

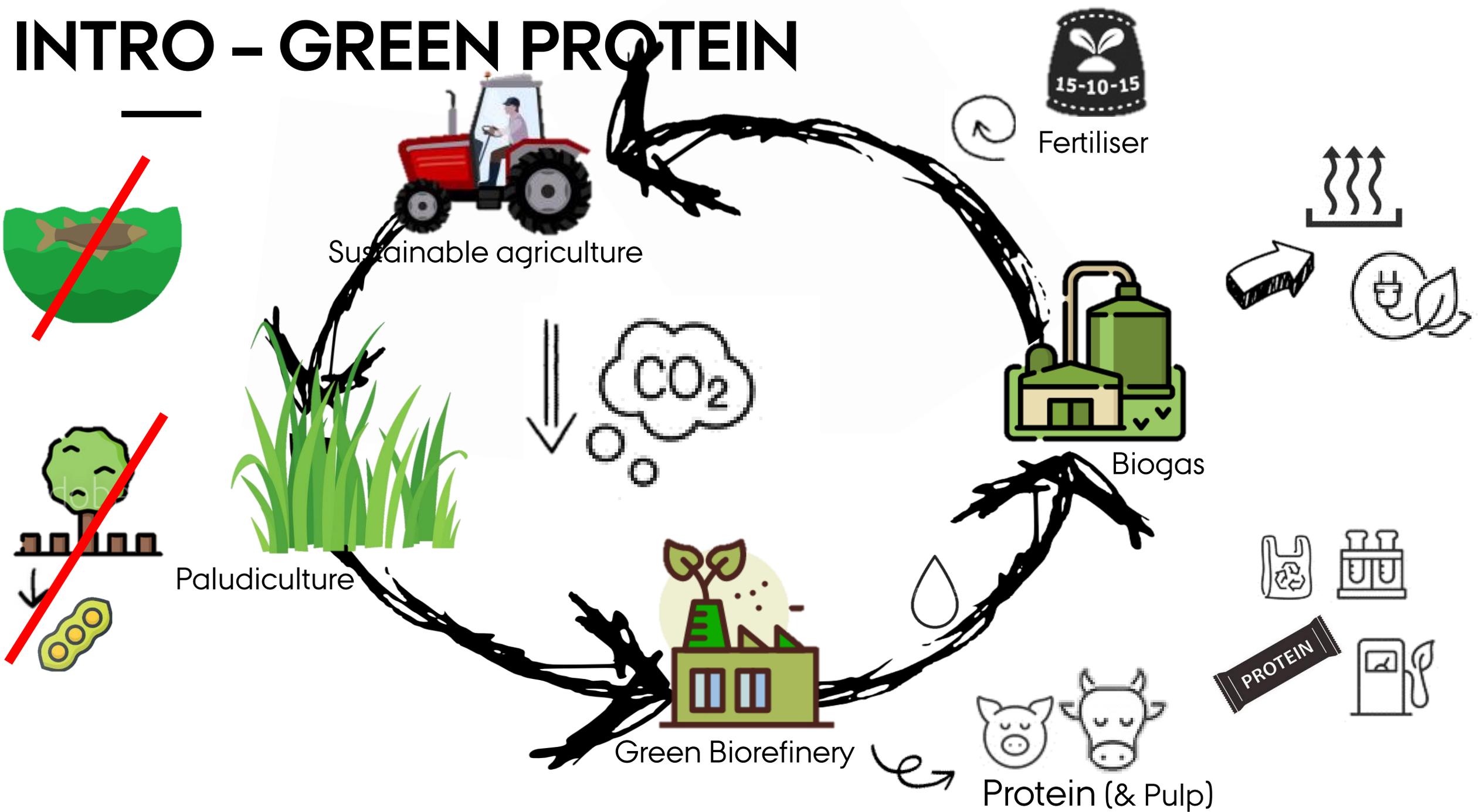


EFFECTS OF HARVEST & FERTILISATION FREQUENCY ON PROTEIN YIELD AND EXTRACTABILITY FROM FLOOD-TOLERANT PERENNIAL GRASSES CULTIVATED ON A FEN PEATLAND

