

# Which is better? Chickpea pasta or durum wheat pasta?

Sophie Saget (TCD)

Marcela Porto Costa (Bangor University)

Boris Shopov (Clicks Ltd.)

Dr. Michael Williams (TCD)

Dr. David Styles (Bangor University)

Kevin O'Leary (TCD)



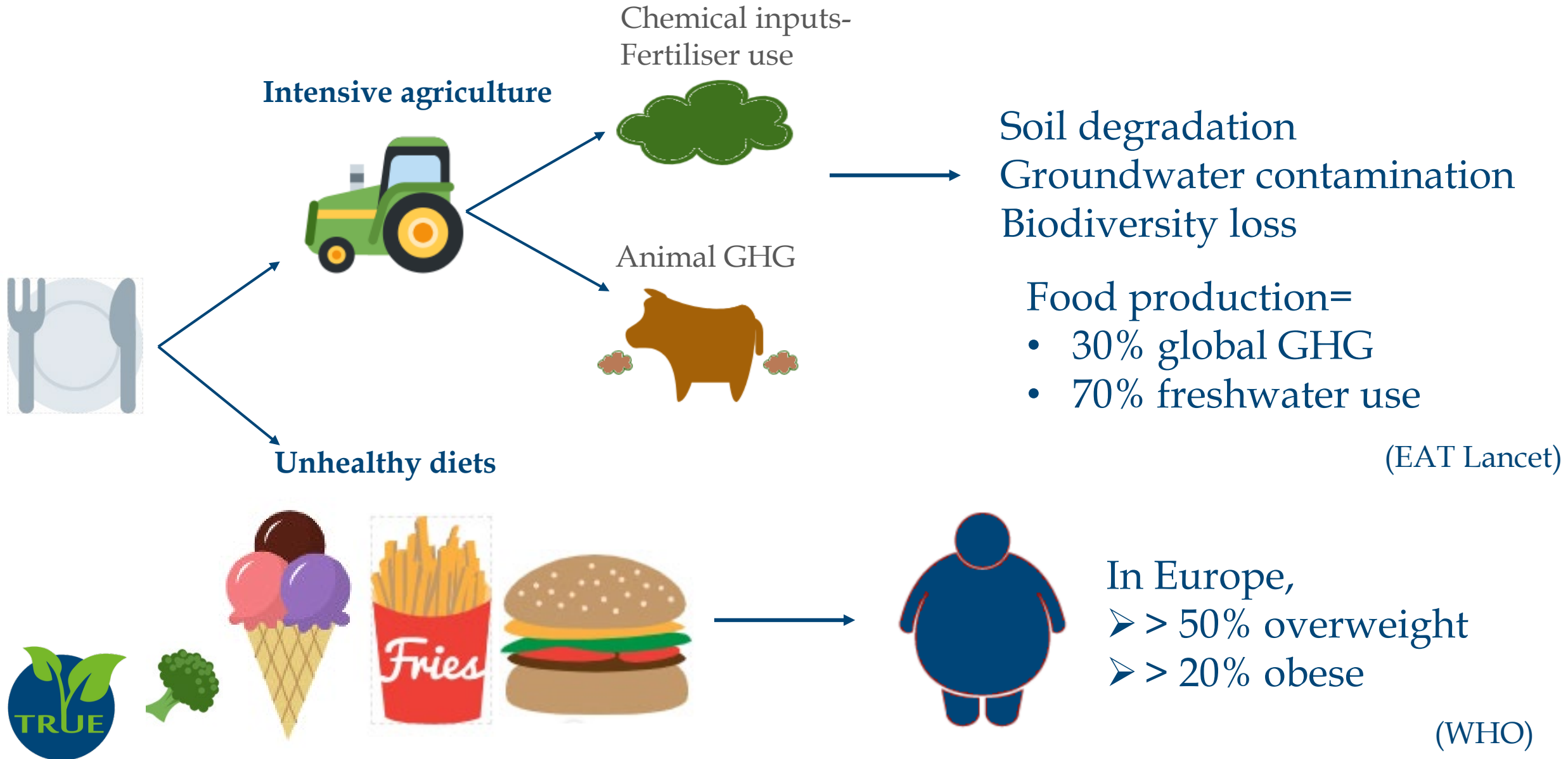
TRansition paths to sUustainable  
legume-based systems in Europe

