realize this, they partnered with a telecommunications leader in Mexico - Global Hitss, a subsidiary of American Movil, to manage user subscriptions. For the critical technological backbone, FIRA sought a partner with proven Agtech expertise and the ability to meet evolving functionalities of its diverse user base. After a thorough evaluation, Cropin emerged as the ideal solution provider, capable of delivering over 85% of the required functionalities.

The Cropin Advantage: Key Platform Features

Cropin's platform brought a suite of powerful features to the initiative:

- **Georeferencing**: Precisely located and mapped farmlands for accurate data analysis and resource management.
- **Near Real-time Monitoring**: Satellite-enabled remote monitoring of crop health, growth stages, soil conditions, etc., for data-driven decision-making.
- **Agroclimatic Insights**: Offered in-depth information on hyper-local climate conditions, including current, historical, and forecasts throughout the season.
- **Intuitive User Interface**: A simple-to-use and intuitive interface ensured easy navigation for users of all technical backgrounds.
- **Seamless Single Sign-On (SSO):** A unified login experience for seamless access to Cropin and Global Hitss platforms.
- **Data Integration**: Seamlessly API integrated data from various sources, like satellite imagery, weather stations, field data, and open-source maps.
- **Scalability and Robust Security**: Designed to accommodate a growing user base and evolving agricultural needs.
  user data and privacy are protected.

Empowering the Ecosystem: Stakeholder Enablement

The Cropin platform served as a central hub, empowering various stakeholders:

- **Subscription Management (Global Hitss):** Seamlessly integrated the telecom provider's subscription model via defined APIs, ensuring secure registration, authentication, and efficient user service delivery.
- **Efficient Platform Administration (FIRA):** FIRA users could use the platform efficiently to ensure proper administration of the interface and its users. Cropin enabled access and use of the generated datasets.
- **Subscription Services for Platform Users:** Cropin developed customized service packages for producers and producer groups, aligning with their specific needs and subscription levels.

The subscription process was designed for simplicity. Cropin created and codified a combination of services. Farmers provided basic information on the telecom provider's platform, which, upon validation, automatically generated user accounts on Cropin with the appropriate roles (Producer, Producer Group, Financial Intermediary) and enabled the subscribed services. Subscription on the telecom provider's platform was based on acreage. Only those services to which the farmers subscribed were enabled. Validation was internal to FIRA in cases of FIRA internal users and administrators. The user inventory records were added immediately and visible on a dashboard. Notification for Users about the registration status of their accounts were enabled.

As climate change continuously disrupts traditional agricultural practices, this Agristack model redefines farming with technology.

Reliable offline capability for uninterrupted data capture even amidst intermittent internet connectivity in rural areas eased connectivity barriers.

User Management and Grouping were done for the following four profiles of Users

Tech-enabled Producers

Aiming to enhance on-farm production and productivity.

Producer Associations/Admins

With a technical/commercial profile, they are focused on boosting production, reducing costs, and fostering collaboration among their network.

Financial intermediaries

Having a financial profile, they seek to improve agricultural credit portfolio supervision and expand financial inclusion.

FIRA users

Have diverse objectives based on the functions they perform, spanning supervision, monitoring, credit prospecting, sectoral intelligence, and platform administration, among others.

According to the user subscription model, the Cropin platform allowed the registration of users both linked to FIRA and not linked to FIRA.

Project Management at Scale

To effectively manage a project of this magnitude (targeting 400,000 farmers), Cropin implemented a robust nomenclature system based on location (country, district, village) for efficient monitoring and tracking of individual plots.