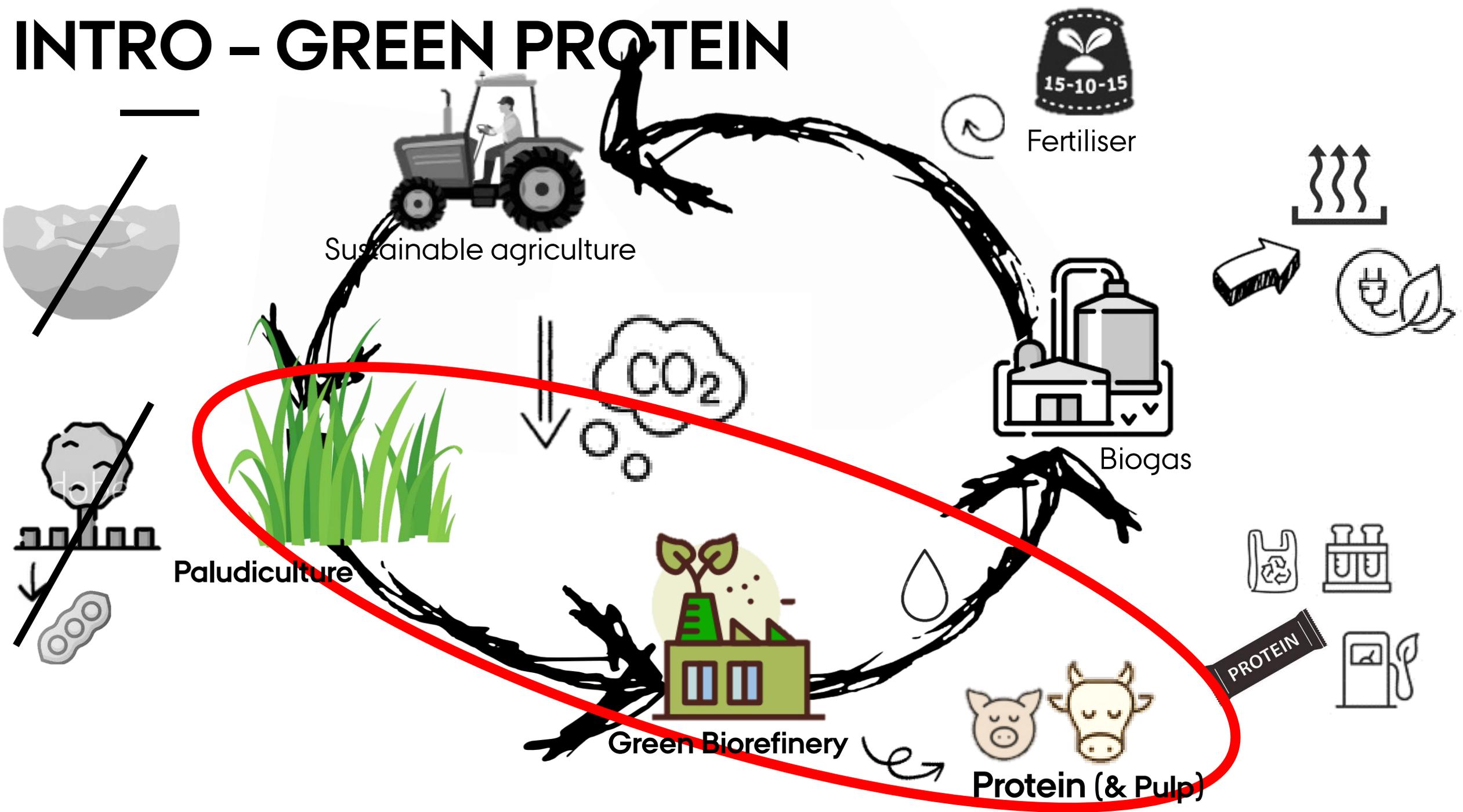
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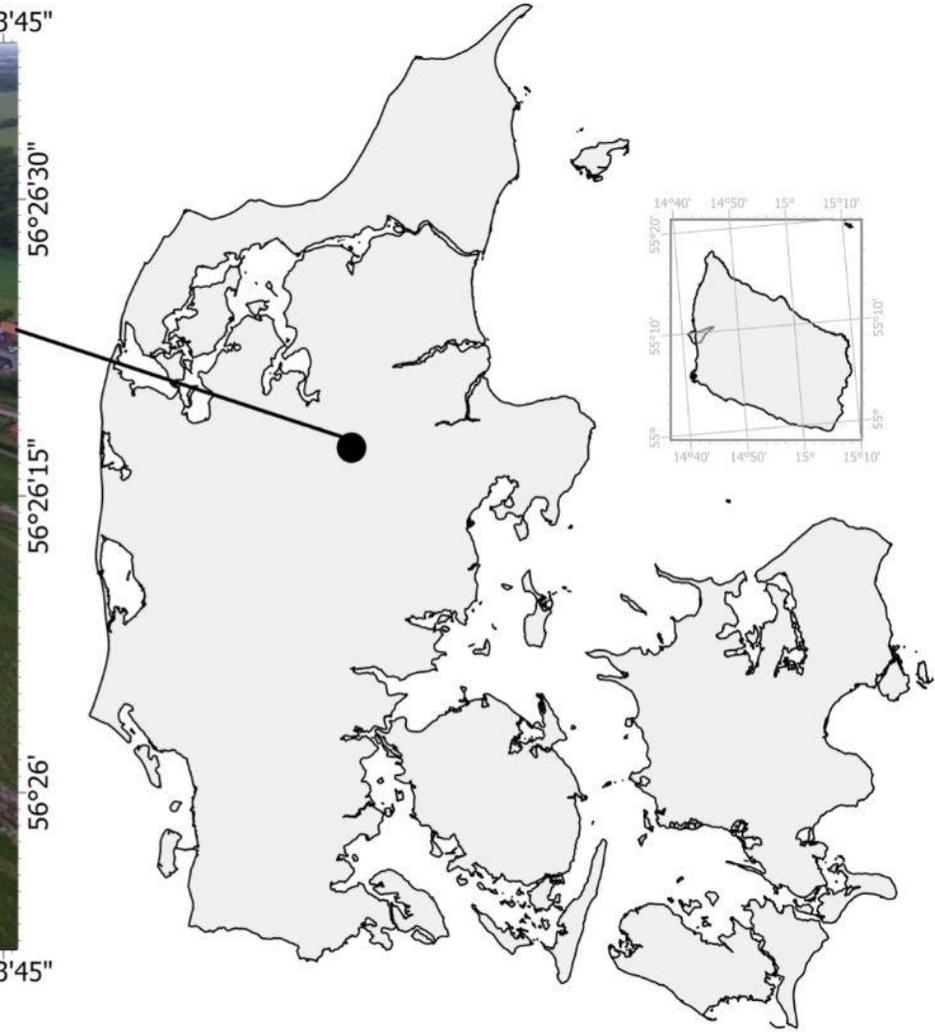
INTRO - GREEN PROTEIN



