

Food - Feed - Fertilizer - Fuel - Future

The project goal of **cycle** is to introduce a holistic approach to improve resource utilization in the Norwegian food chain by developing knowledge and sustainable solutions for eco-friendly bio-processes and technology within a bio-economical perspective.

Automated quality differentiation and sorting of co-streams and waste

SINTEF has developed the world's first robotic concept for harvesting of chicken fillets from the carcass. The Gribbot uses machine vision to take images of the chicken, a robot arm for manipulation and a compliant gripper that is able to harvest the fillets from the carcass with a relatively optimal yield. So far, the video demonstrating the Gribbot is seen by almost 80 000 (March 2015) users across the world and been referred to in many media such as Discovery Planet TV channel, Daily Mirror in UK and numerous national and international newspapers and magazines. A video demonstrating the concept can be seen at the cycle website.

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Photo TYD

Nofima has been working with a system for transmission measurements of complex foods like meat and fish based on Near infrared (NIR) hyperspectral imaging. The method is used for detailed non-destructive chemical characterization of biomaterials and is used for industrial on-line quality control of foods as it offers several advantages over conventional spectroscopy. The whole thickness of the sample is measured when NIR light is transmitted from one side to the other, and chemical images of for instance fat can be obtained, which show also fat deeply embedded in the sample. This research is currently being published.

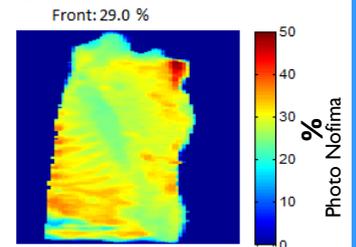


Photo Nofima

Whole pork belly measured by NIR transmission imaging. The resulting chemical image to the right indicates average fat content and shows the concentration distribution of fat.

Resource-efficient bioprocessing technologies for food industry

Edible films can be prepared directly from potato peels. After pretreating wet potato peels with high-pressure homogenization and optimally also with heat, it is possible to produce biopolymer films with similar barrier and mechanical properties to potato starch films. With potato peels, starch is the key component in film formation, but interestingly, it is also possible to prepare films using starch-free peels. As potato peel films are excellent grease barriers, they could find use as edible barriers in multicomponent food products. Potato peels could also be used in non-food applications like in cardboard coatings and as mulch films.



Photo Juhani Sibakov, VTT

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Bio-processing of waste for feed, fertilizer and energy

15 horses at Skjetlein vocational school, Trondheim produce a lot of manure. A 10 m³ reactor is used to treat the manure, and matured compost will be used to fertilize the fields. The input of manure and bedding material is registered daily. Greenhouse gas (GHG) may be emitted by composting, and the closed system is well suited for measurements. In this study, other substrates, e.g. vegetables waste, will be added to see the effect of a changed carbon/nitrogen ratio on GHG emissions.

The short composting process is valuable to create a more homogenous manure. The chemical composition, assessed by 7 representative samples of fresh and 7 of composted manure from the autumn of 2014, show a slight increase in carbon/nitrogen, dry matter, ashes, potassium, ammonium, calcium, magnesium, sulphur and pH. Total-nitrogen and phosphorus was unchanged.

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Socio-economy – market and consumer

SIFO researcher Marie Hebrok presented a literature review with the aim to identify intervention points for Design for Sustainable Behaviour (DfSB) to reduce food waste. DfSB relates to user-centred design and persuasive design and aims at changing behaviour through design. The field draws on theoretical and methodological resources from social science. The hypothesis examined through the review was that while recent quantitative studies provide a thorough overview of the quantity, character and demography of household food waste in Norway, qualitative studies give a deeper understanding of the different mechanisms causing food waste in households through investigating consumer behaviour and practices.

Generally, the quantitative studies examined were found to focus on definitions and scope of food loss, and provide descriptive information based on bin analyses, while qualitative studies pursue in-depth understanding prioritizing why-questions and knowledge on waste behaviour. As of yet few studies investigate what works in terms of changing behaviour. In order to address this gap in the literature Hebrok reviewed both qualitative and quantitative literature, with special attention to explaining behaviour and identifying strategic (change) options, thus aiming to identify possible intervention points for DfSB.

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Food safety and logistics

It is estimated that one-third of the edible parts of food produced for human consumption is lost, and food supply chains are facing a major challenge in reducing both waste and their environmental impact. In a recent study on the topic, we found that:

- There is no agreed definition of food waste, making it difficult to both measure and compare waste data from different studies
- All food products have an impact on the environment but the burden at each supply chain stage varies substantially between product types
- Although highly perishable items like fruit and vegetables contribute to the largest amounts of waste in terms of weight or volume, meat and fish are the largest contributors when it comes to value

In the postharvest stage, fruit and vegetables show the highest waste percentages, while meat and fish/seafood waste dominate the processing stages. In the distribution stage, fruit and vegetable waste again dominates. In total, the consumption stage is where most of the waste occurs.

The high rate of loss for fruits and vegetables is mostly due to the particular sensibility of the products as well as retailers' strict requirements regarding physical aspects such as appearance, colour, shape and weight. Consumers quote damages during transport, bad quality, too large packaging sizes and short remaining shelf life as key reasons for waste in households. Meat products appear to be less wasted in the supply chain but their production requires high amounts of energy and water inputs, and releases high amounts of greenhouse gases.

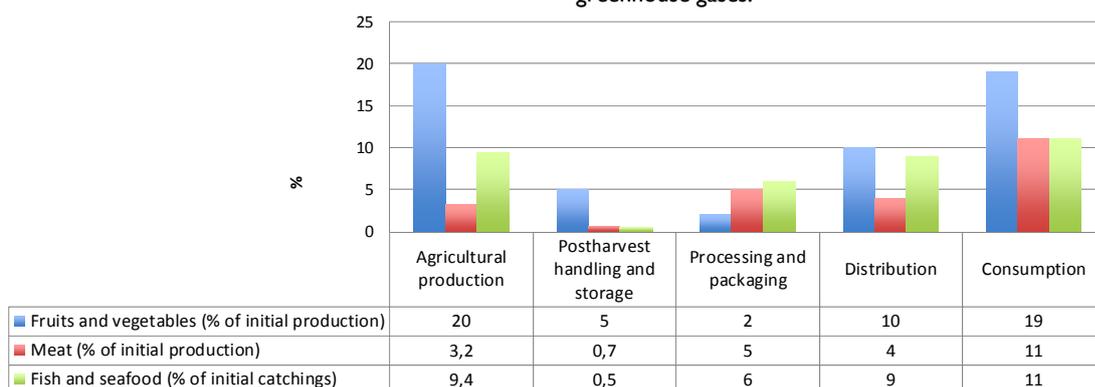


Figure 1 – Estimated percentage waste per product type and supply chain stage (adapted from Gustavsson et al., 2011)

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Next event is Open CYCLE day in October 2015

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