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# Case Nortura/Norilia

## Improving the utilisation of co-streams in poultry processing

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The research project **CYCLE** aims on achieving total utilisation of raw materials from fish, chicken and vegetables with cycle thinking and sustainable technological solutions for an efficient and profitable food industry. CYCLE-industry partner **Norilia** is responsible for development and sales of co-streams

from **Nortura** slaughterhouses. Some of the co-streams are further processed. Chicken **co-streams** are fully exploited, but there is still potential to increase value by up-cycling, i.e. by processing the material for new applications in more high-value-markets.

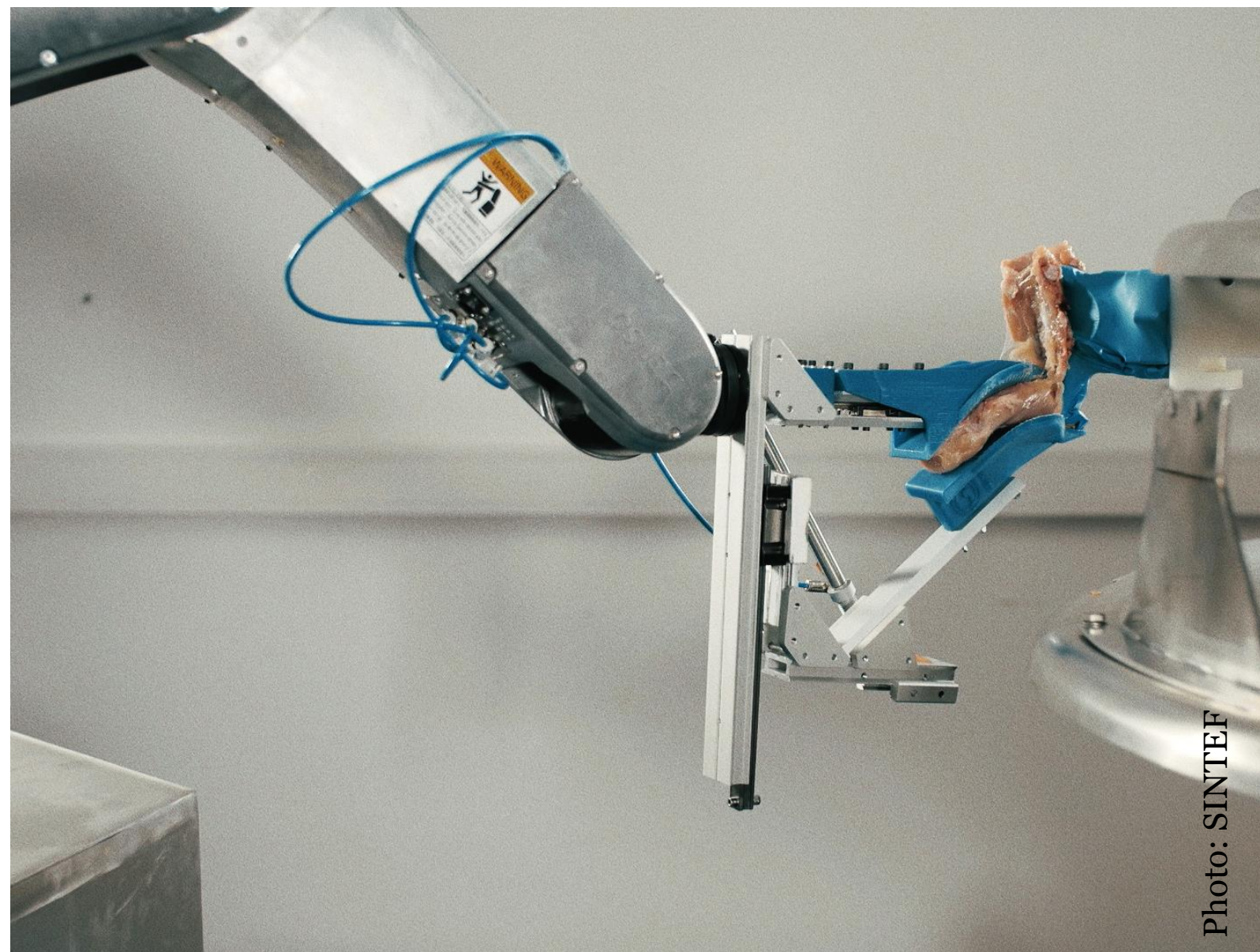


Photo: SINTEF

### Robot

Automated concepts have been developed for an efficient and precise sorting of raw materials and co-streams.

- The Gribbot (photo) is successful in both scrapping the carcass and harvesting the fillet including the tenderloin. The entire procedure takes 4.75 seconds (Misimi et al. 2016)



Photo: Nofima

### Online analysis

CYCLE researchers have developed VIS, NIR and X-ray based sensor systems for quality differentiation of raw materials and co-streams.

- Mapping of fat and protein in poultry bones (photo)
- Collected data can be used to steer hydrolysis of the material



Photos: SINTEF

### Enzymatic hydrolysis

Enzymatic hydrolysis, originally developed for fish co-streams, was adapted for use with poultry bones.