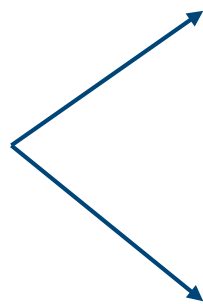


## WP5: Environmental LCA and Nutrient Quality Assessment

- Assess the **environmental footprints** of legume products, and benchmark against **conventional alternatives**







Atmospheric nitrogen fixation  
Natural soil fertilisation  
Soil structure and health

Protein, fibre



Low production in EU  
1% of energy intake in Europe

## How to make legumes great again?



3.4 thousand tons of pasta consumed in Europe each year





## Life Cycle Assessment (LCA)

**ISO 4040:** compilation and evaluation of the inputs, outputs and the potential environmental impacts of a product system throughout its life cycle.



## Nutritional Functional Unit

$$NDU = \frac{\left(\frac{\text{essential fatty acids}}{DV_{EFA}}\right) + \left(\frac{\text{protein}}{DV_{prot}}\right) + \left(\frac{\text{fibre}}{DV_{fibre}}\right)}{3 \times \left(\frac{S_i}{2000 \text{ kcal}}\right)}$$

## Impact Categories

- **Climate change**
- Ozone depletion
- Human toxicity, cancer
- Human toxicity, non-cancer\*
- *Particulate matter*
- Ionising radiation, human health
- Photochemical ozone formation, human health
- Acidification
- Eutrophication, terrestrial
- Eutrophication, freshwater
- **Eutrophication**, marine
- Ecotoxicity, freshwater\*
- **Land use**
- **Water use**
- Resource use, minerals and metals
- **Resource use**, fossils

Research Objectives

Situation

Methods

Results

Application

Nutrients to encourage	Nutrients to limit
Protein	Saturated fat
Fibre	Sugar
Vitamins A, C, E, B12	Sodium
Calcium	
Iron	
Potassium	
Magnesium	
Zinc	
EFA	

$$NRF_{12.3} = \frac{\sum_{1-12} \frac{nutrient_i}{DV_i} - \sum_{1-3} \frac{nutrient_i}{MRV_i}}{\frac{S_i}{2000}} \times 100$$

