



## Pulse Nutri-Track

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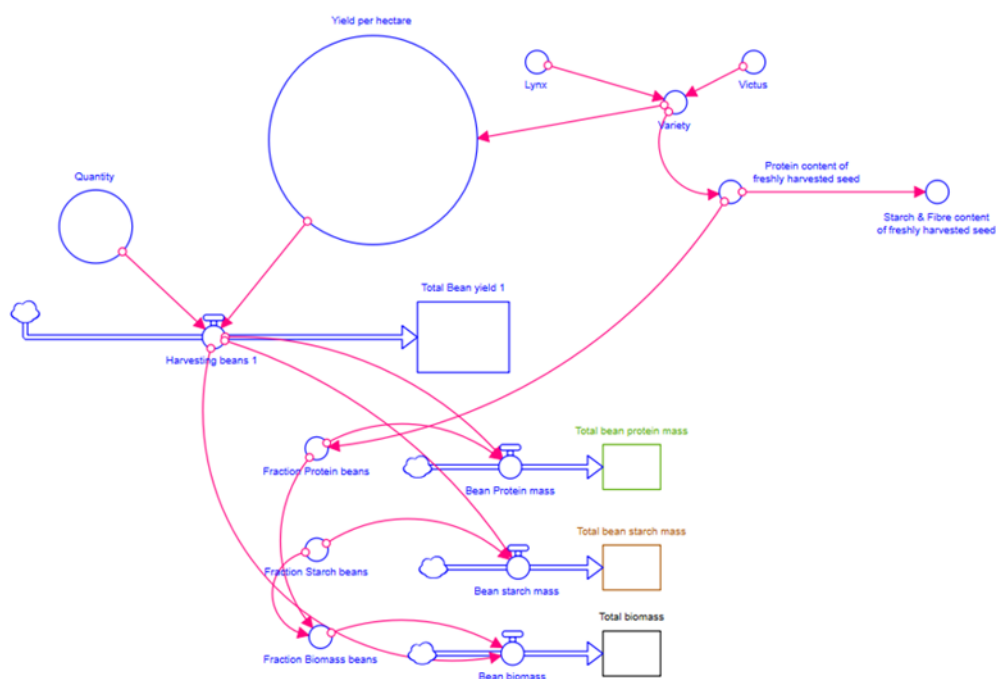
### Problem Statement

Understanding the availability of macro-nutrients such as protein, starch and fiber, through the lens of a food system, from farm to fork, is difficult due to the many complex interactions that occur within a biological system. However, to maximize the valorization of a particular system of production, it is important to understand the quantities of core products available at each stage of the process and the impact of alternative management on the mass balances of macro-nutrients within each of these products. The use of protein crops to deliver high-value food and feed ingredients is one such complex system that requires close monitoring and tracking of nutrient flows to ensure its economic sustainability.

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### Solution

To complete supply chain nutrient tracking and environmental assessments in protein crop production systems, a systems modelling approach was applied, using data derived from the processes of crop cultivation, ingredient development and product formulation. Using the dynamic systems modelling tool Stella Architect, a software programme developed by ISEE systems (see 2.1.6), a simulation of system boundaries to produce a range of plant-based products was developed. The schematic below illustrates the various components and configuration used in the nutrient tracking model. The model components can be adjusted to investigate different scenarios in relation to agronomy (varietal effect, composition, yield etc.), processing parameters and external factors along the processing and supply chain.



## Benefits

Starting at the cultivation stage, inputs such as variety chosen and time of sowing can be used to determine the yield per hectare of a given crop (in the initial case study, data for faba bean was used). This biomass can then segment into its constituent parts of protein, starch and fiber through a series of processing stages that include dehulling, milling and fractionation, with mass balances recorded for each. Through data generated in the VALPRO Path project, a range of novel processing technologies can be simulated within the model, such as the isolation of protein fractions through both dry and wet fractionation techniques. Further iterations of the model will include alterations to the milling process using data generated from trials on a wet-milling and roasting processes.

Finally, the plant fractions produced in the protein extraction stage can be included in a simulation of the production of a range of plant-based ingredients and products such as a plant-based beverage or energy bar.

## Practical recommendations

This simulation model is a purpose-built scenario analysis tool that enables users to cohesively track nutrient flows through the production lifecycle of a plant-based product. Outputs can be subsequently communicated through a purpose-built systems simulation 'Pulse – Nutritrack', which will act as an important decision support tool for all stakeholders involved in valorising plant-based value chains.

## Environmental Impact

Work is underway to include environmental (carbon capture and GHG emissions) outputs from the model which will ultimately allow the user to run multiple scenarios and sensitivity analysis for multifactorial decisions taken on a range of protein crops and their respective food applications.

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## Weblinks (FSH will incorporate the links once the Practice Abstracts are posted online)

<https://www.iseesystems.com/store/products/stella-architect.aspx>

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## About this practice abstract and VALPRO Path

These practice abstracts were elaborated in the VALPRO Path project based on the EIP AGRI abstract format. VALPRO Path, a Horizon Europe project spanning 4 years, from September 2022 until August 2026. With the participation of 22 partners from 9 countries, VALPRO Path is developing fresh possibilities, validating and showcasing ways to enhance plant protein production for food and feed in the EU.

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*This project has received funding from the European Union's Horizon Europe research and innovation programme under grant agreement No. 101059824 and co-funded by UK Research and Innovation (UKRI) under the UK government's Horizon Europe funding guarantee.*

Project website: <https://valpropath.eu/>