

ORGANOFINERY: A biorefinery for the production of organic protein-rich feed for monogastric animals

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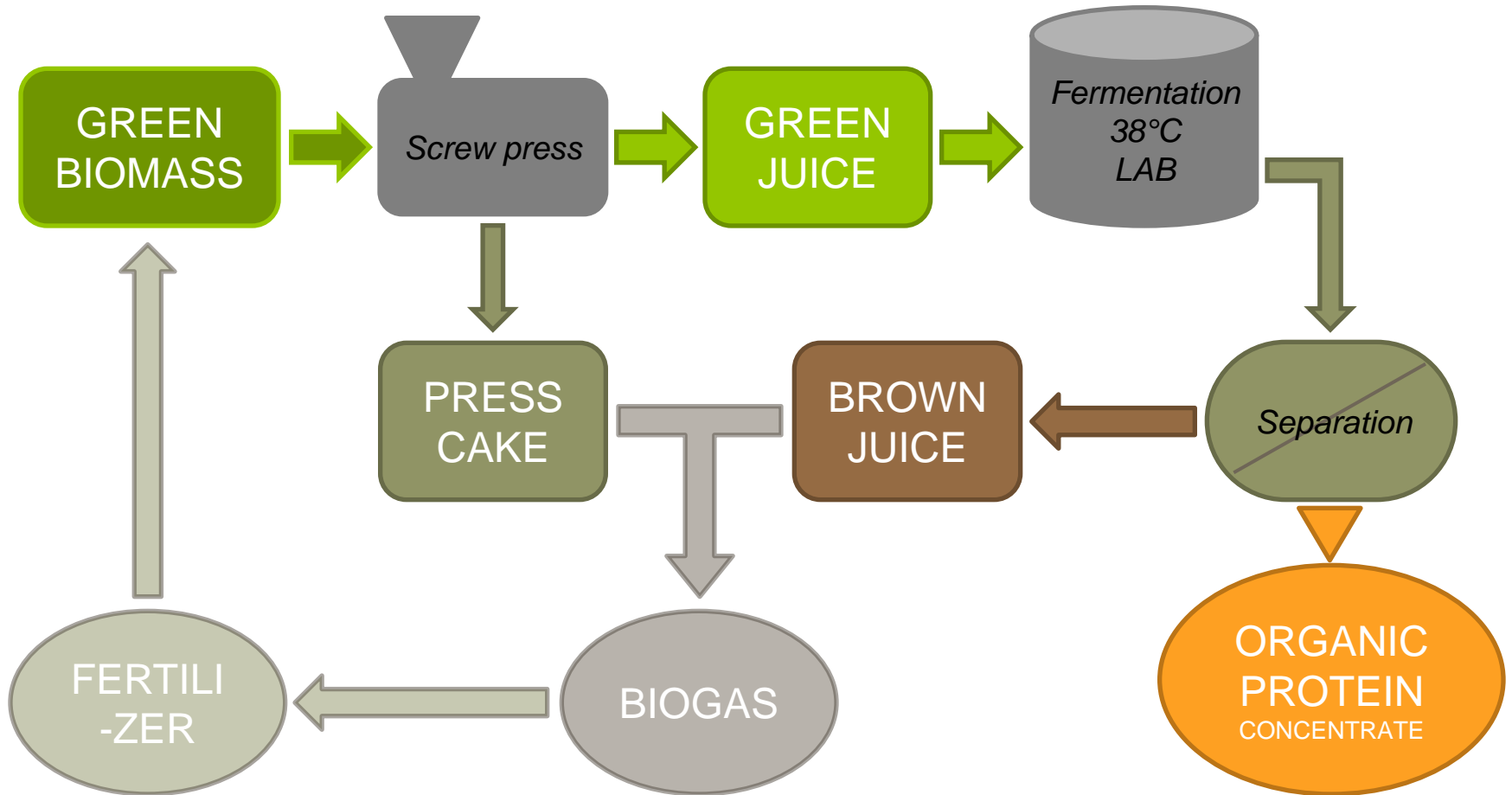
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THE NEED FOR ORGANIC PROTEIN-FEED

- Several challenges in the **supply of organic protein feed** for monogastric animals:
 - Difficulties to obtain organic soybeans, and at reasonable price.
 - Lack of legumes with the suitable amino acid profile.
 - The use of conventional feed in organic agriculture is to be totally forbidden from 2018.
- Europe needs to develop **sustainable farming systems** based on **locally produced feeds**.