Research Objectives

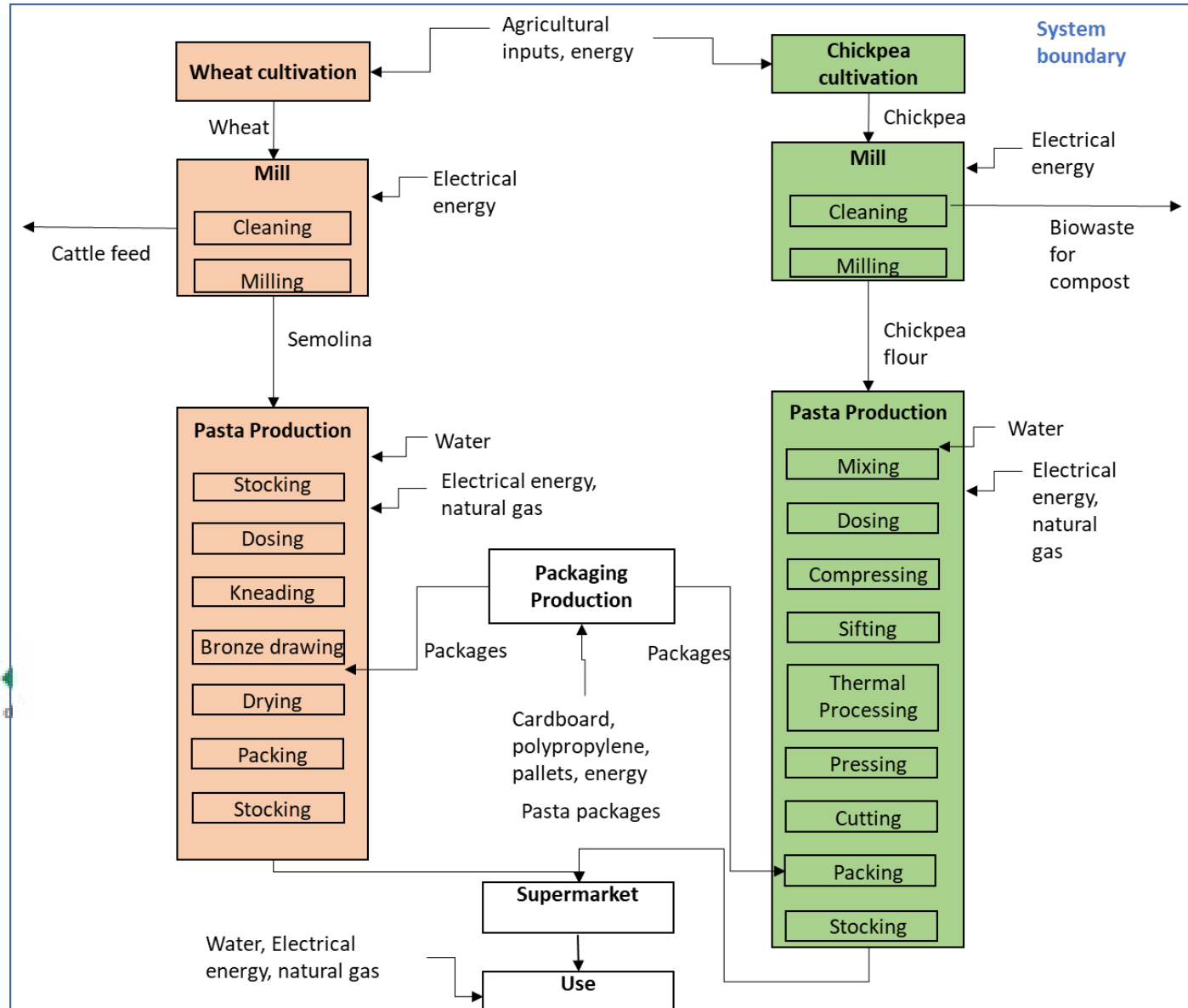
Situation

Methods

Results

Application

- Attributional LCA
- Cradle to fork
- **FU:** Weight (250g cooked) and Nutrient Density Unit