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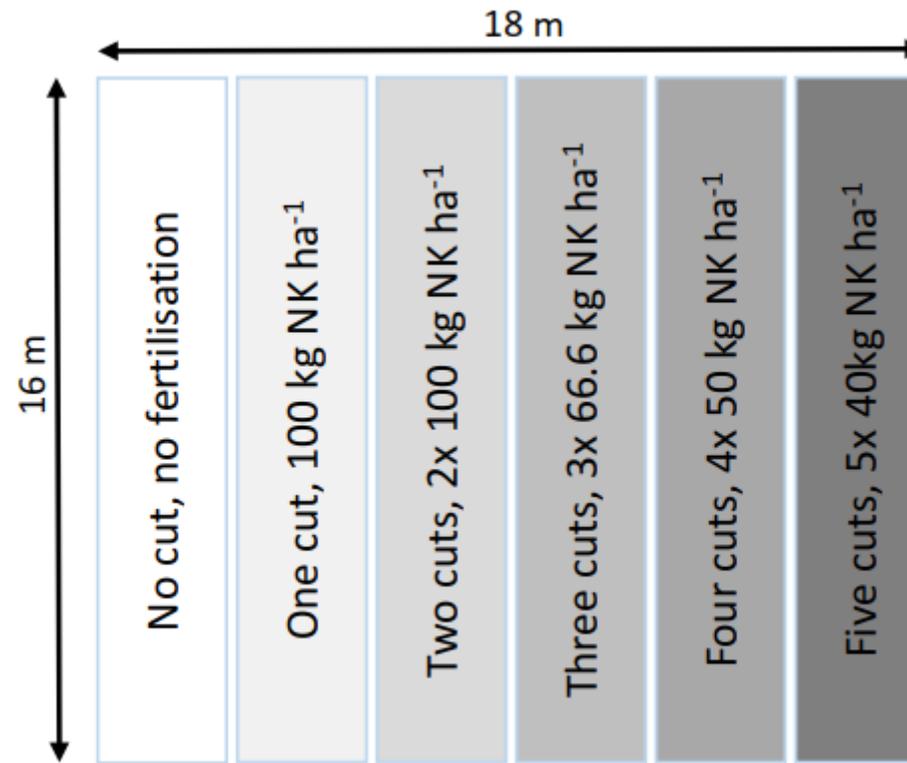


INTRO



DESIGN

- Split-plot with 4 replicates
- Two species:
 - Reed Canary Grass
 - Tall Fescue
- Five treatments:
 - 1 – 5 cuts & fertiliser applications per year