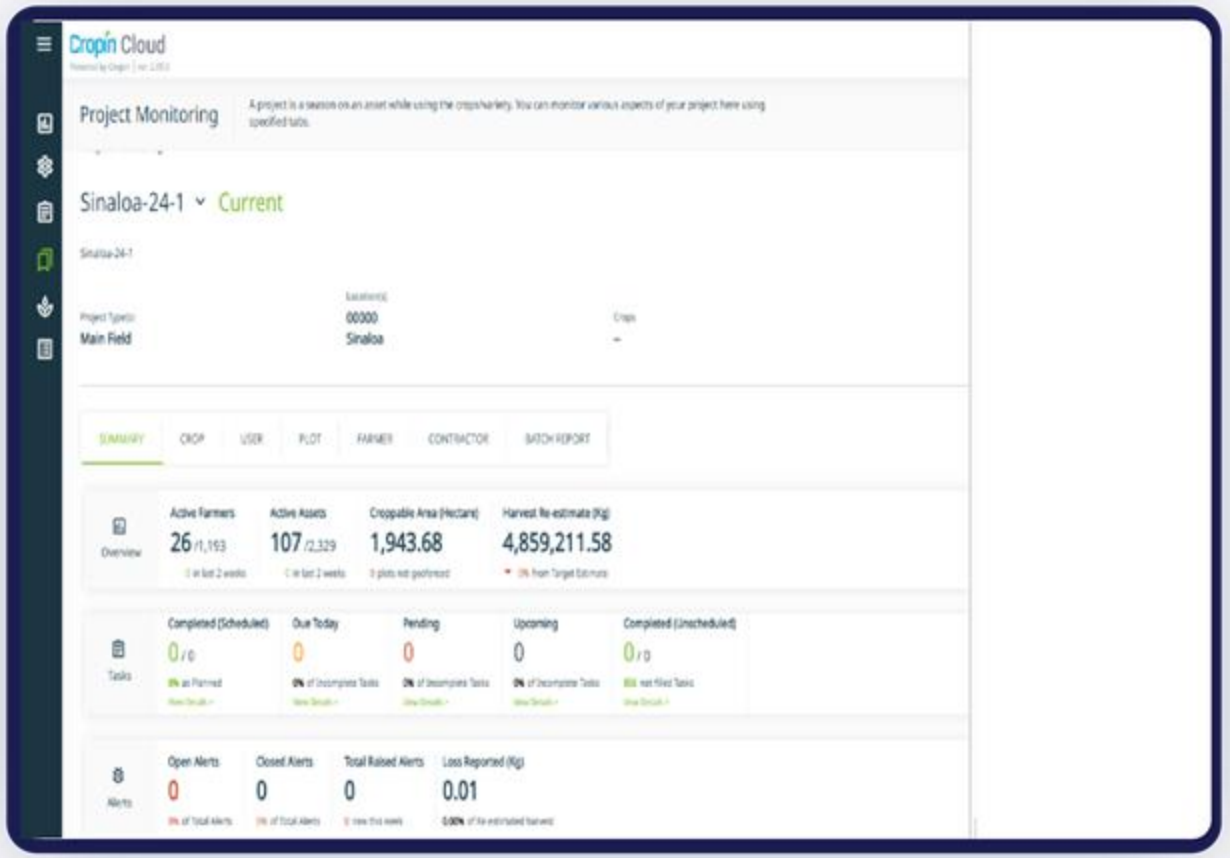


Figure 1: Project Monitoring Dashboard in Cropin Cloud Platform

Core Platform Services

- Area Audit
- Field Notebook
- Satellite monitoring of farms, Agroclimatic information

The Cropin platform delivered crucial services:

- Precise Area Audit: Enables producers to geotag their fields for accurate acreage verification, ensuring fair subscription alignment and efficient resource allocation. User-friendly web and mobile applications could facilitate the capture of precise spatial data and image uploads. Geolocating plots provided the foundation for accurate weather reports.
  Cropin's dynamic feature enablement could automatically activate relevant platform services (e.g., plot intelligence, weather monitoring) based on the farmer's subscription plan after the area audit.
  The differentiated user roles provided tailored access to information based on the subscribed service level.