Red: wheat pasta

Green: chickpea pasta

White: shared stages

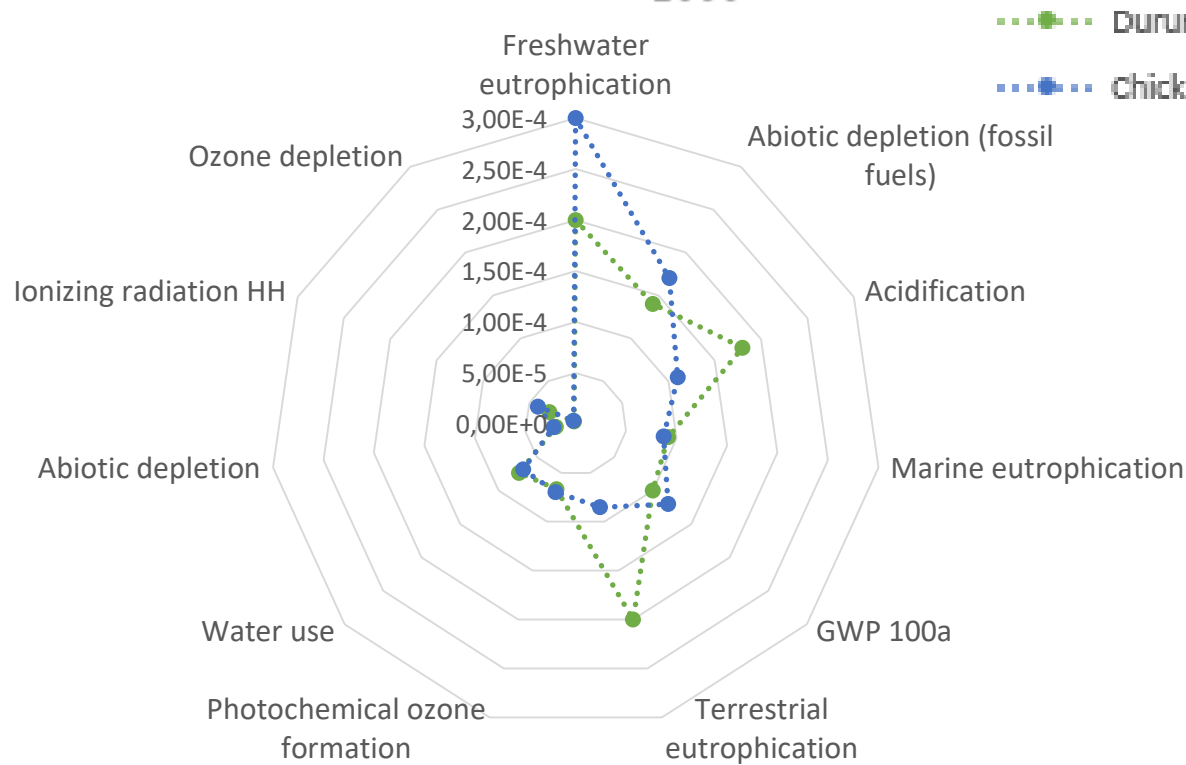


# Nutrient Density Unit

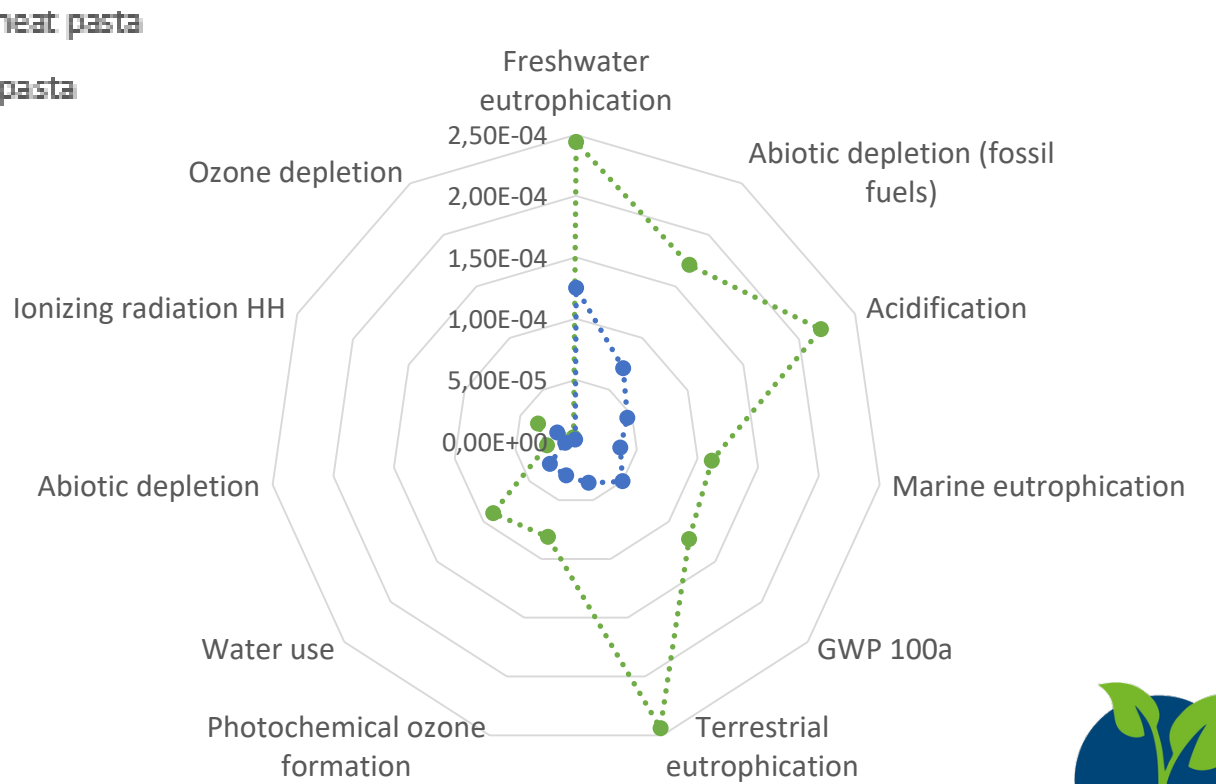
$$NDU = \frac{EFA + \frac{Protein}{50} + \frac{Fibre}{25}}{3 \times \frac{Energy}{2000}}$$

$$NDU_{variva\ pasta} = \frac{\frac{0.44}{12.4} + \frac{19.5}{50} + \frac{20}{25}}{3 \times \frac{338}{2000}} = 2.4$$

$$NDU_{wheat\ pasta} = \frac{\frac{0.564}{12.4} + \frac{12.5}{50} + \frac{3.6}{25}}{3 \times \frac{357}{2000}} = 0.82$$



