CASE STUDY: THE CROP TRUST PROJECTS (Genesys & GGCE)

aimprosoft

Two platforms for managing and sharing global crop diversity data

Partner information:

Partner: **Global Crop Diversity Trust**

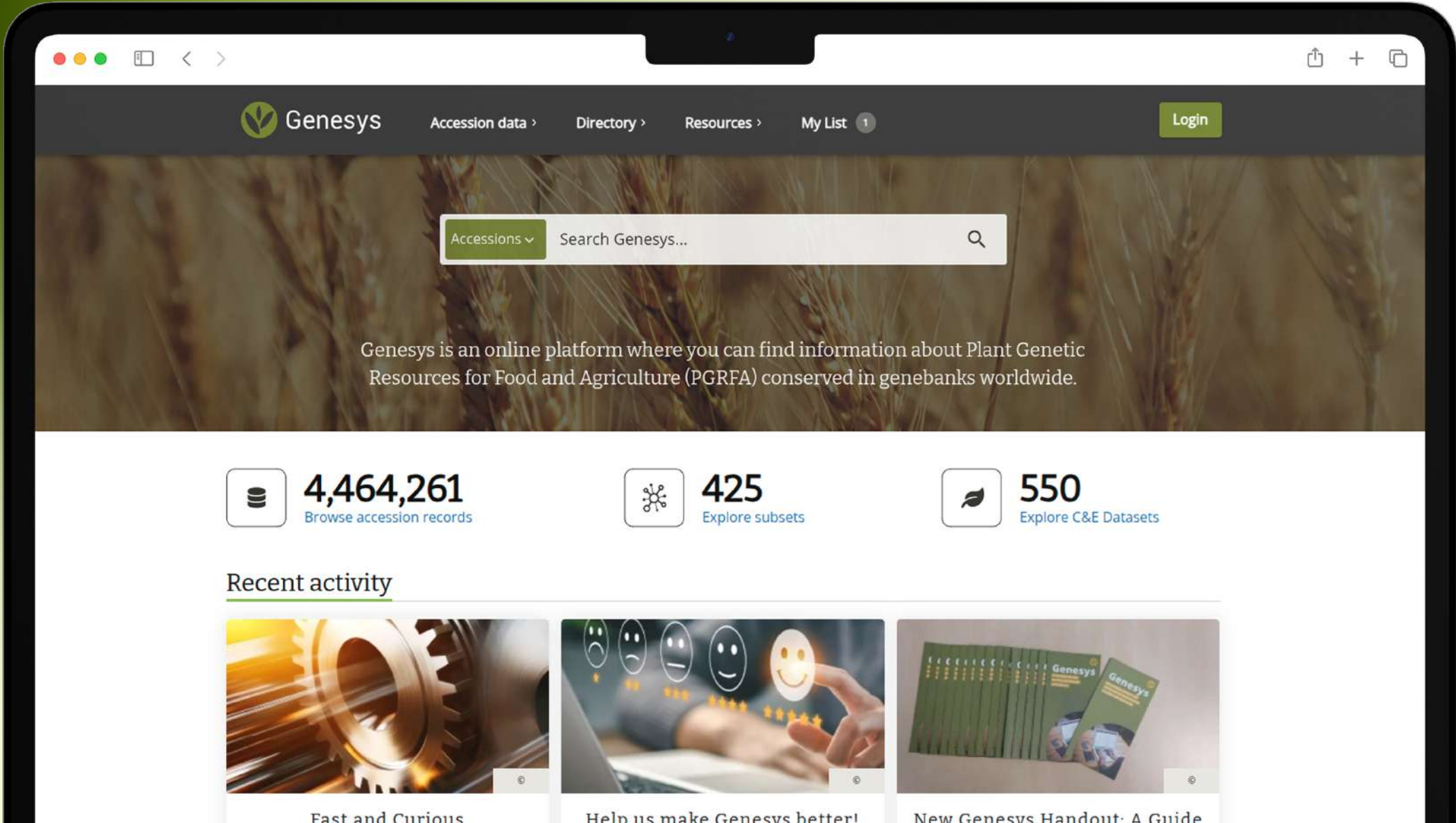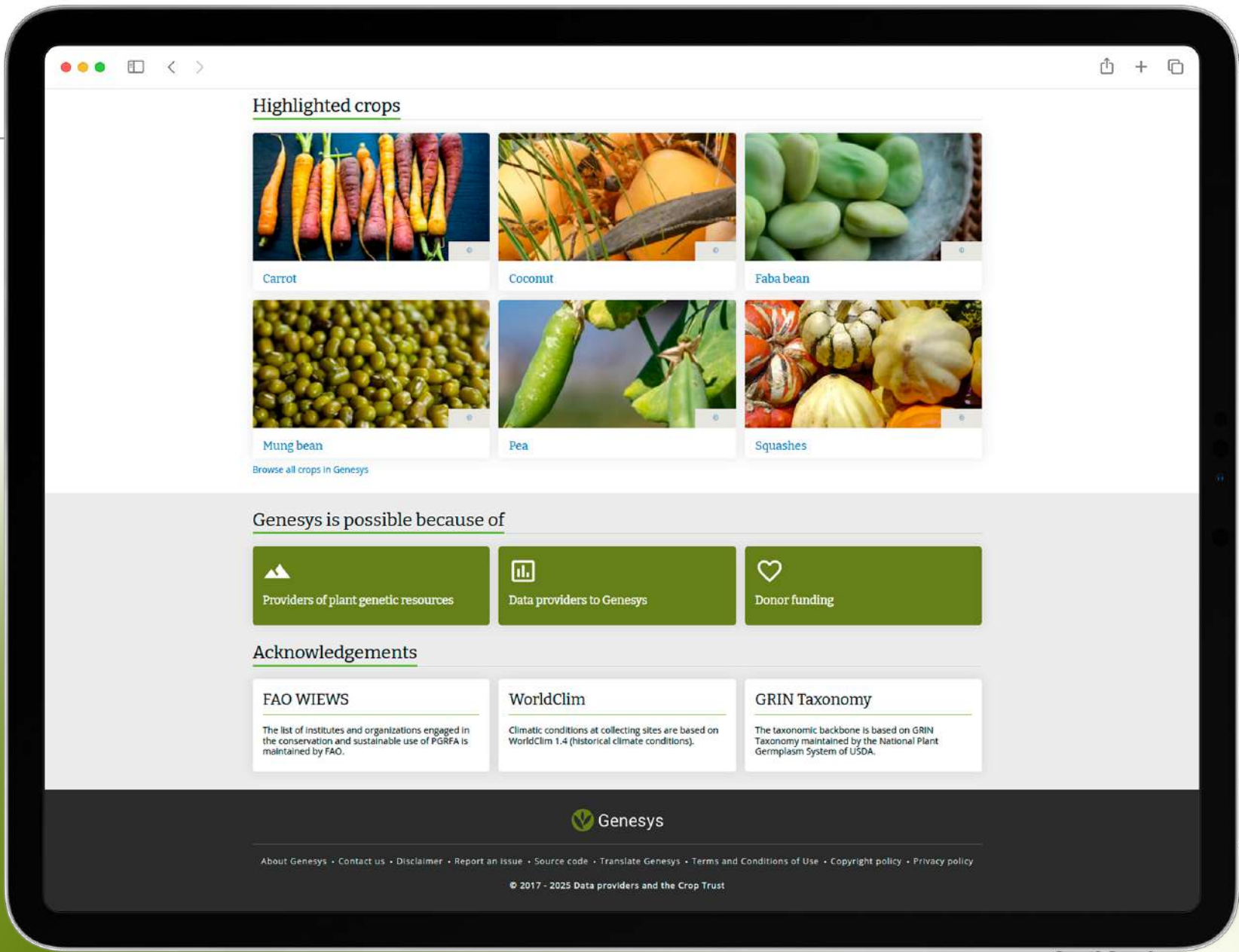Company size: **11-50**