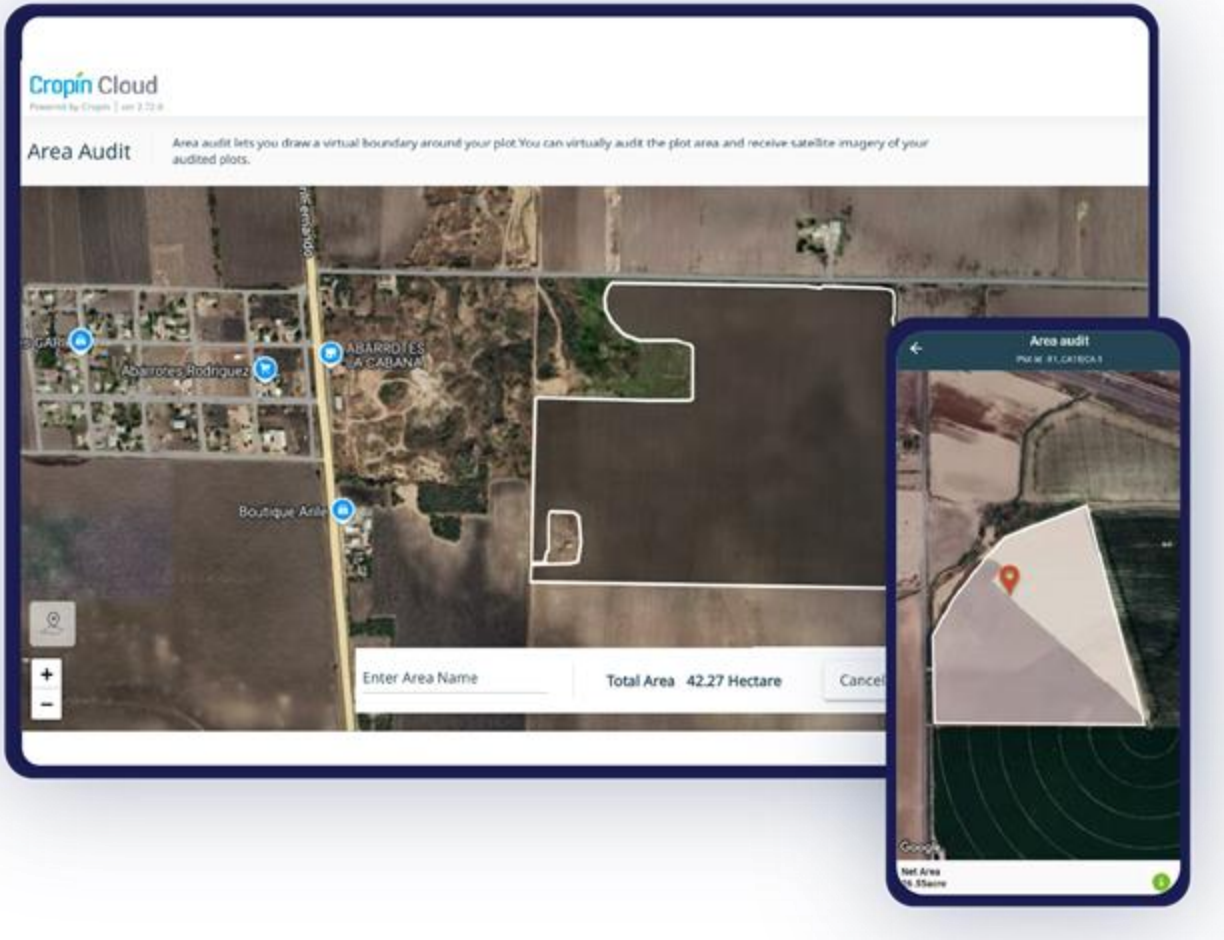


Figure 2: Area Audit Feature in Cropin Cloud Platform and Area Audit mobile view

Comprehensive Field Book:
Cropin platform could offer digital record for all farm activities, to enable customized farm planning, efficient data capture (including images and geolocation). It could also facilitate knowledge sharing of Package of Practices (PoP).

