Unlocking Protein Resource Opportunities to Evolve Ireland's Nutrition

PRESENTED BY: Dr. Sinead Fitzsimons

7th April 2022

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Teagasc
Agriculture and Food Development Authority

Presentation Overview

- Overview of U-Protein
- Who is involved
- Case Study x 2
- What next?

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Background

- **U-Protein** - **U**nlocking **P**rotein **R**esource **O**pportunity **T**o **E**volve **I**relands **N**utrition

- DAFM funded - 5 years (Nov 2020 - Oct 2025)

- Objective - to re-engineer Ireland's agro-ecological system through greater diversification and biotransformation of protein resources, to deliver sustainability, bio-circularity and quality nutrition.

Overview

Alternative Proteins for the Irish Agri-Ecosystem

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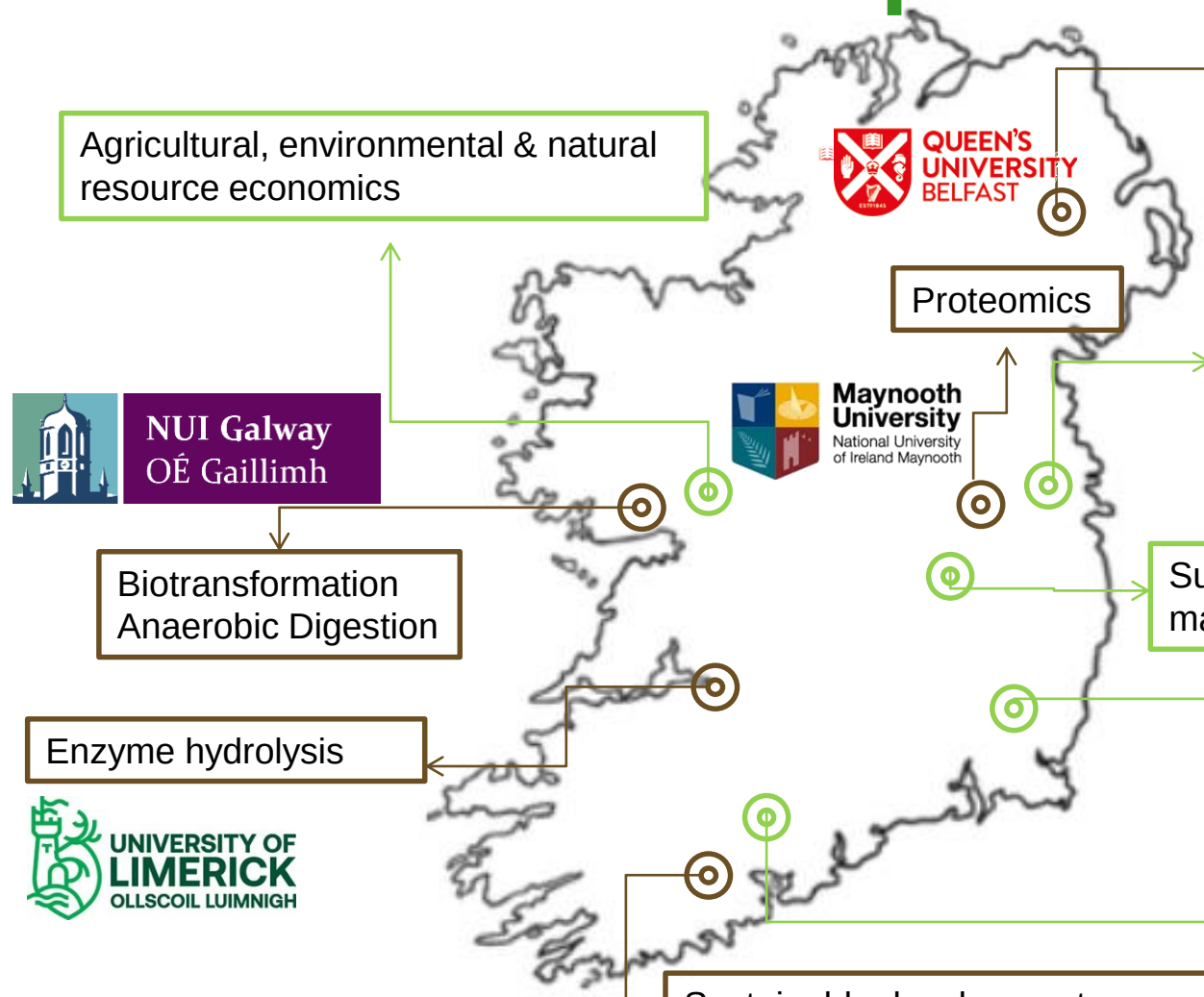
Consortium & Expertise