Headquarters: **Germany**

Team size:

Back-end developer: 1   QA engineer: 1
Front-end developer: 1   Project manager: 1

PROJECT OVERVIEW

In 2013, the Crop Trust, an international organization dedicated to preserving crop diversity, partnered with us to help rebuild Genesys, their global plant genetic resource platform. Originally, Genesys was built on PHP and, over time, began to lack the flexibility and performance needed to support the growing volume of genebank data worldwide. We had to redesign the system using Java to improve the platform's scalability and simplify access to data about more than 4 million plant samples.

After the successful relaunch of the Java version in 2015 and the frontend migration to React in 2019, the scope of our involvement expanded. In 2020, we became responsible for a second Crop Trust product—Grin Global Community Edition (GGCE), an open-source software and database system used by genebanks to manage internal workflows and data. Our role was to support the system, modernize and expand it.
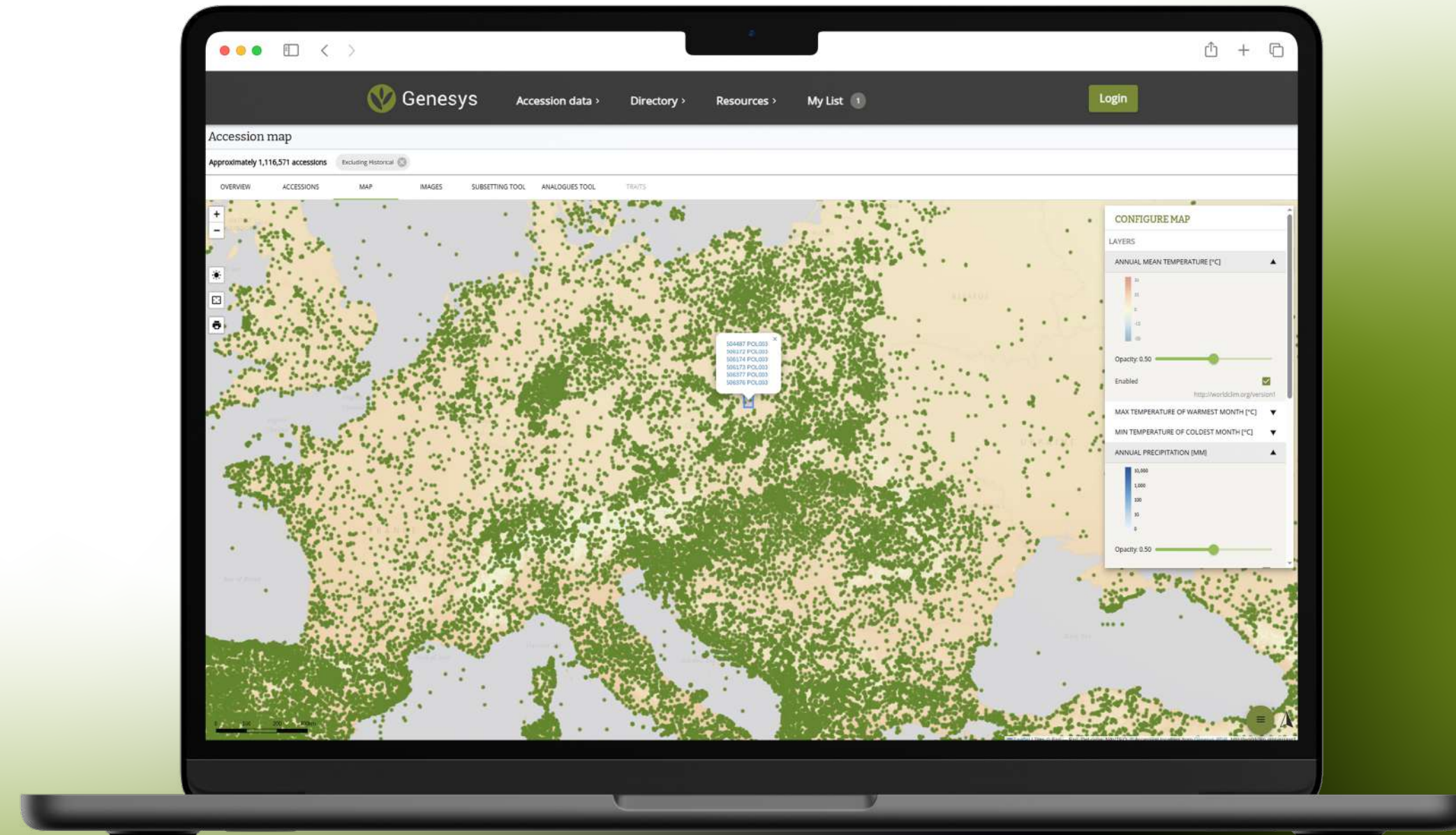
Over the years, our work has evolved from solely technical task execution to architectural consulting, improving data processing and continuous delivery of new features across both systems. Genesys now serves as a global access point for researchers and institutions working to preserve crop diversity, while GGCE helps local genebanks manage and digitize their internal operations.