- For food applications, oil and dried hydrolysates were derived (photos)
- Chicken oil had low oxidation and hydrolysis values, but thermally separated oil had better quality than oil after enzymatic hydrolysis (Tveit 2014)



Photo: Adler S., NIBIO

### Feather meal

Pressure cooking increases the digestibility of feather keratin, but limits the availability of some amino acids. CYCLE researchers worked on improving the hydrolysis process.

- Autoclaving, NaOH and Na<sub>2</sub>SO<sub>3</sub> improved digestibility, but the tested enzymes had no effect
- Solubilised and residual fractions differed in pepsin digestibility and amino acid composition

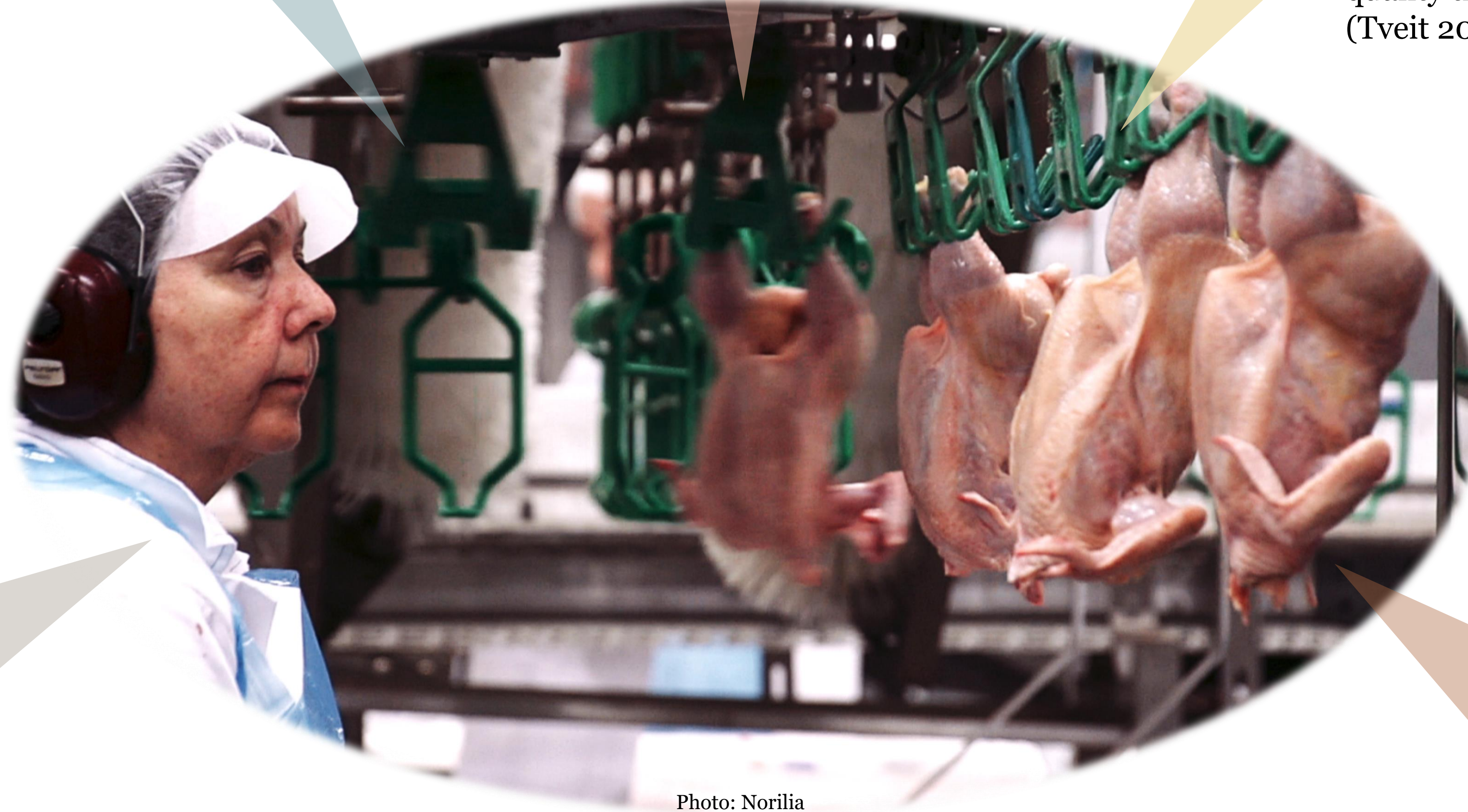


Photo: Norilia

CYCLE industry partner

### Nortura / Norilia

Nortura SA is a cooperative owned by 19,000 farmers. Nortura-owned Norilia AS is responsible for development and sales of co-streams from slaughtering of beef, pork, lamb and poultry at the Nortura slaughterhouses.

### Upcycling

Norilia is planning to invest in a hydrolysis plant for poultry bones in Hærland. A separate plant for hydrolysis for category 3 material is an option. Further development and implementation of CYCLE research may significantly improve resource utilisation and improve environmental sustainability in the chicken value chain by up-cycling co-streams and thereby improving the profitability for Nortura/Norilia.