Agricultural, environmental & natural resource economics

Dietary interventions
Nutrient Regulation

Proteomics

Marine research
Phytochemical
Novel Food Processing Technologies
Novel Food Preservation Technologies
Fresh and Processed Meat
Wheat / flour Chemistry and Technology

Biotransformation
Anaerobic Digestion

Sustainable production and management of protein crops

Soils, land use and sustainability

Enzyme hydrolysis

Grassland/Grazing management
Protein Chemistry / Functionality
Food Structure / Microstructure
Food Digestion
Process Engineering
Formulation Science
Scale up
Biotransformation
Food Preservation

Sustainable development
Protein Functionality
Formulation Science
Safety and sensory evaluation

5 Teagasc centres

5 Universities

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U-PROTEIN Partners

An Roinn Talmhaíochta, Bia agus Mara
Department of Agriculture, Food and the Marine

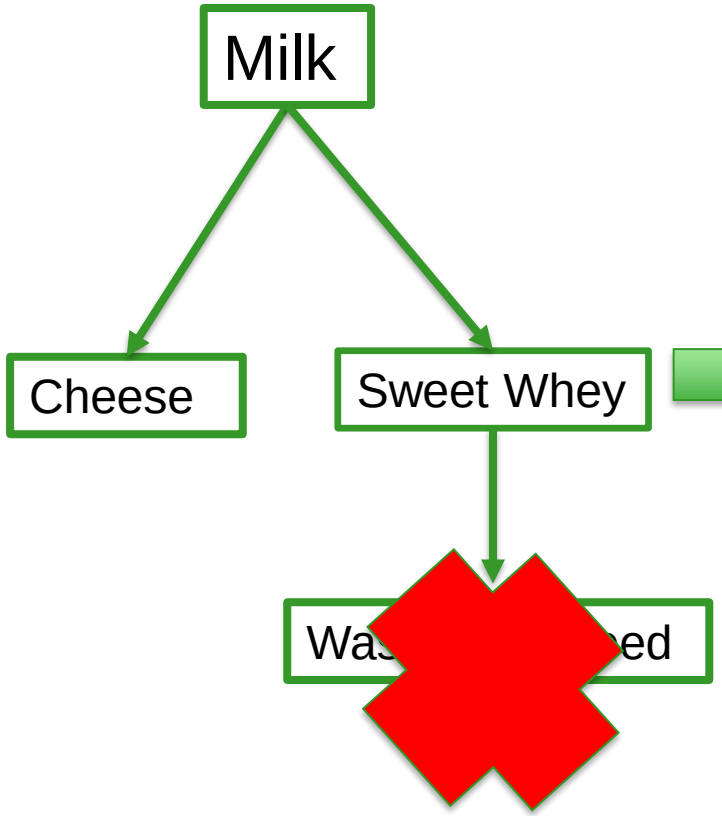
AARHUS UNIVERSITY

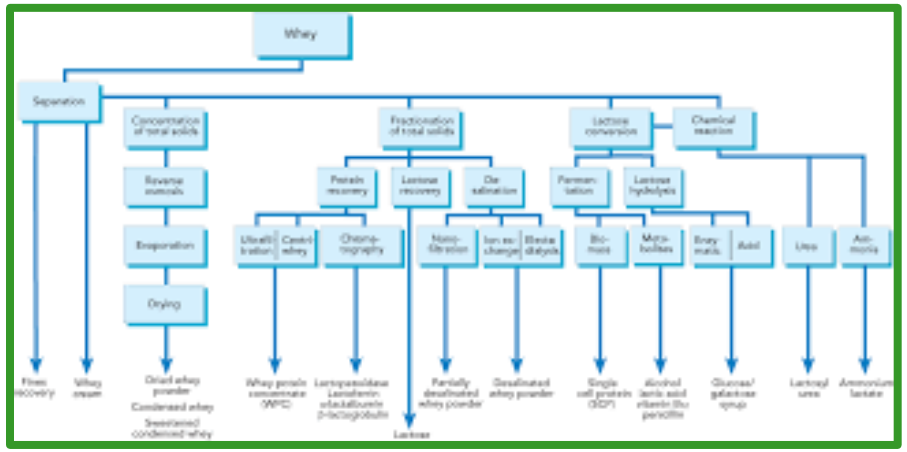
Criteria for Selection of “Crops”