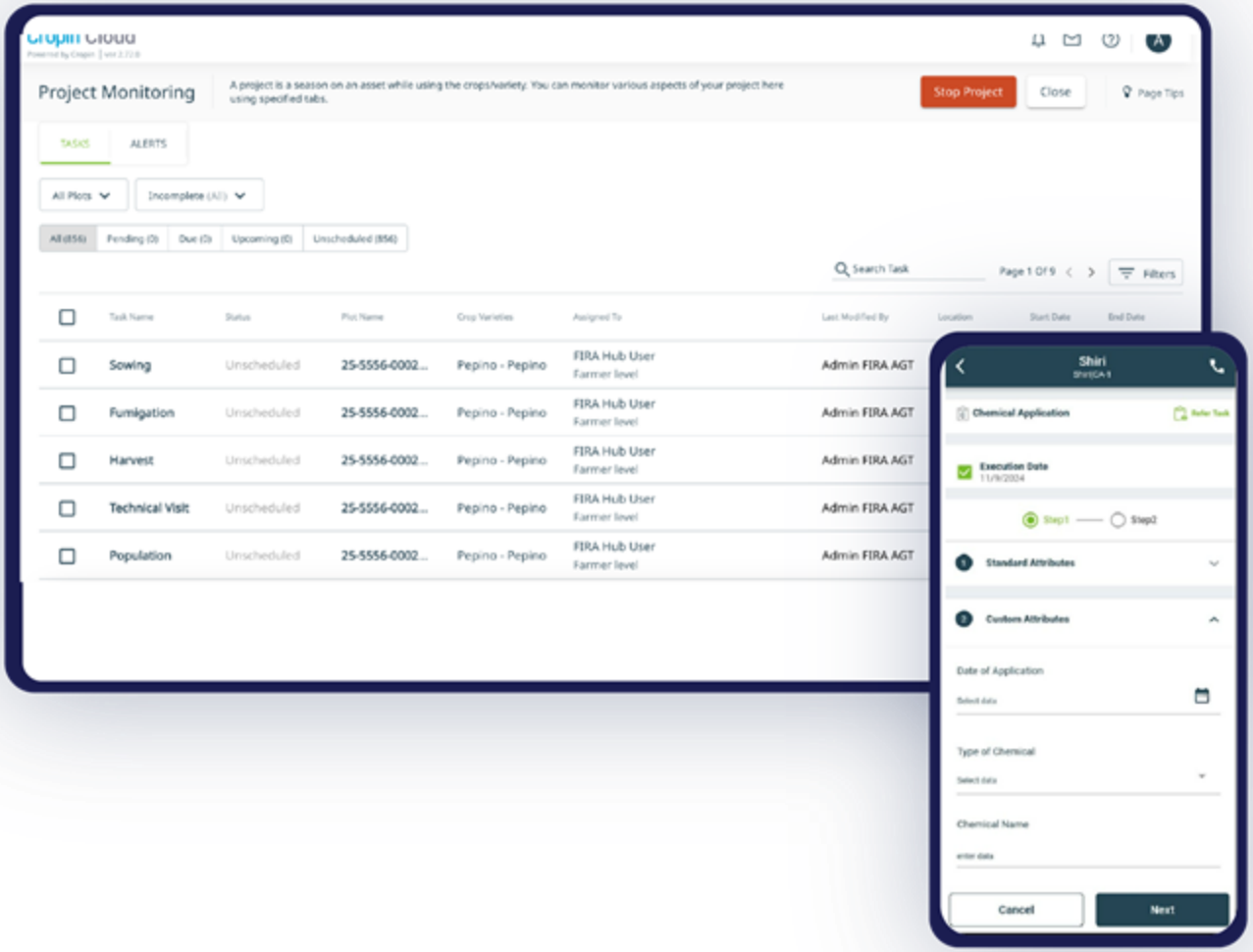


Figure 3: Dashboard Showing Detailed Field Activities and Mobile View of Field Book

