FORTISSIMO PLUS

FFPLUS SUCCESS STORY:
BUSINESS EXPERIMENTS

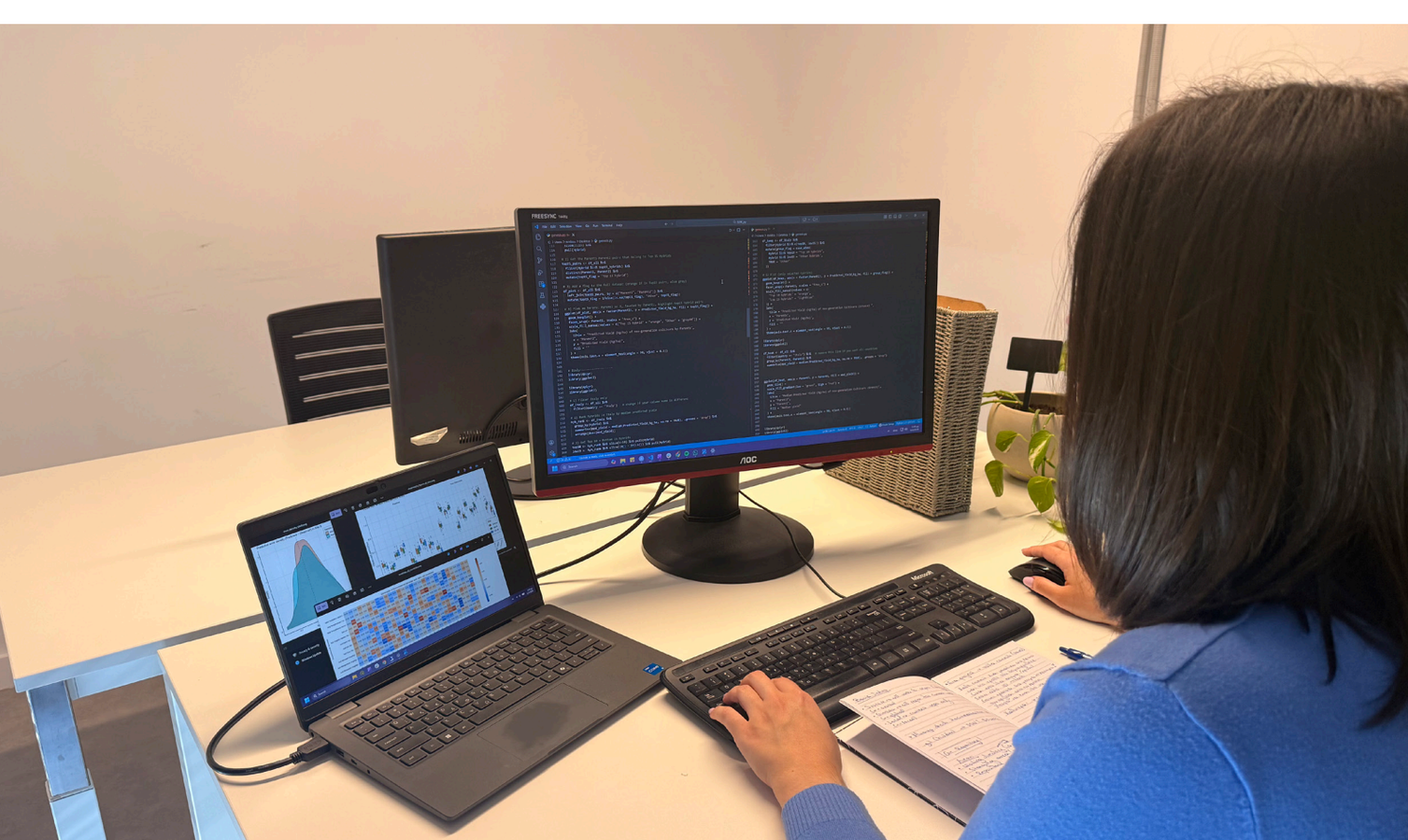
# HPC-ENHANCED GENOMIC SELECTION FOR CLIMATE-RESILIENT CROP BREEDING

## ORGANISATIONS

**BIOS Agrosystems SA** is a Greek seed-breeding SME specialising in crop improvement and variety development. It contributes proprietary genomic, phenotypic and multi-environment field-trial datasets and validates results against commercial breeding outcomes. **bSpoke Solutions P.C.** is a Greek HPC and AI specialist delivering advanced data engineering, machine learning and cloud technologies.

## THE CHALLENGE

Developing new crop varieties typically requires 7–10 years of testing and multi-million-Euro investment. Climate change increases uncertainty, making seed breeding decisions riskier and more expensive. BIOS needed to evaluate thousands of genetic combinations across multiple environments, but analysing genomic, field and climate data at scale exceeded conventional computing capabilities and impacted innovation.



**Technology used:** HPC, AI, ML
**Industry Sector:** Agriculture

## THE SOLUTION

GENESIS is a cloud-based AI platform that combines genomic markers, field-trial results and climate data to predict crop performance before extensive field testing. Running on the MeluXina EuroHPC supercomputer, it trains and evaluates thousands of machine-learning models in parallel. HPC enabled rapid exploration of large model combinations, improved prediction accuracy and delivered actionable breeding recommendations within commercial timescales.

## THE IMPACT

GENESIS enables breeders to identify promising varieties earlier, reducing costly field evaluations and accelerating commercial release. During pilot studies across three locations, AI-generated recommendations matched actual top-performing varieties in 90–100% of cases and identified candidates achieving yield gains of 0.46–0.48 tonnes per hectare above site averages. HPC was critical, allowing large-scale genomic and climate-data analysis that would have been impractical using standard IT infrastructure.
For BIOS, this supports lower R&D costs, improved allocation of breeding resources and faster response to market and climate challenges. For bSpoke Solutions, the project created a commercially validated AI-HPC platform suitable for subscription-based deployment, opening new recurring revenue streams. The approach also broadens access to advanced genomic selection for smaller breeding organisations.

## BENEFITS

- 90–100% success in identifying field-leading varieties.
- 0.46–0.48 tonnes/hectare yield gains above site averages.
- Up to 95.2% prediction accuracy versus field outcomes.
- Up to 8× faster model training using EuroHPC resources.
- Supports faster, lower-risk breeding decisions.

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EuroHPC Joint Undertaking