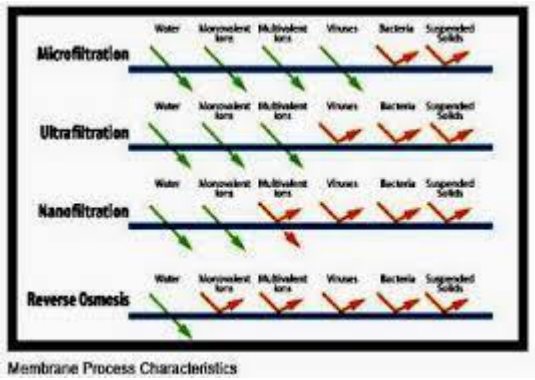
- Grow in Ireland
- Potential for Extraction
- Potential for Residual Biomass Optimisation
- Protein Quality and Safety
- Good Sensory Properties Potential
- Potential for Circularity

Note: Crops = Grassland; Cereals; Legumes; Niche Crops & Marine

Dairy Analogy







Membrane Process Characteristics

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“Crops” Selected

Crops

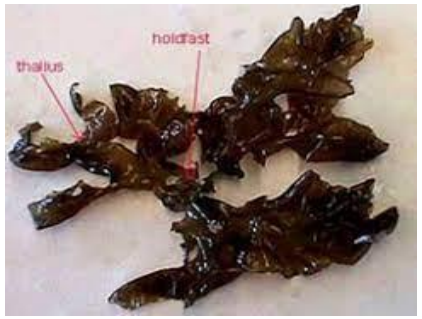
- Faba Beans -13 Varieties
- Peas -3 winter and 10 spring
- Lupin -5 varieties
- Oca
- Mashua
- Yacon

Grasses

- Mixed species sward
- Selected Foliage

Sea weed

- Porphyra sp. (Nori)
- Ulva sp. (Ulva lactuca – sea lettuce)
- Chondrus crispus (Irish mosss)



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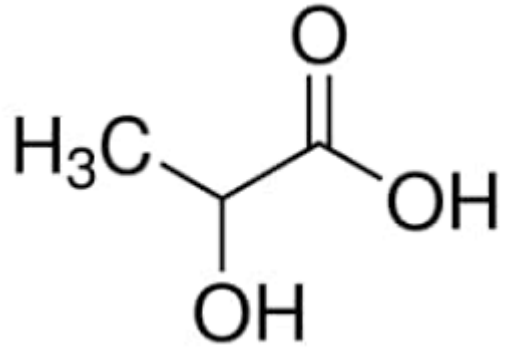
Case Study 1 - Fava Beans

- 13 Varieties available
- 7 Varieties prioritised
  - Grow in Ireland Lynx & Tundra
  - Low anti-nutrient vicine / convicine
- Protein Extracted via 2 processes (1 x standard, 1 x patentable)
- Protein levels achieved up to 85% Protein
- Extraction Yield 71.4%
- Process optimised and will be used for other crops

Fava Beans

- Residual Biomass sent to Task 4
- Compiling microbial biobank for biotransformation
- 2 strains identified for production of lactic acid from fava bean residual biomass
- Colour ……..
- Lignocellulose……
- Biogas ……



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Case Study 2 - Oca and Mashua

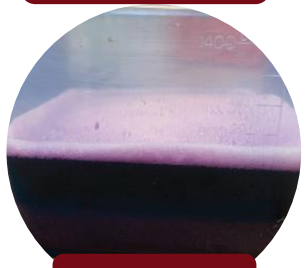
- Oca is an Andean tuber that is the second most widely cultivated tuber after potato
- Mashua is also an Andean tuber crop fourth most widely cultivated after potato in the Andean region
- Suited to growth conditions in Ireland ✓
- Good protein profile ✓

Mashua / Oca Process

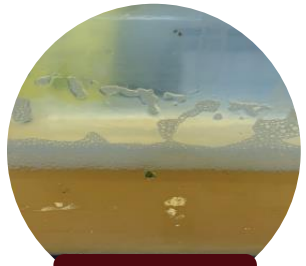
Raw crop

Juicer

Juice



Mashua



Oca

Residue

Diced

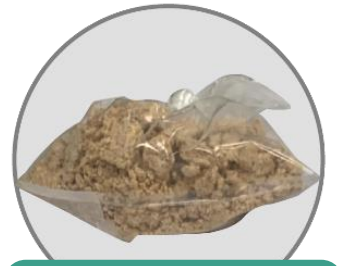
Freeze dried

Powdered

Mashua Juice

Oca Juice

Mashua Residue



Oca Residue

Mashua whole

Oca whole

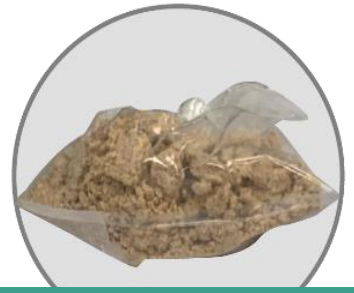
Analysis of dried powders for protein content