Intelligent Remote Monitoring:
Utilizing satellite imagery (from Planet for high-frequency data and Sentinel for broader coverage) Cropin could provide insights into crop health through indices like NDVI, NDRE, and LSWI, enabling early detection of issues. The platform tracked 30+ raw indices from various satellite sources for in-depth production analysis.

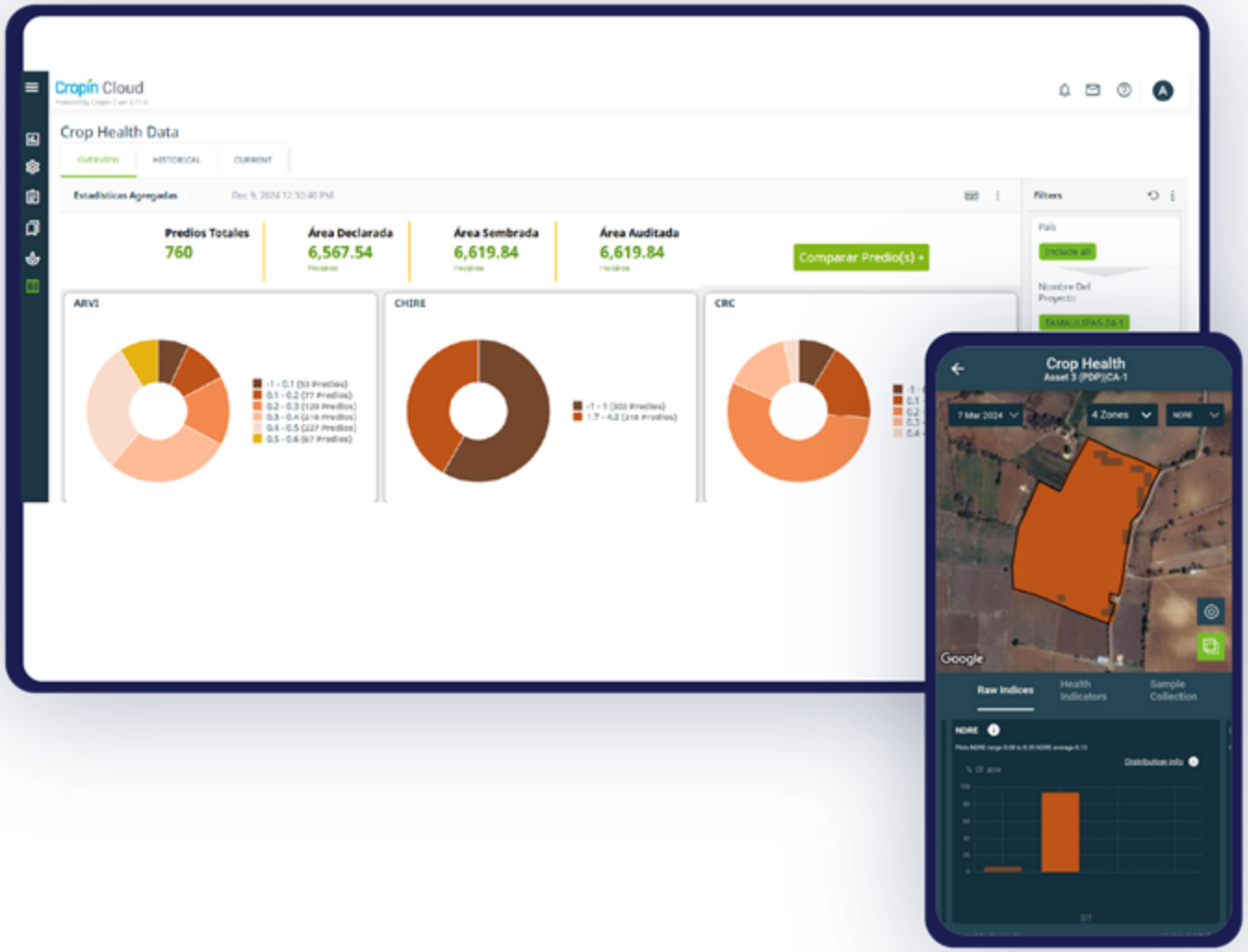
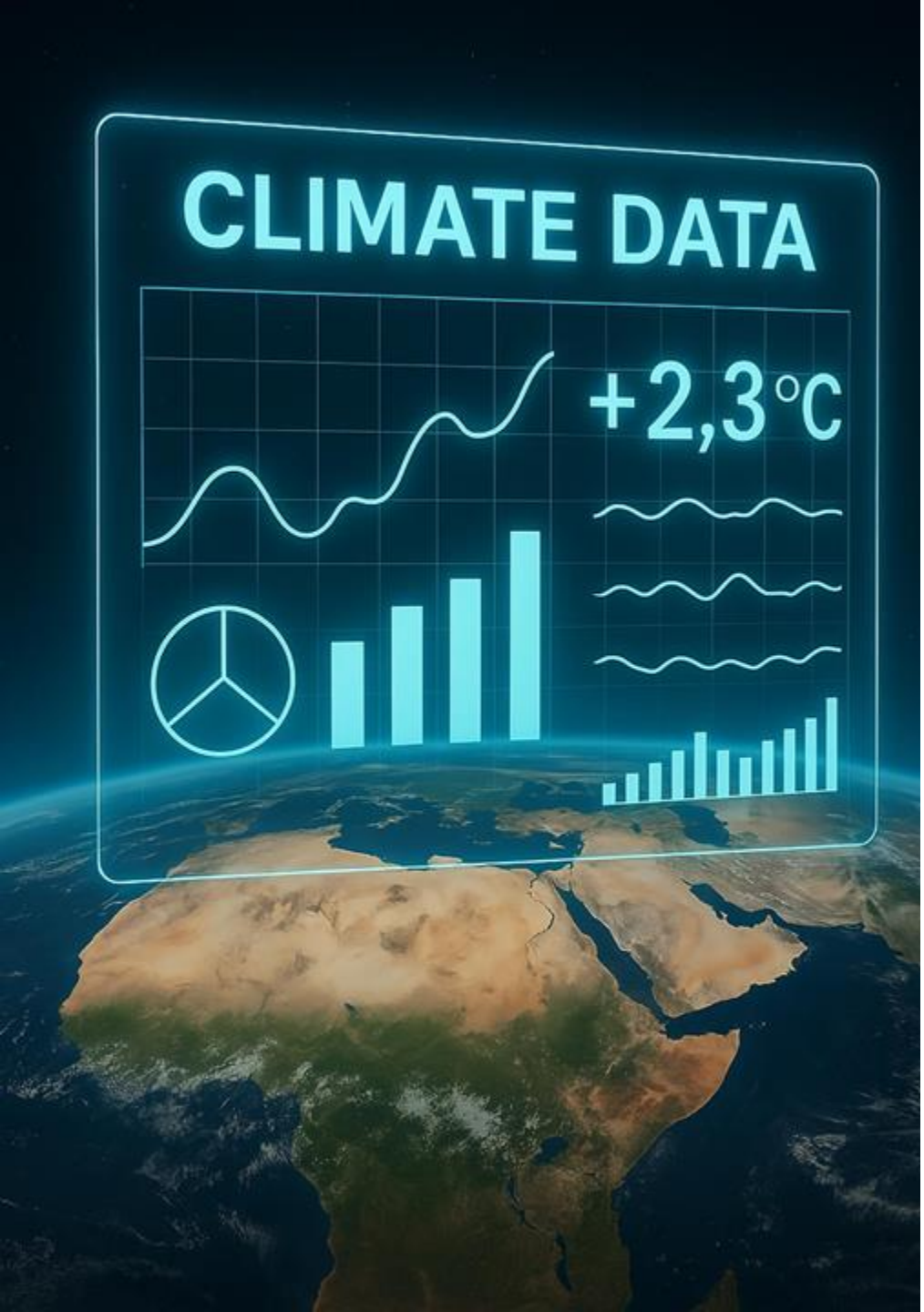