Weight FU: 250g cooked pasta



Nutritional FU: NDU





Research Objectives

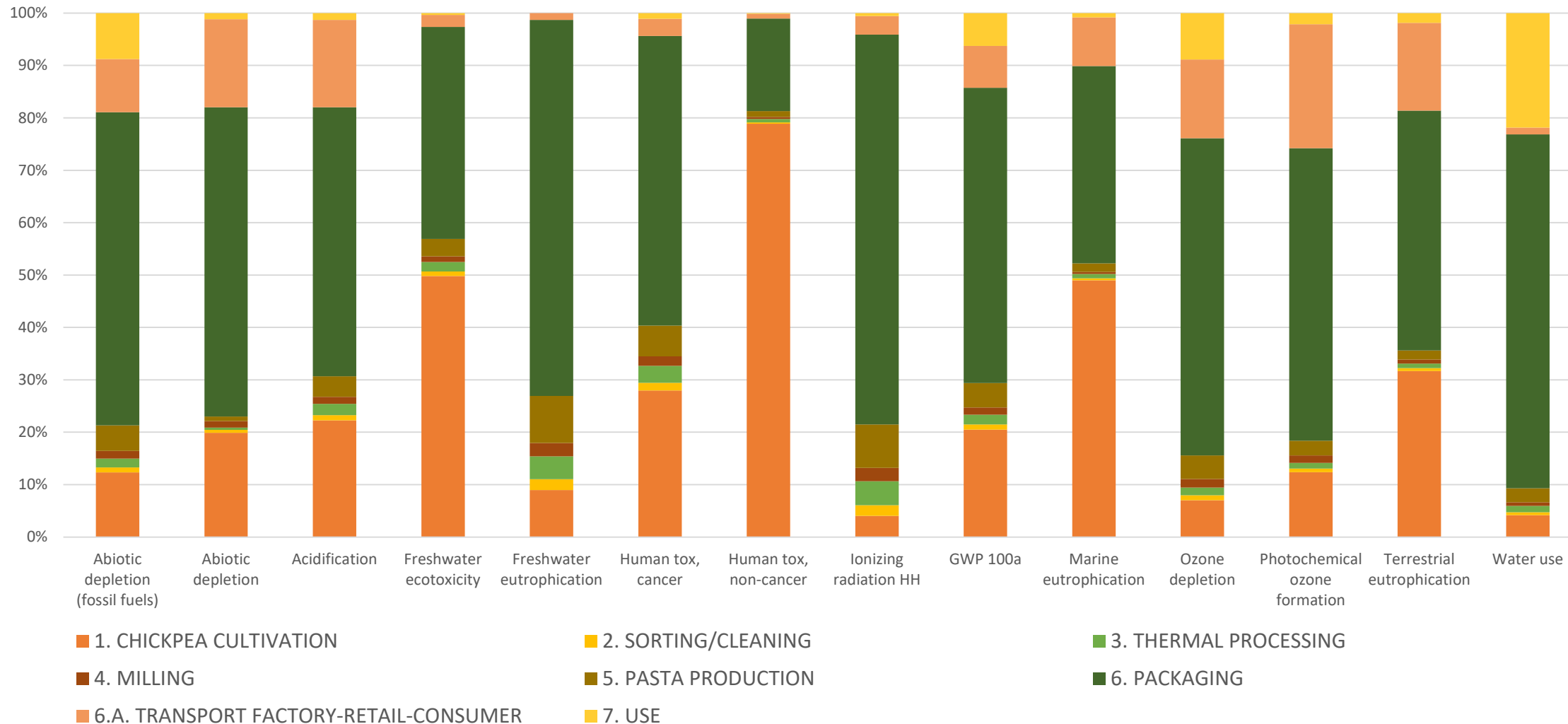
Situation

Methods

Results

Application

# Process contributions



## How the results could be used by Industry- Green Purchase

- Communicate visual and reliable information
- Identify hotspots → improvement opportunities

**CARBON REDUCTION**  
EQUAL TO THE ANNUAL EMISSIONS OF  
**420 X CARS**  
2,100 METRIC TONS OF CO<sub>2</sub> SAVED PER 1 MILLION PACKAGES

**SAVED 2 FOOTBALL FIELDS**  
OF CLEAR-CUT FOREST  
ECOSYSTEM SAVED PER 1 MILLION PACKAGES

**SAVED 8,800 MEGAWATT HOURS**  
ENOUGH ENERGY TO LIGHT THE STATUE OF LIBERTY AND ELLIS ISLAND FOR A YEAR  
RESOURCES SAVED PER 1 MILLION PACKAGES