Mashua Juice

Mashua residue

Mashua whole

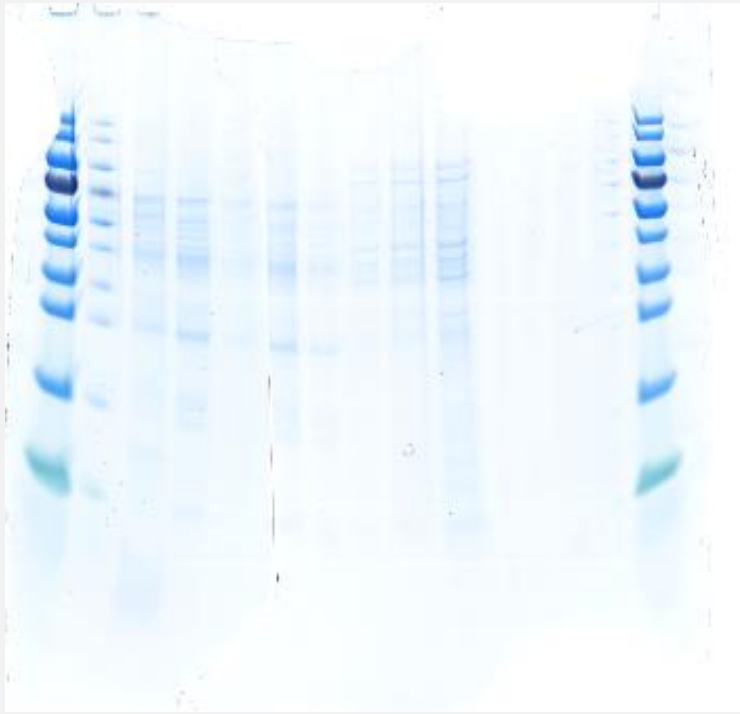
Oca Juice



Oca residue

Oca whole

Gel protein analysis



- Each blue line representing an individual protein

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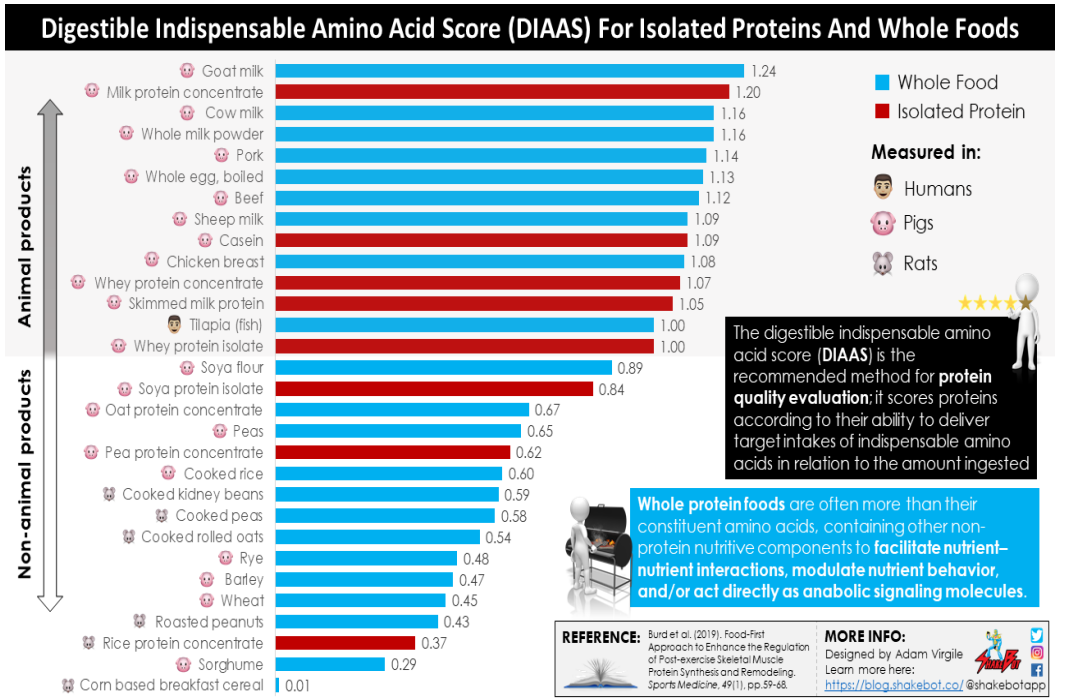
What next?