Harvest Dates 2019

Treatment	Week (Dates)				
	12. - 15.05	09. - 12.06	04. - 07.08	01. - 04.09	13. - 16.10
One cut			32		
Two cuts		24		36	
Three cuts	20		32		42
Four cuts	20	24		36	42
Five cuts	20	24	32	36	42

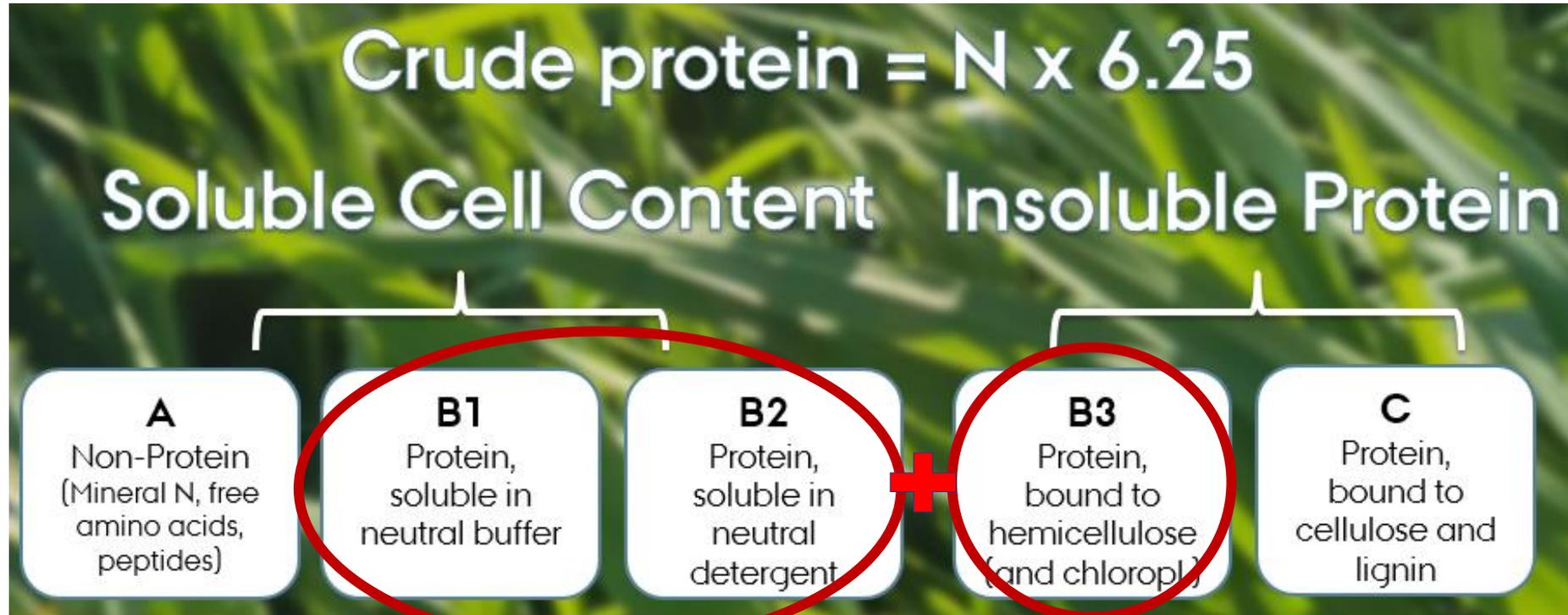
AIMS

Do we have higher biomass and protein yield by manipulating the harvest frequency? → More harvest = juvenile plants = more protein!

- #1: Determine the combined effect of harvest and fertilisation frequency on biomass and protein yields
- #2: Quantify theoretically and potentially extractable protein fractions by the CNCPS method
- #3: Assess the extractability of plant protein fractions using biorefinery techniques

METHODS: CNCPS

Cornell Net Carbohydrate and Protein System (CNCPS):