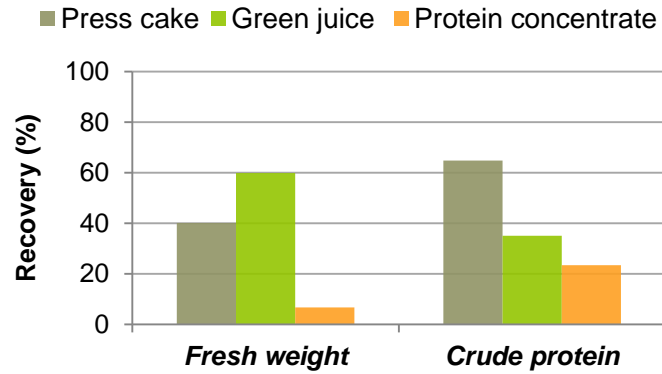
▶ **Extraction of proteins from green biomass in a green biorefinery concept.**

THE ORGANOFINERY PROCESS

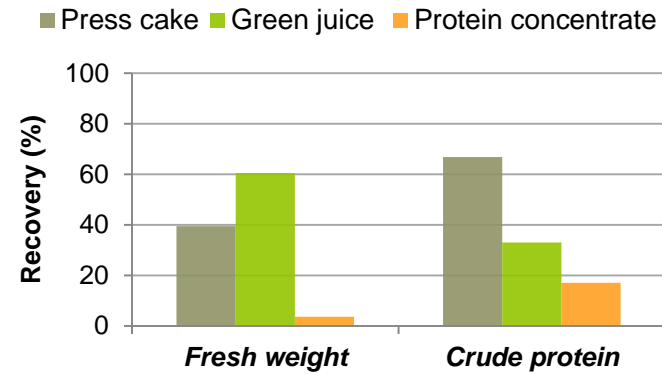


LABORATORY SCALE EXPERIMENTS

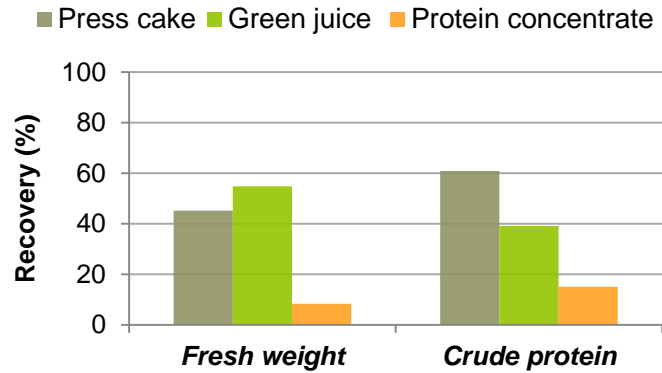
RED CLOVER



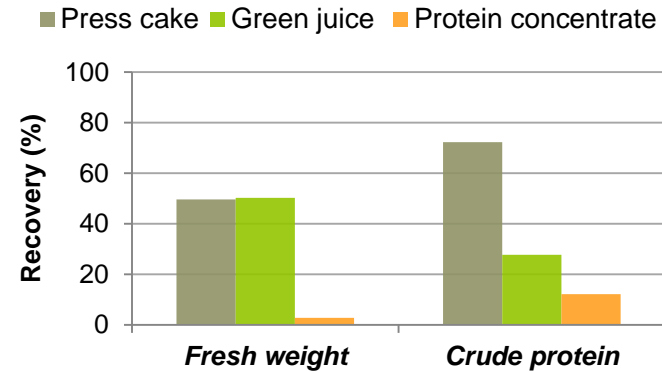
CLOVER GRASS



ALFALFA



OILSEED RADISH



FEEDING QUALITY IN DRY PROTEIN PRODUCT

Essential aminoacids for poultry