Together, these platforms make a critical digital foundation for long-term global food security and biodiversity preservation. As of today, Genesys hosts over 4.3 million seed samples. More than 450 genebanks contribute to the platform, and data is sourced from over 100 countries.

And we're proud to be part of the Crop Trust's mission, ensuring their systems remain stable, scalable and ready for what's next.

PROVIDED SERVICES & TECHNOLOGY STACK

Provided services

- Web development
- QA & software testing
- Project management

Technologies & tools

- **Platform:** Java
- **Frontend:** Webpack 5, React, Express.js, Redux, Redux-Saga, Material-UI, TypeScript, SCSS, D3.js, i18n
- **Backend:** Java 11, Spring Framework (Core, Web MVC, Data, Security, ACL), Hibernate, MariaDB, MySQL, Elasticsearch, Hazelcast, Liquibase, QueryDSL, Eclipse Jetty, Node.js, MSSQL, Express.js
- **QA tools:** JPA, JUnit, Liquibase, Hazelcast, Maven3, JSP, ACL, Webpack3, ES6
- **Additional tools:** ESLint, npm, Yarn, Git flow, GitFlow, PM2, GitHub, AI Assistant, 0Auth2
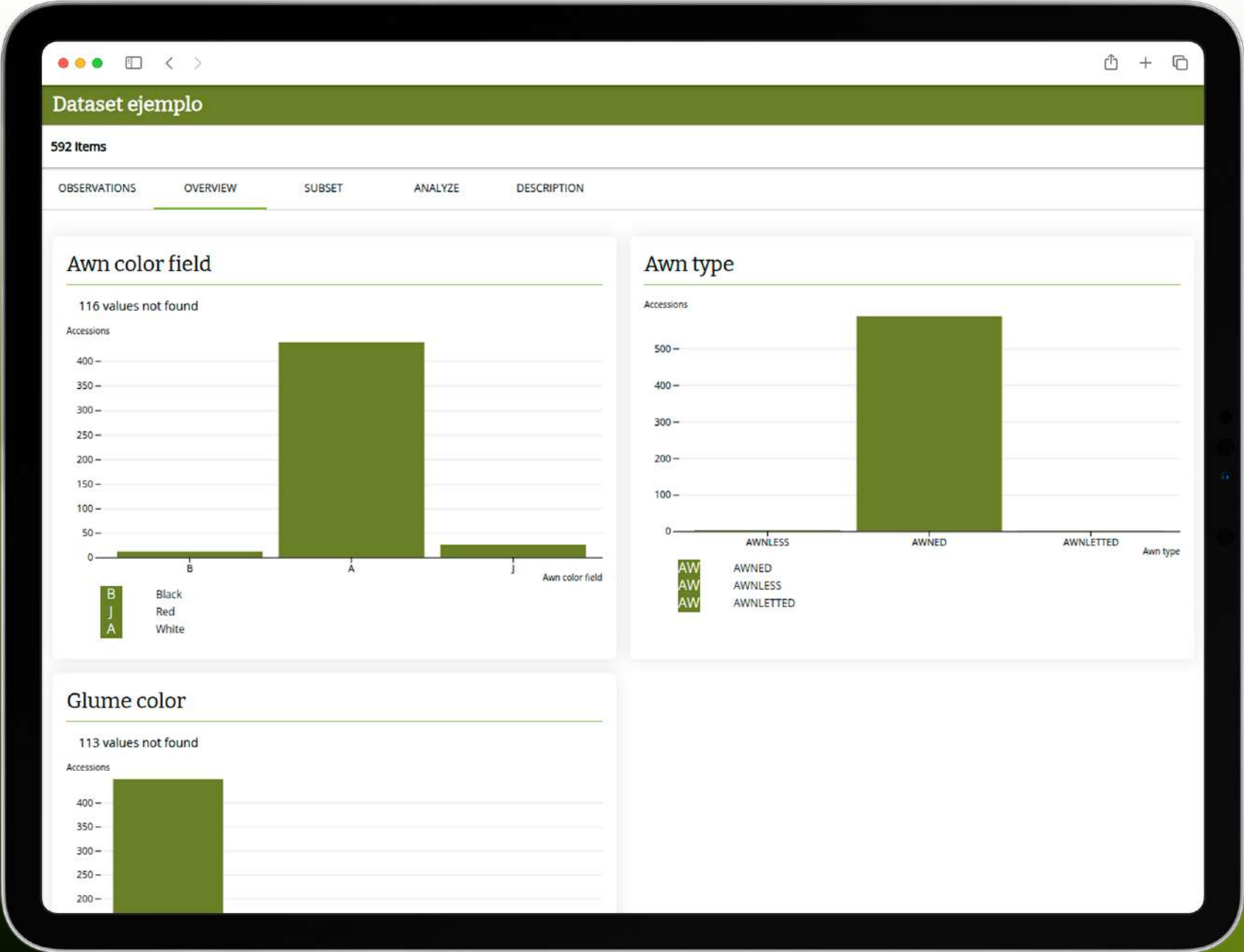
REQUIREMENTS & CHALLENGES