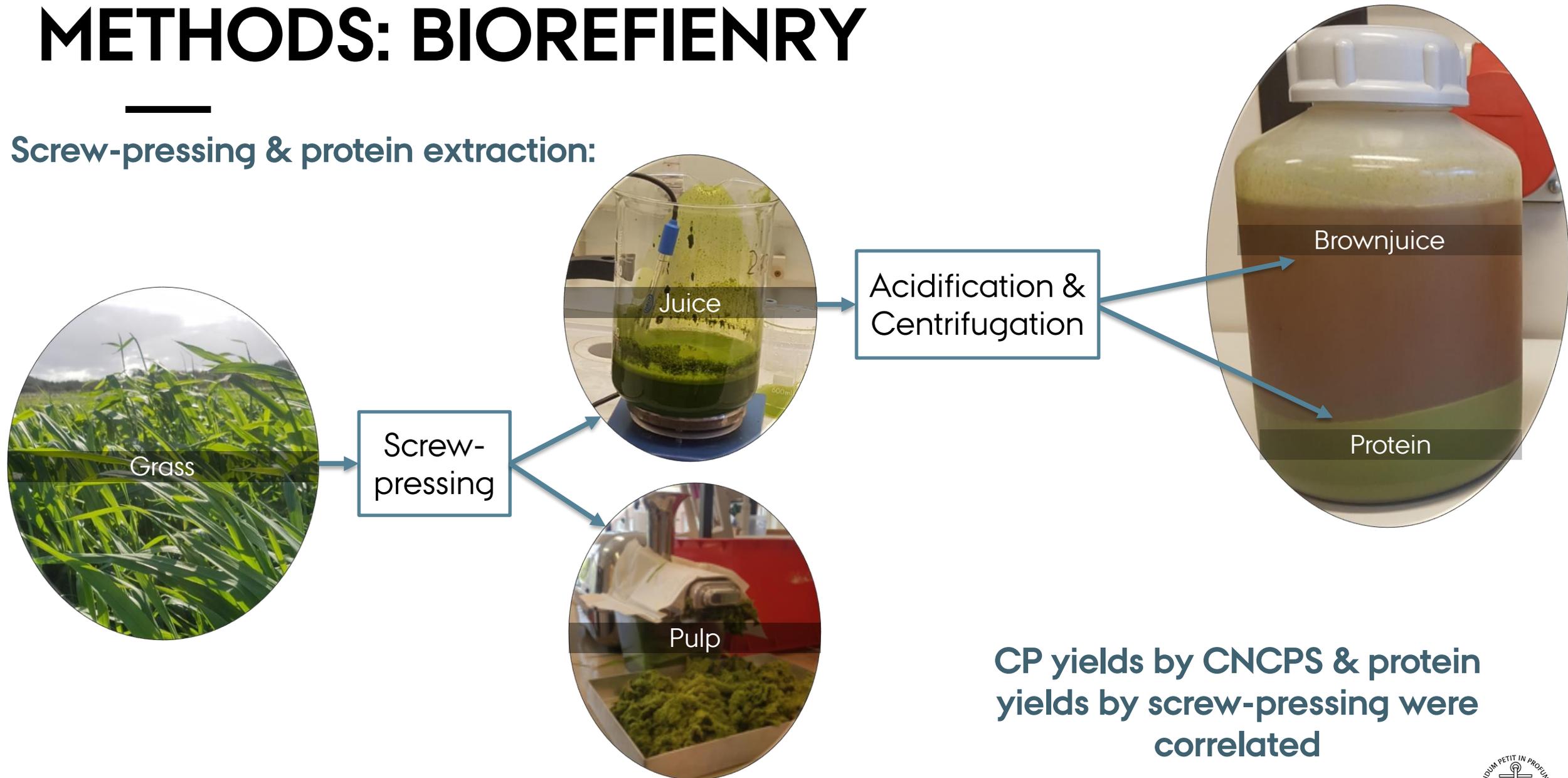


Neutral-extractable true protein

Acid-extractable true protein