g/kg DM	Arg	Cys	His	Ile	Leu	Lys	Met	Phe	Thr	Val	Total
<i>Soybeans^a</i>	31.4	5.8	10.1	18.5	29.3	26.2	5.2	19.7	15.6	18	179.8
<i>Red clover</i>	26.8	2.5	10.8	23.5	39.4	26.8	8.5	26.5	20.1	28.2	213.1
<i>Clover grass</i>	22.9	2.4	9.1	20.9	34.3	23.9	8.2	23	17.7	24.8	187.2
<i>Alfalfa</i>	20.1	3.4	9	21.8	35.4	21.5	7.8	25.5	17.6	24	186.1
<i>Oilseed radish</i>	23.4	4.7	10.1	21.7	37.3	25.4	9.1	25.3	19.2	26	202.2

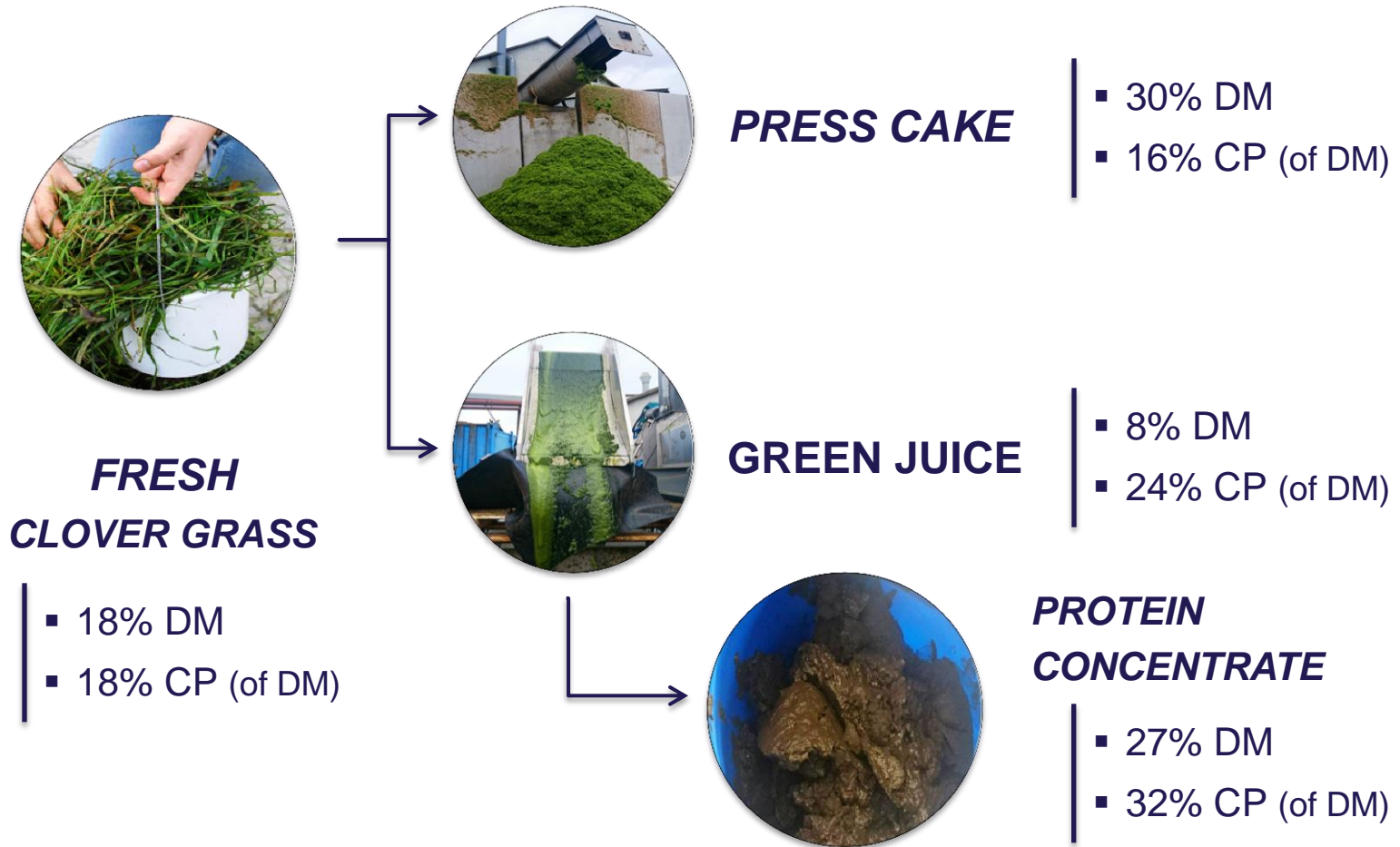
^aSteenfeldt and Hammershøj, 2015.