Figure 4: Dashboard Image: Overview of Crop Health with Raw Vegetation Index Range and Mobile view of Crop Health with Raw Vegetation Index Range



Actionable hyperlocal Weather & Climate Insights:
Cropin provided historical weather data (40 years), nowcast, and short-term (10-day) and long-term (6-month) forecasts, along with insights on extreme weather events. This perspective could help decode climate change patterns, empowering informed decision-making.

78M

Grids Analyzed

40+

Weather parameters analysed

30+

No of Raw Indices used

From Planet: **NDVI, NDRE,ARVI, CHI_RE, EVI, LAI2, MSAVI**

From Landsat: **NBRT1 and VI6T**

From Sentinel: **CRC, DSWI2, DSWI3, DSWI4, DSWI5, EMSI, ENDDI, ENDWI, FAPAR, LAI, LSWI, MCRC, MRA, MSI, NDDI, NDSVI, NDTI, NDWI, SAVI, SRNDI, STI**

Additional insights like solar radiation, advanced parameters like extreme weather events (tropical cyclones, hail, cold & heat waves, frost-free period), growing period, dog days, and ENSO forecasts are also available.

Forecast:

- Short-term – hourly forecast for the next 10 days
- Long-term – monthly forecast for the next 6 months

Historical data: Range - last 10 days to monthly averages for last 40 years (from 1980)

Weather bulletins covering daily and weekly weather updates

Regional Intelligence

Cropin's advanced analytics delve deep into historical weather data over 40 years. The platform analyzed nearly 100 parameters and provided valuable insights into long-term climate trends and seasonal variations, which could also be downloaded. This comprehensive analysis empowered stakeholders to make informed decisions and adapt to changing climatic conditions. Additionally, Cropin leveraged publicly available geospatial data to generate detailed maps and spatial analyses. This information was crucial for understanding the geographical and environmental factors influencing agricultural productivity.

Figure 5: Map Layer Dashboard Showing Accumulated Actual Evapotranspiration

Navigating Challenges, Delivering Solutions

The project implementation encountered several key challenges:

- **Seamless Subscription Model Integration**: Ensuring smooth connectivity between the Global Hitss and Cropin platforms.
- **Integration of Public Data**: Visualization of diverse publicly available geospatial datasets from sources like INEGI, CONAGUA, CONABIO, and CONAFOR, required translation to provide contextual information.
- **Complex Data Integration**: Unifying diverse datasets from various internal and external sources.
- **Language and Data Accessibility**: Addressing the Spanish-only availability of data within vector files, requiring manual translation and cleaning.
- **Ensuring Data Quality and Accuracy**: Overcoming limitations in the resolution and accuracy of certain datasets, particularly within the Mexican context.
- **Efficient Cross-Platform Integration**: Guaranteeing seamless data flow and user experience between the Cropin Cloud and Global Hitss platforms.
- **Overcoming Technical Hurdles**: Addressing API integration and data synchronization challenges.
- **Facilitating Cross-Team Collaboration**: Managing communication and coordination across teams with different time zones and work styles.
- **Maintaining Data Security and Compliance**: Implementing robust measures to protect user data and adhere to all relevant regulations.