- Extracted protein analysed for its amino acid profile & peptides
- Protein functionality
- Food formulation
- In-vitro digestion;
  - Digestible Indispensable Amino Acid Score (DIASS)
  - INFOGEST models
- Human trials to evaluate the human metabolic responses to the consumption of extracted protein



What next?

- New novel protein products
- Digestibility score
- Biomass transformation products
- Land use models
- LCA /Kg Protein

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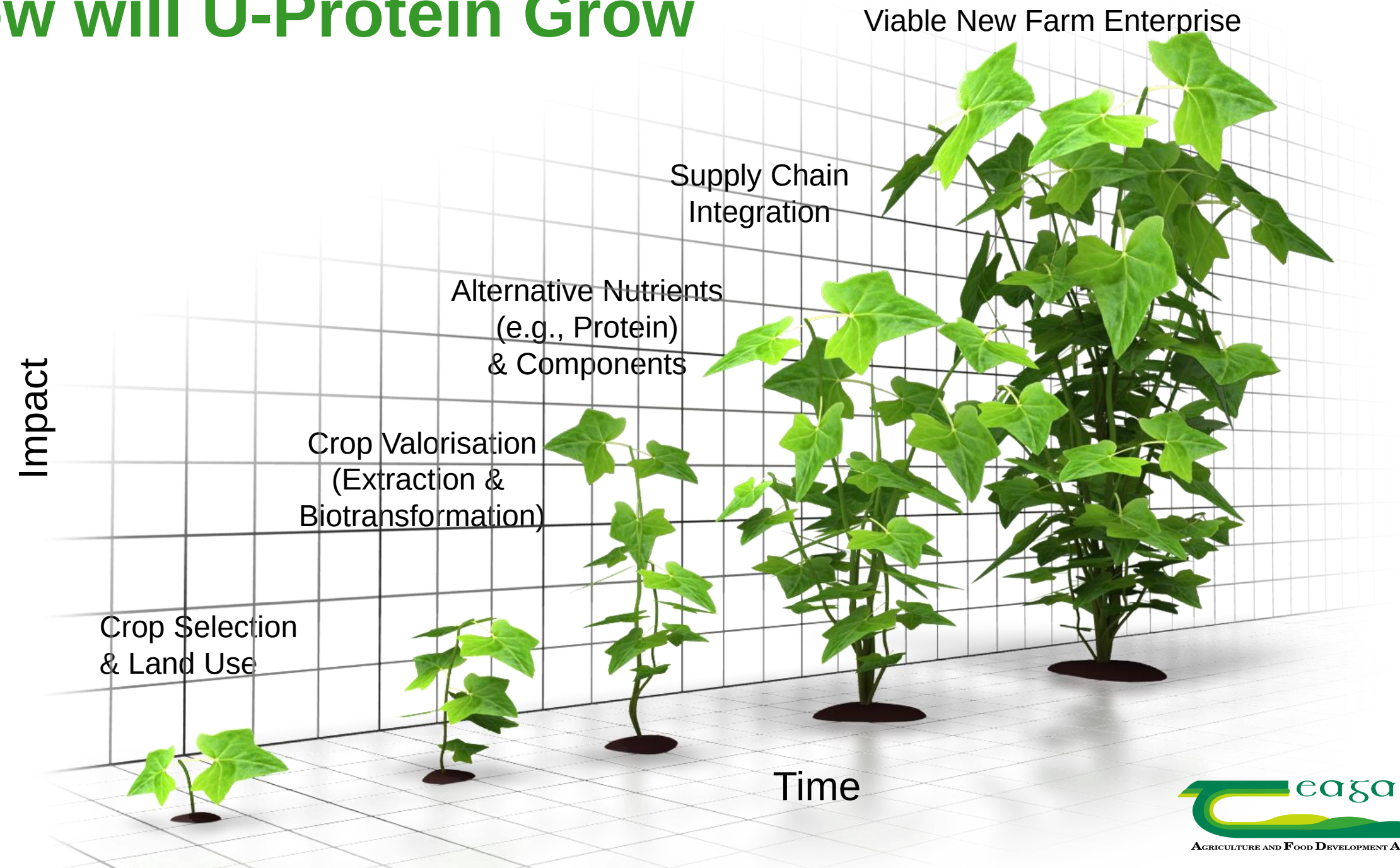
How will U-Protein Grow



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