Using integrated data and AI to compare alternative proteins more efficiently

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Summary for practitioners

Objectives

Food manufacturers and research organisations increasingly need to compare alternative protein ingredients across nutrition, safety, environmental performance and technical functionality. However, the necessary evidence is often scattered across scientific papers, databases, laboratory reports and internal company files. This makes ingredient screening slow, difficult to reproduce and heavily dependent on expert judgement.

GIANT LEAPS addressed this problem by developing an integrated data environment and an AI-supported decision concept that can help product developers identify and prioritise suitable protein ingredients before committing resources to laboratory trials.

Results

The project brought together data on nutritional quality, digestibility, allergenicity, food safety, sustainability and techno-functional performance in a structured cloud environment. Users can compare ingredients across several criteria instead of relying on one indicator, such as protein content, carbon footprint or solubility alone.

Building on this data foundation, GIANT LEAPS developed an AI-based recommender concept for protein selection. The tool is designed to take user-defined requirements - for example, nutritional targets, sustainability limits, safety considerations or functional needs - and suggest protein ingredients or combinations that merit further investigation.

The project's exploitation work identified food-sector R&D managers, product developers, ingredient suppliers and research organisations as the main early users. The principal value is not to replace experimentation, but to reduce the number of unsuitable options entering laboratory testing and to document why particular ingredients were prioritised.

Practical implications

Practitioners should start by defining the decision they need to make. A useful screening question might be: Which protein ingredients can meet a specific nutritional target, perform in a particular

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food matrix and remain within defined environmental or safety limits?

The tool can then be used to compare candidate ingredients across several dimensions, identify major data gaps and create a shortlist for laboratory validation. This approach can reduce time spent on desk research, avoid repeating low-value tests and make internal decisions easier to explain to technical teams, managers and external partners.

Digital recommendations should not be treated as final product approval. Ingredient behaviour still depends on processing conditions, formulation, batch variability and the final food matrix. Laboratory, sensory, safety and regulatory validation therefore remain necessary.

The main implementation costs are software access, staff onboarding, data preparation and continued data curation. The benefits include faster screening, fewer unnecessary experiments, better traceability of decisions and more efficient use of R&D resources.

Additional dissemination and exploitation materials

www.giant-leaps.eu

www.linkedin.com/company/giantleapseu

Geographical location

Europe. The data platform and decision-support concept were developed through the GIANT LEAPS consortium, using evidence generated by partners across several European countries. The initial go-to-market work considered Spain as a possible entry market for food-sector R&D teams, ingredient companies and research organisations, while the longer-term application is relevant to the wider European alternative-protein ecosystem.

Additional information

A major enabling condition was the multidisciplinary structure of GIANT LEAPS. The project generated evidence on nutrition, digestibility, food safety, allergenicity, sustainability and ingredient functionality through different work packages. Bringing these results into a shared data environment created a stronger basis for comparison than any single dataset could provide. The exploitation process then translated this technical foundation into a practical use case for food R&D teams.

The central implementation challenge is data quality. Alternative-protein evidence is uneven: familiar plant proteins are generally better documented than newer microbial, algal, insect or cultivated sources. Data may also have been generated using different methods, units and experimental conditions. Before results can be compared, datasets therefore need clear definitions, metadata and quality checks. A digital platform cannot compensate for weak or incompatible evidence.

Long-term value will also depend on governance. Responsibilities are needed for approving new data, correcting errors, updating datasets and deciding which information is open, restricted or commercially sensitive. Users must also be able to see when recommendations are based on strong evidence and when uncertainty remains. Transparent assumptions and traceable source data are essential for building trust.

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Future work should validate the system with food manufacturers and research organisations using real formulation decisions. It should also expand data coverage, improve interoperability with European research infrastructures and food data spaces, and assess whether harmonised methods developed in GIANT LEAPS can be incorporated into the platform.

Key messages for practitioners: Define the decision before collecting data. Compare ingredients across nutrition, safety, sustainability and functionality. Use digital screening to prioritise laboratory work, not replace it. Keep data sources and uncertainties visible. Validate recommendations in the complete product and process. The usefulness of AI depends more on the quality and governance of the underlying data than on the sophistication of the algorithm.

About this practice abstract and GIANT LEAPS

This practice abstract was elaborated in GIANT LEAPS project based on the EIP AGRI abstract format.

GIANT LEAPS is a project that has received funding from the European Union's Horizon Europe Research and Innovation Programme under Grant Agreement No 101059632

Project website: *www.giant-leaps.eu*

Co-funded by the European Union