Cropin met these challenges head-on with a meticulous and solution-oriented approach. This included developing a robust user role system aligned with the subscription model, ensuring data compatibility and secure API integration, supporting SSO implementation, and conducting in-depth research and analysis to address data quality and accessibility issues.

Empowering Through Knowledge

Cropin facilitated seamless platform adoption through comprehensive demonstrations and provided dedicated customer success support, including training and readily accessible resources. This ensured that users of all technical backgrounds at FIRA could effectively leverage the platform's capabilities.

Cropin's Role in Agricultural Transformation

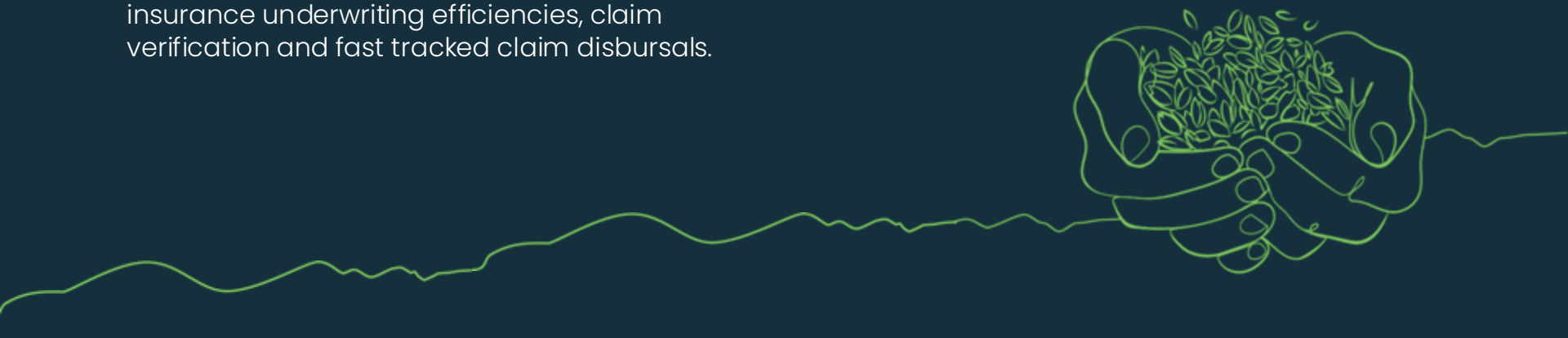
Cropin's advanced platform, powered by AI and machine learning, analyzed vast datasets to provide real-time insights on crop health, soil moisture, weather conditions, and more.
The integration of diverse data sources and the visualization of multiple datasets underscored Cropin's Agtech expertise. The platform's advanced algorithms identified critical trends, patterns, and anomalies, empowering FIRA with actionable intelligence.

The Transformative Impact

By leveraging Cropin's insights, FIRA gained a deeper understanding of farm performance, enabling data-driven decision-making, precise risk assessment, and the development of targeted farmer support programs. The implications were far-reaching:

- **Informed Policy Formulation**: Providing governments with data to address climate change and agricultural challenges effectively.
- **Strategic Financial Decisions**: The digital footprint of farmers could foster financial inclusion, providing access to vital data, streamlining lending processes, enhancing risk assessment, and stabilizing the agricultural ecosystem.
- **Near real-time monitoring** could improve insurance underwriting efficiencies, claim verification and fast tracked claim disbursals.

In conclusion, the partnership between FIRA and Cropin exemplifies the transformative power of Agtech in addressing critical challenges in the agricultural sector at national scale. By providing a user-centric platform that delivers actionable insights, fosters collaboration, and empowers stakeholders across the ecosystem, Cropin is playing a pivotal role in cultivating progress and building a more resilient and prosperous future for Mexican agriculture.



Cropin®

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, Italy, The Netherlands, and Brazil. We have digitized 30 million acres of farmlands and positively impacted over 7 million farmers worldwide. Our crop knowledge graph, spanning 350 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.