**SAVED 8,900 KILOGALLONS OF WATER**  
EQUAL TO 68 X MILLION 500ml WATER BOTTLES  
WATER SAVED PER 1 MILLION PACKAGES



- 99% LESS WATER
- 93% LESS LAND
- 90% FEWER GHGE
- 46% LESS ENERGY

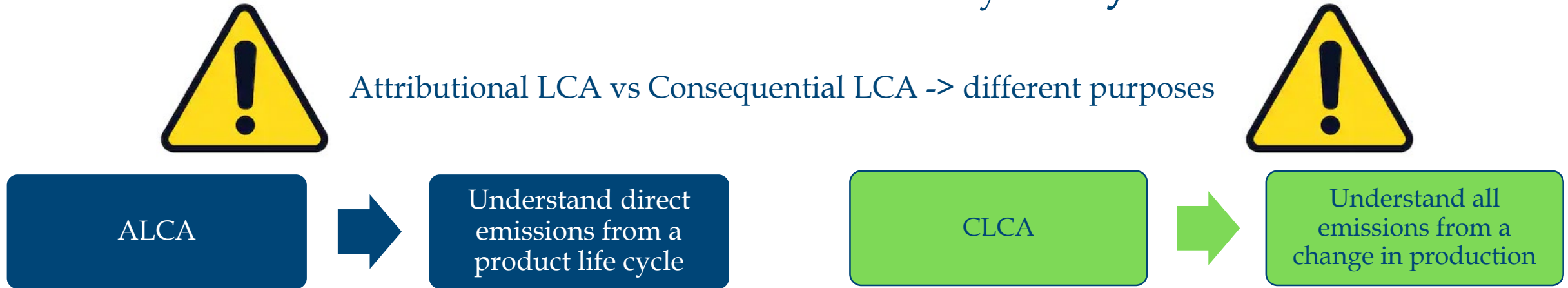


Per NDU:

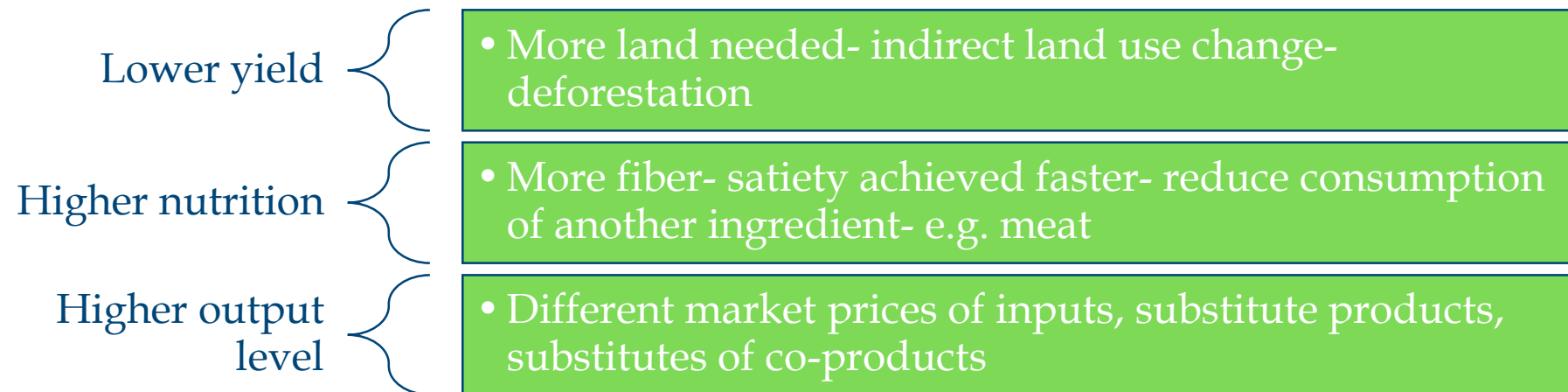
- 30% LESS WATER
- 60% LESS LAND
- 40% FEWER GHGE
- 40% LESS FOSSIL FUELS
- 555% MORE FIBRE
- 156% MORE PROTEIN
- 290% MORE NUTRIENT DENSE



## How the results can be used by Policy



- **Example scenario:** Replace durum wheat pasta with chickpea pasta in schools and in government canteens across Europe.



# Thank you

**Are you involved with manufacturing a legumes-based food product and would like to collaborate with us and get your free LCA?**

Get in touch with us:

[sagets@tcd.ie](mailto:sagets@tcd.ie)

[marcela.costa@bangor.ac.uk](mailto:marcela.costa@bangor.ac.uk)

TR **Transition** paths to s**U**sustainable  
legume-based systems in **E**urope

Sophie Saget