When the Crop Trust first approached us, our primary objective was to rebuild their existing platform, Genesys, and help scale it into a more resilient and modular system. The task was to refactor, optimize and expand it so that it could support current demand and future growth.

Shortly after, our scope expanded to include Grin Global Community Edition (GGCE), a platform designed for internal genebank management. Our task was to take over development and ensure its alignment with current software standards, data models and integrations, while supporting existing users across multiple countries.

As both platforms evolved, so did the scope of our work and degree of engagement. We had to update legacy components, improve query responsiveness for large-scale datasets, rework data exchange layers, and adapt to our partner's expectations surrounding maintainable code style and tech stack relevance, all while maintaining stable releases for an active global user base.

Optimizing data exchange

Genesys's original structure sent an excess of redundant data, slowing response times and adding load to the UI. We needed to restructure the flow of data exchange between frontend and backend to send only the necessary data, improving speed, especially in low-bandwidth environments.

Managing two related but distinct platforms

Supporting both Genesys and GGCE required clear architectural separation, careful coordination, and flexible feature implementation to account for different audiences, system requirements, and development timelines.

Keeping tech stack updated

To ensure long-term maintainability and compliance with modern development standards, we needed to regularly upgrade core components. These updates had to be delivered seamlessly across environments without affecting platform stability or introducing regressions for end users.

Maintaining consistent data across platforms

Differences in data formatting and delivery between systems occasionally led to errors and inconsistencies. Ensuring both platforms always display reliable, synchronized data is essential for creating a seamless UX and preserving data accuracy.

Customizing open-source tools

Various tools like Liquibase didn't cover all our partner's operational needs straight out of the box. We had to go deeper, creating custom logic to automate initial data loading and secure database integrity on every deployment.

Designing architecture for future growth

Scalability and reusability were key design principles from the outset, so our team needed to build both Genesys and GGCE to accommodate new APIs, reusable services, and potential integrations, all without system disruptions and major changes to service.

HOW WE WORK

Collaboration approach & process

Our collaboration with the Crop Trust has been shaped by **long-term partnership, confident mutual trust and a high level of autonomy.** From the beginning, we've been treated not as a typical external vendor, but as a strategic partner responsible for driving the evolution of both of their critical platforms: Genesys and Grin Global Community Edition.

With the Crop Trust as the ultimate product owner and strategic decision-maker, our team leads the implementation of core features, handles architectural decisions and manages day-to-day development processes across both systems. We regularly propose improvements based on real usage patterns and performance insights, participate in planning, and review platform priorities.

Over time, we adopted **a shared ownership mindset.** Our proactive approach, technical consistency and ability to anticipate upcoming needs allow us to support not only code delivery, but long-term platform sustainability and reliability necessary to serve the Crop Trust's global conservation mission.

Partner testimonial

The team at Aimprosoft is instrumental at keeping Genesys attractive to our users and data providers. Together we have built an open, fast and secure platform that provides researchers and breeders with the data about plant material in genebanks worldwide.

Matija Obreza,
Product Owner at The Crop Trust

STEP-BY-STEP PROJECT FLOW

Stage 1: Rebuilding and modernizing Genesys (2013–2015)

Our team's first task was to replace their original PHP-based platform with a modern Java backend and robust REST architecture. At this stage, we focused on rebuilding core functionality for long-term scalability and data reliability. We handled the full technical rewrite and supported the first production release.

Stage 2: Frontend modernization (2019)

As user needs grew, the outdated JSP-based UI was no longer fit for purpose. We migrated Genesys to a React-based frontend, improving performance, usability and development speed, and laid the foundation for interactive features and visual data exploration.

Stage 3: Taking over GGCE development (2020)

We joined the ongoing development of GGCE, a separate platform used by genebanks to manage internal operations. Our team worked to stabilize the system, align it with current backend standards and extend it based on user feedback. From this point onwards, we became responsible for maintaining and developing both products in parallel.