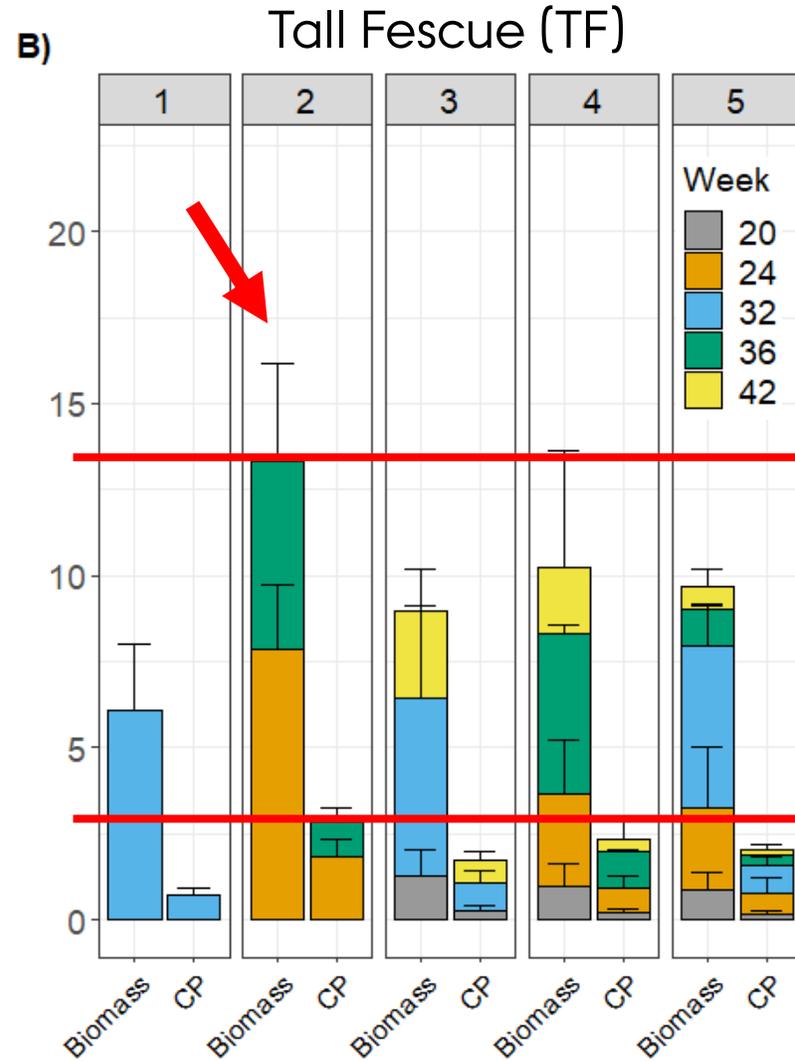
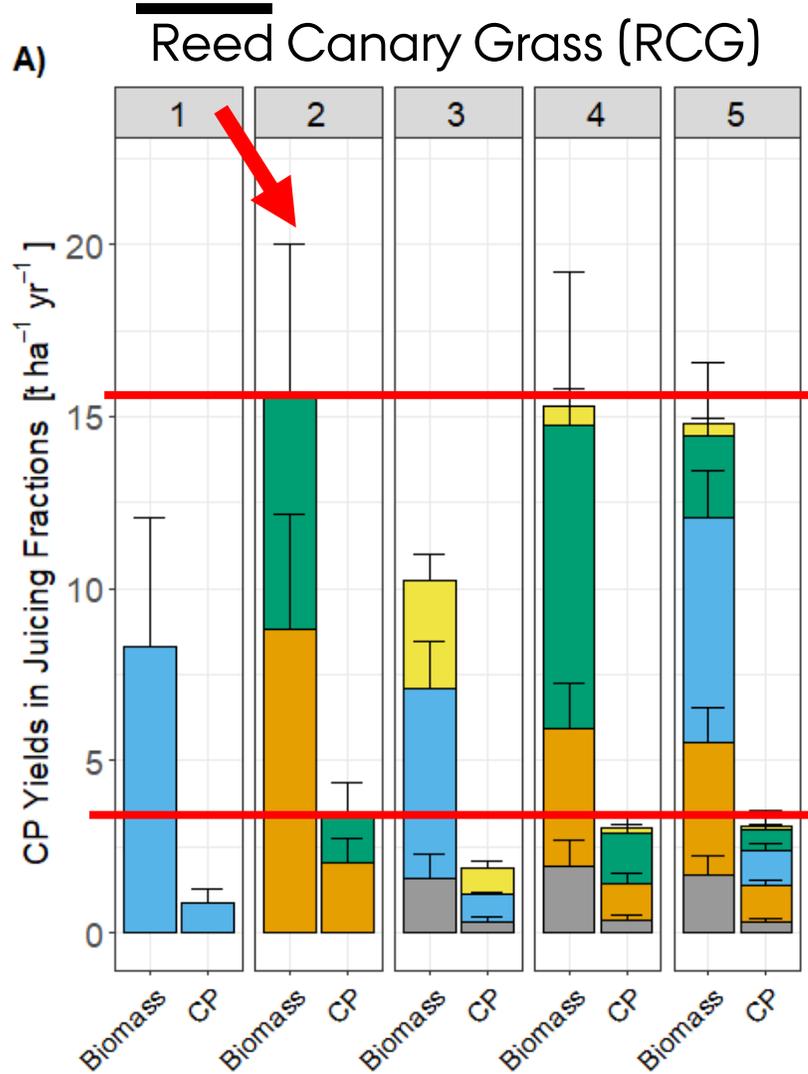
METHODS: BIOREFIENRY

Screw-pressing & protein extraction:



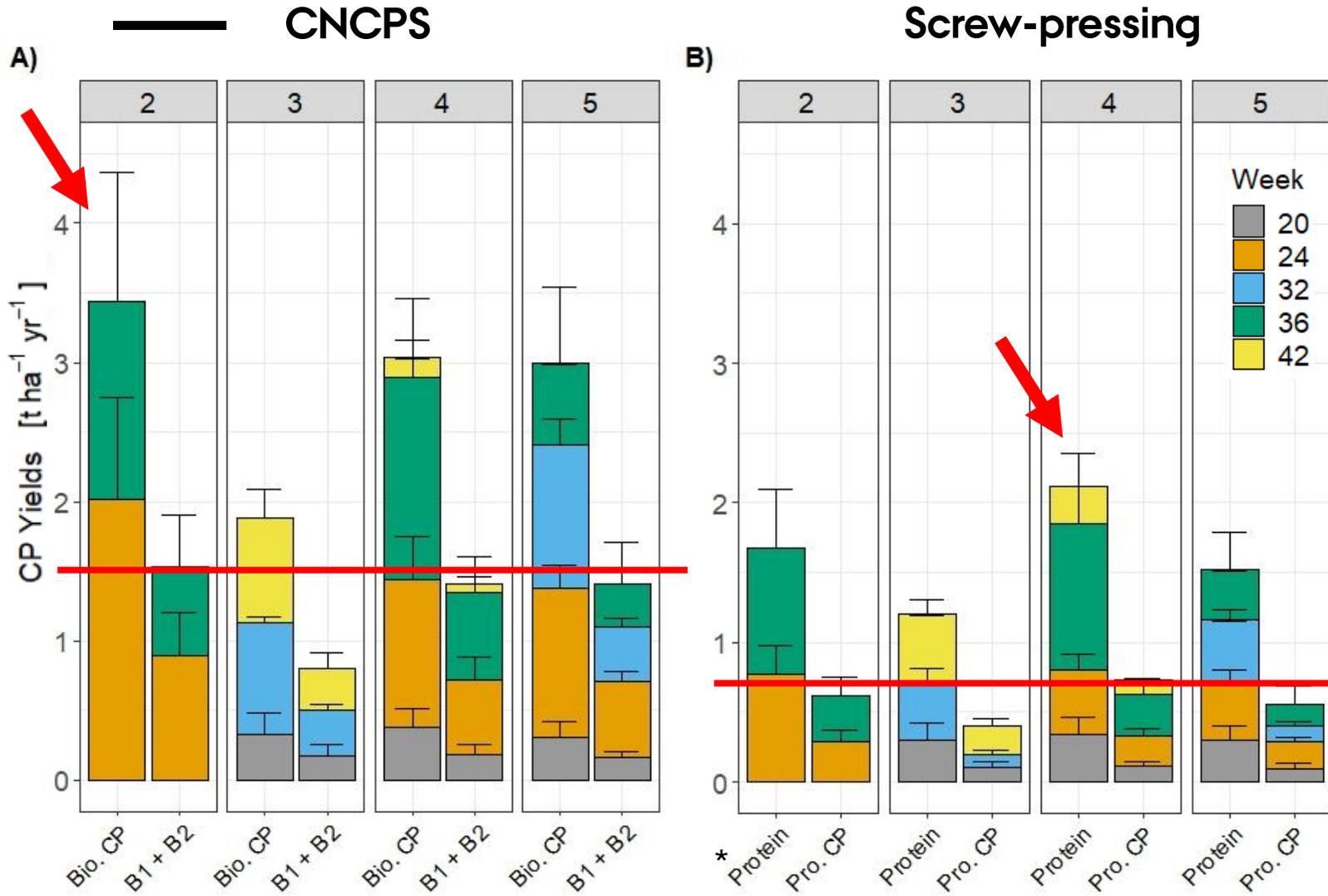
CP yields by CNCPS & protein yields by screw-pressing were correlated

YIELDS



- Highest biomass yield in 2-cut
 - 15.6 t (RCG), 13.4 t (TF)
 - Highest crude protein (CP) in 2-cut
 - 3.4 t (RCG), 2.9 t (TF)
 - Harvest frequencies did not improve yields beyond 2 cuts
 - But CP content remained high with frequent cuts
- Timing of harvest!