#### References

Misimi E. et al. 2016. GRIBBOT – Robotic 3D vision-guided harvesting of chicken fillets. Computers and Electronics in Agriculture, 121:84-100.  
Tveit, G.M. 2014. Enzymatic hydrolysis of Chicken Rest Raw Material. M. Sc. thesis. Norwegian University of Science and Technology (NTNU), Trondheim.

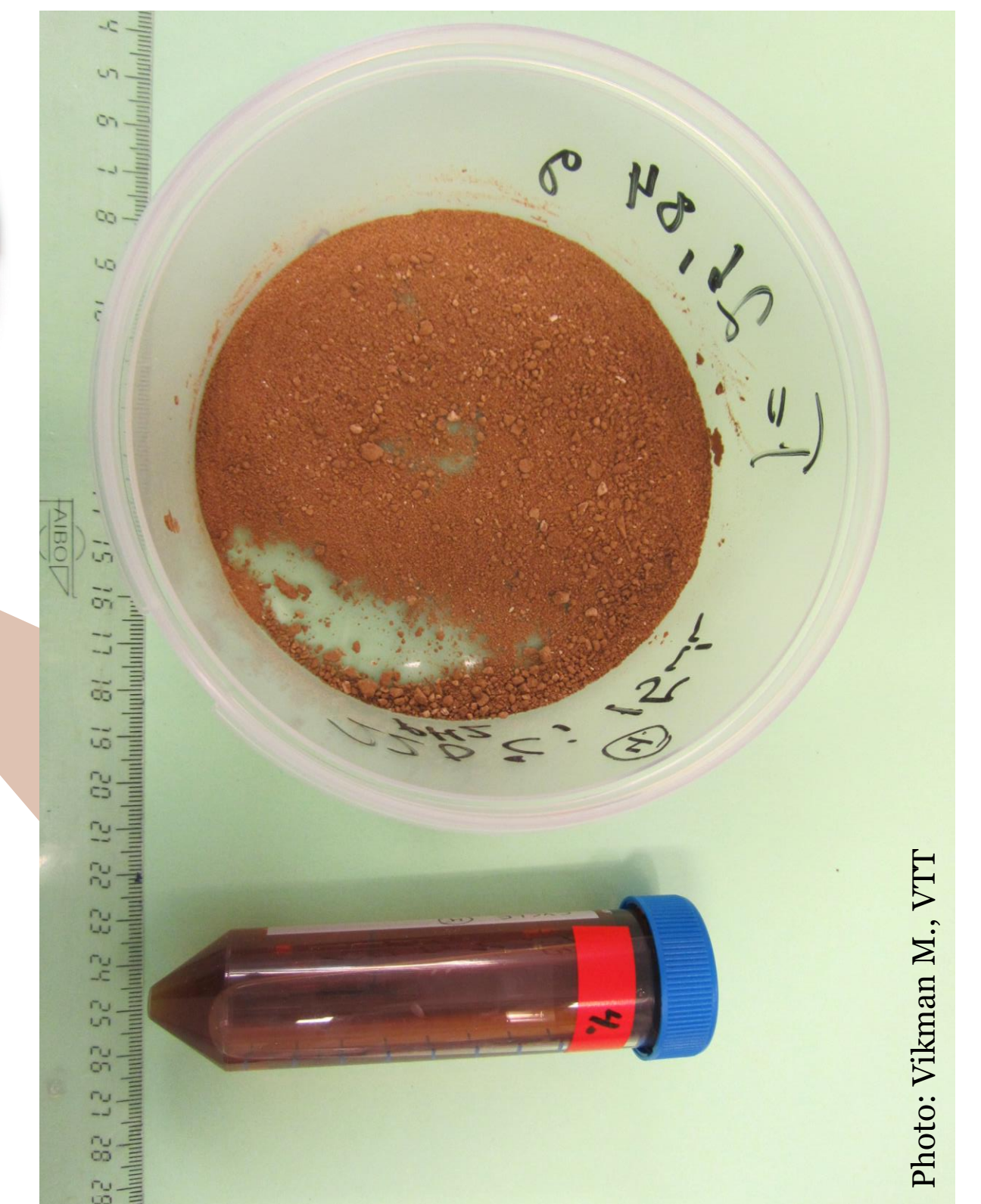


Photo: Vikman M., VTT

### HTC

The residues from enzymatic hydrolyses of poultry bones were treated with hydrothermal carbonization (HTC: 150-220°C, <50 bar in aqueous suspension).

- Distribution of the P and N between the liquid and solid phase can be controlled by adjusting process temperature and pH
- HTC yielded between 43 and 65% biochar
- The solid fraction can be utilised as feed ingredient, soil amendment, fertilizer or energy source (photo)
- Nutrients can be recovered from the liquid fraction

#### CYCLE

"Total utilisation of raw materials in the supply chain for food with a bio-economical perspective" (2013-2016) was funded by the Norwegian Research Council and is supervised by SINTEF Fisheries and Aquaculture.  
[www.cycleweb.no](http://www.cycleweb.no)



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