STEP-BY-STEP PROJECT FLOW

Stage 5: Documentation and platform onboarding (2022–2024)

To support global adoption of both platforms, our team developed an extensive documentation layer within each. These handbook-style internal documents help new users navigate data upload, filtering and reporting features without external training. This stage also marked our growing involvement in platform usability and long-term maintainability.

Stage 4. Continuous delivery and increased ownership (2020–2023)

With both platforms in active use, our work shifted to cover the ongoing delivery of new services, API extensions and architectural refinements. We regularly shipped updates across environments, fixed critical issues and improved internal tooling, and our responsibilities expanded as we took ownership of performance, security and infrastructure tasks.

Stage 6: API modernization and AI integration prep (2024–ongoing)

Currently, our team is leading a full-scale migration to API v2, introducing stricter response structures and more efficient data exchange. Simultaneously, we are aiding in the integration of an AI assistant that supports dynamic filtering and smart search for Genesys. Though early-stage, these projects set the groundwork for the next decade of Crop Trust's crop diversity conservation work.

DELIVERED PRODUCTS & FUNCTIONALITY
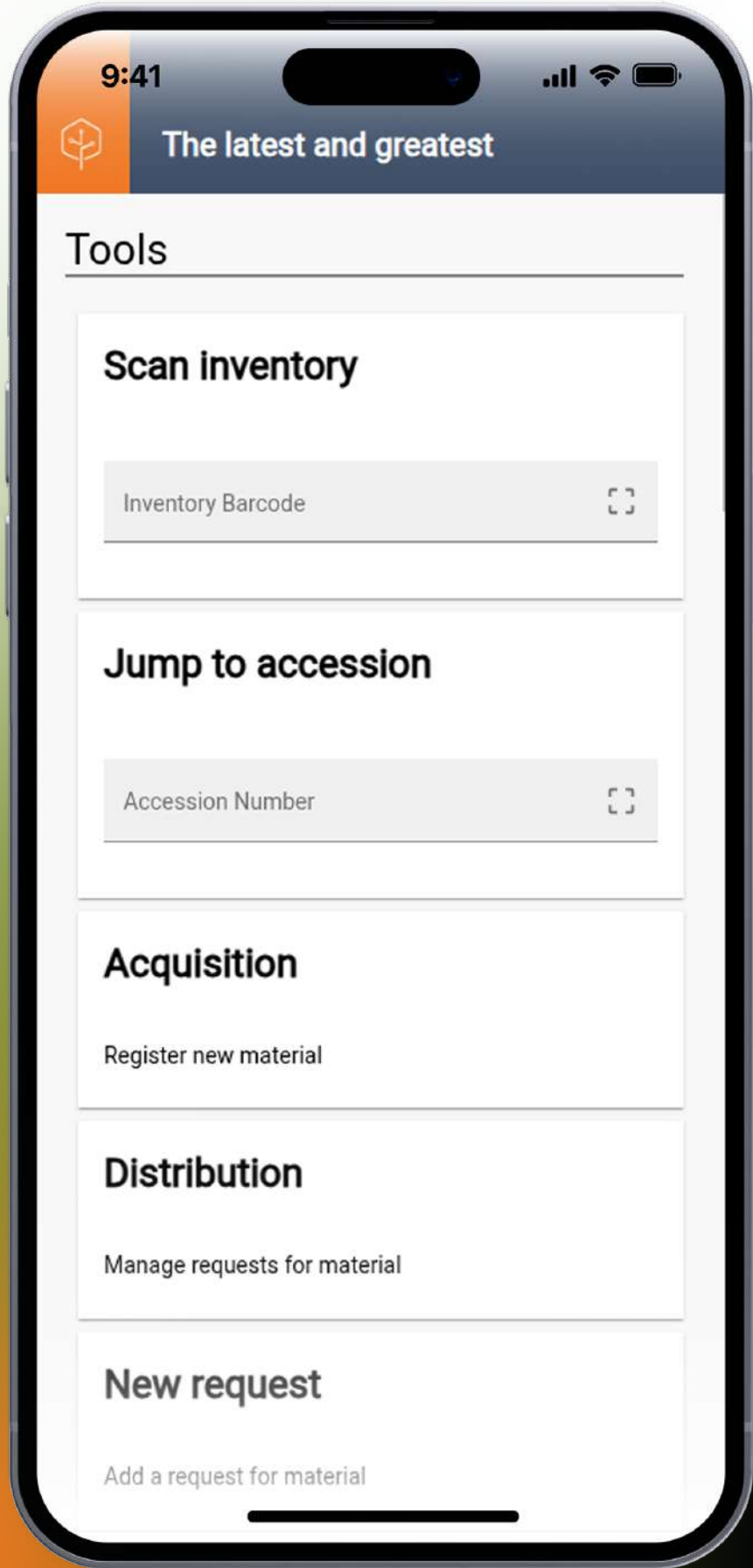
- **Centralized accession data management and filtering (Genesys):** With new advanced filtering tools, users can search and navigate millions of seed samples by crop type, origin, donor and other parameters. These updates make it easier for researchers and policymakers to locate materials quickly. Genesys now also supports integration with climate and trait data.