EXTRACTABILITY

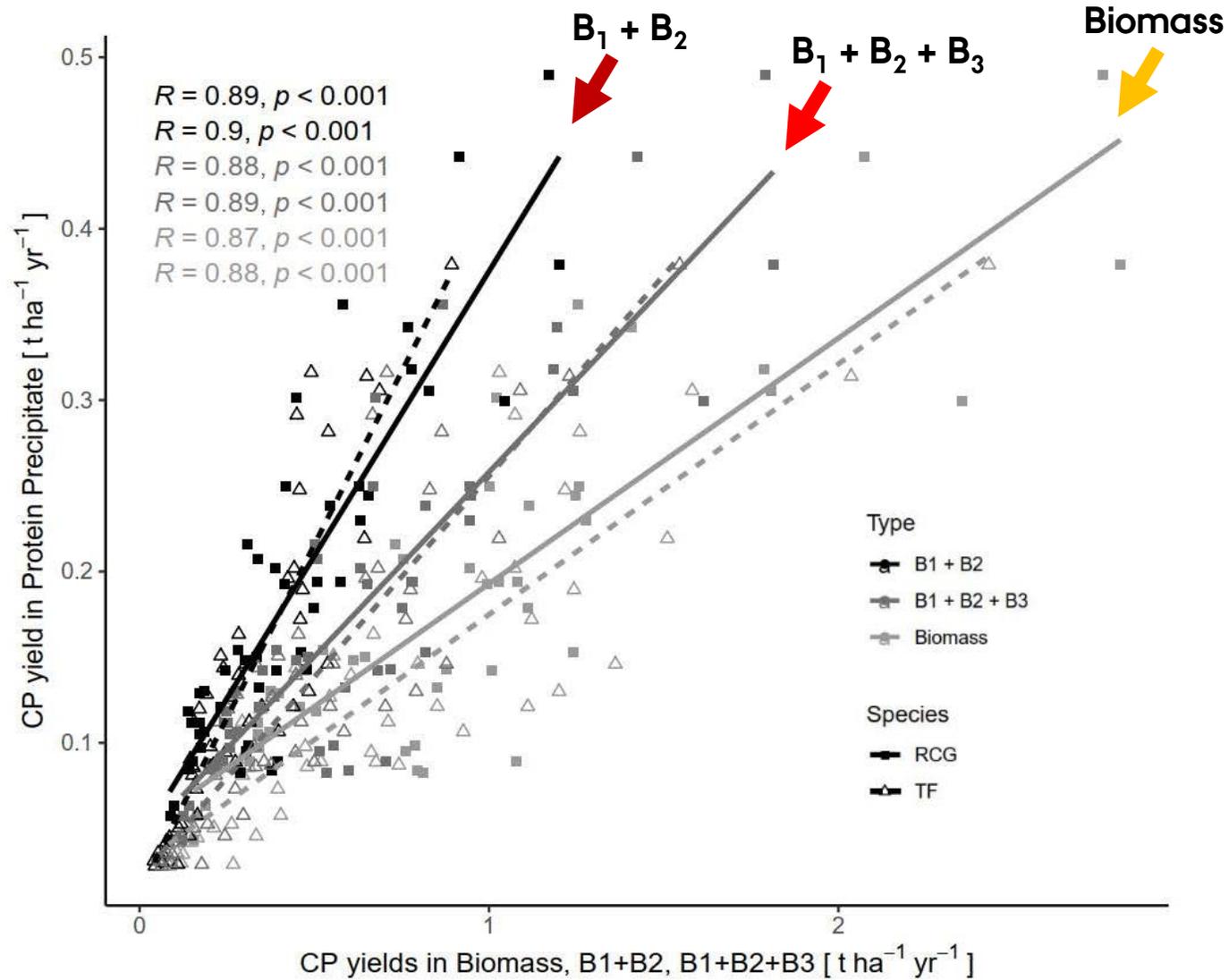


- Highest B₁ + B₂ in 2-cut
→ 1.5 t ha⁻¹ yr⁻¹
→ Representing 45 % of total crude protein (CP)
- Highest protein concentrate in 4-cut
→ 2.2 t DM ha⁻¹ yr⁻¹
→ Containing 0.7 t CP

→ Improvement of precipitation efficiencies needed!

- Protein: concentrate in DM;
- Pro.CP: Yield of CP in protein concentrate

CORRELATION



KEY MESSAGES

- #1: No improvement of yields with >2 cuts; but grass quality remained high
- #2: Plant maturity and harvest frequency affects allocation of plant protein
- #3: CNCPS analysis suitable for prediction of protein extractability in biorefineries
- #4: Paludiculture for biorefinery can provide an attractive economic output & promote rewetting, can potentially be competitive to legume species

Reed canary grass is more than bioenergy:

→ Promising feedstock for value-added biorefinery products



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