PILOT SCALE EXPERIMENT



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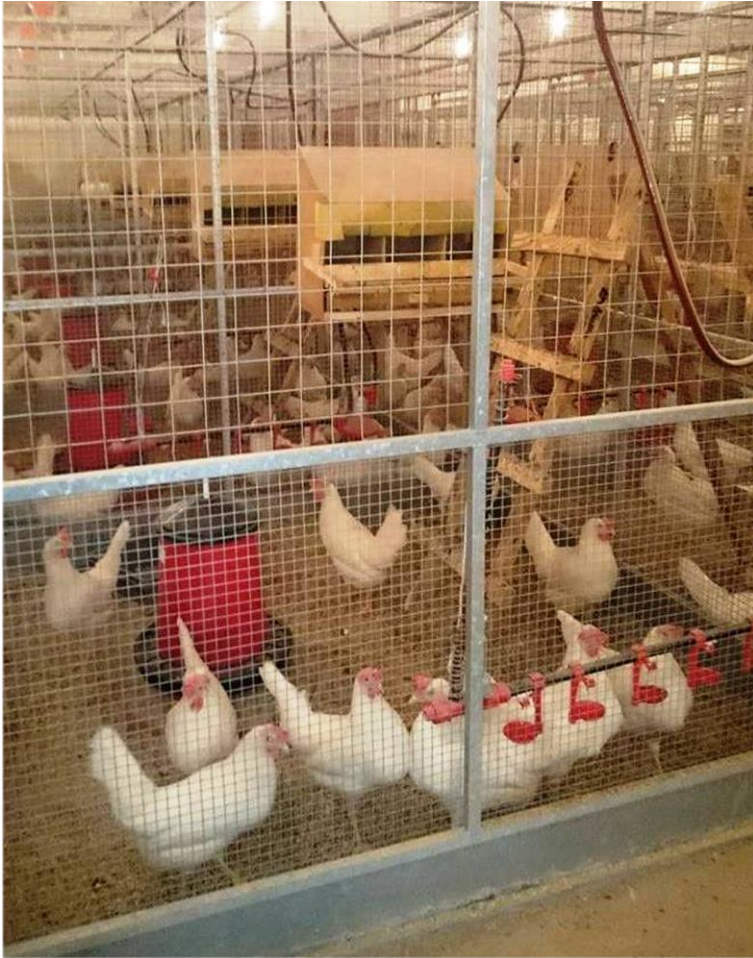
PILOT SCALE EXPERIMENT



PILOT SCALE EXPERIMENT



PILOT SCALE EXPERIMENT



- **4% of proteins** in the fresh crop were recovered in the protein concentrate.
- Dry protein product contained **30-35% of proteins**.
- Bottlenecks in the process:
 - Screw pressing.
 - Decanter centrifugation.
- Next steps:
 - Feeding trial with laying hens.
 - Feeding trial with pigs.
 - Press cake will be tested as cow feed (Bio-value).

CONCLUSIONS

- Organofinery process can produce **organic protein-rich feed for monogastric animals**.
- Efficient process at laboratory scale:
 - Up to **23% of proteins recovered** in the protein concentrate from red clover.
 - Yields between **6kg and 13kg of dry organic protein product** per ton of fresh crop.
- Several challenges to face at large scale:
 - Optimization of the screw pressing.
 - Improve the separation of proteins after the fermentation.
- Good practical experience, and stakeholders look forward the next steps for Organofinery to become a reality soon.

ACKNOWLEDGMENTS



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