- **Data entry and internal workflows for genebanks (GGCE):** We improved tools for managing accession (seed sample) data within individual genebanks to help them digitize their collections and reduce manual record-keeping. GGCE now supports custom workflows, barcode-based tracking and configurable statuses on real-life genebank operations.

- **Bulk data upload and standardization tools (Genesys):** We implemented mechanisms for bulk uploading accessions and linked metadata from various formats. Users can validate datasets before submission to avoid data corruption and check alignment with international standards, reducing onboarding friction for new institutions contributing to Genesys.

- **Role-based access control and permissions (GGCE):** With flexible user roles and permission logic added to GGCE, our team enabled control over who can access and modify specific parts of the system. And genebanks can now assign responsibilities across teams (from data curators to technical staff) without compromising security.

- **Streamlined data contribution with Genesys API (Genesys):** Our team delivered a flexible API layer and a Java-based Anno uploader to simplify the process of submitting accession data to Genesys. The tool converts various formats into the standardized MCPD format. It helps partner institutions share data faster, requiring less manual formatting and internal training.

- **Interactive map-based accession filtering (Genesys):** An interactive map helps users explore accession data by geographic origin and climate conditions. Using multiple climate layers and visual filtering tools, users can select areas on the map, view precipitation and temperature data, and identify matching cultivars. It makes complex genetic data more intuitive and easier to locate.

PROJECT IN NUMBERS

By improving system performance, supporting complex data workflows, and ensuring smooth adoption for new users, our team continues to help the Crop Trust serve genebanks and scientists worldwide.

4.3
million seed samples

12
years of partnership between our team and Crop Trust

450
genebanks worldwide provide Genesys with data

165
partner institutions

PROJECT OUTCOMES

Rebuilt and modernized Genesys for scale, reliability, and global use

Our team transformed Genesys from a legacy PHP system into a modern platform. It enabled the new platform to handle millions of records and support dozens of integrations with genebanks, laying the foundation for what would become the world's largest open-access repository of plant-based genetic resources.

Upgraded the tech that contributes to global food security

Our work powers the infrastructure behind more than 4.4 million accessions shared across 450+ genebanks to preserve biodiversity and respond proactively to climate change. We're proud to play a long-term role in building and supporting tools that directly serve one of the most important missions of our time.

Improved data formatting and ease of access to Genesys

We built and implemented systems for bulk uploading, transforming and validating accession data from diverse sources and formats. This functionality significantly lowers the barrier for new institutions to contribute their data to Genesys. It also ensures data quality and consistency, critical for research and policy decisions.

Built long-term sustainability into two critical plant conservation platforms

By evolving both Genesys and GGCE, we ensured that institutions across 100+ countries can rely on stable, scalable, and continuously improving systems. Our long-term involvement minimizes the need for costly rebuilds while supporting uninterrupted access to critical conservation data and ongoing feature delivery.

Supported the digitization of local genebank operations worldwide

Through GGCE, we help genebanks move from outdated operations to seamless internal processes with tools for internal accession tracking, workflow management and others. Users can manage hundreds of thousands of samples across multiple regions, which is a significant step toward more efficient crop conservation.

Revamped global access and usability through a modern React frontend

Replacing outdated, server-rendered interfaces with dynamic React applications, our team improved system performance, usability and maintainability. These upgrades drastically improved the experience for researchers, data contributors and policy advisors accessing the platforms. It also made room for future improvements like dynamic filtering, AI-driven assistance and responsive UI components.

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