Info letter about

Increased protein efficiency in agriculture

There is a need for increased self-sufficiency in protein feed for pigs and poultry to subsitute imported feed. Today's consumption of protein feed for livestock contains a high degree of imported soy and corn from vulnerable areas such as Argentina, Brazil and USA.

There are several implications with imported feed like deforestation of the Amazon, excessive use of pesticide and antibiotics and transportation across the globe.

Also, excessive use in monocultures, no crop rotation and use of mineral fertilizer to produce these commodities are consequential errors.

Increased local feed production from locally found grass and clover can increase self-sufficiency, food security and local production of feed .

Biorefining is not new technology, and several industrial companies have proven biorefining to be cost effective and sustainable at an industrial scale.

Protein extraction is especially suitable for cereal farmers, benefitting improved soil fertility in cereal dominating areas through using clover-gras in between growing seasons.

We can extract proteins from diverse sources containing protein:

- **Grass**
- **Animal by-product**
- **Beans**

Depending on our goal, we can process the solid remnants several ways:

- **Drying:** By removing the moisture from the remnants, we obtain a stable, dry product in the form of powder or pellets. This method helps preserve the protein content for longer-term storage and makes it easier to transport.
- **Liquid Solution**: Sometimes, the liquid byproduct containing proteins is more valuable in its wet form. This solution can be used directly in some applications or can undergo further processing to isolate specific protein fractions or nutrients.

Technology demo: Pilot plant for green biorefining of gras and clover at Sötåsen Agricultural School in Sweeden

Protein extraction with a screw press is a method used to separate fresh or ensiled grass into two main fractions: a liquid fraction (press juice) and a solid fraction (press cake). The process begins by mechanically pretreating or cutting the grass, followed by pressing it with a screw press to achieve efficient separation.

The liquid fraction (press juice) is rich in protein and can be processed further into protein concentrate through heating or pH adjustment, causing the protein to coagulate and precipitate. This concentrate can be dried and used as a feed ingredient for monogastric animals like pigs and poultry. Press juice from ensiled grass, though degraded to peptides and amino acids, can be directly used in wet feeding systems for pigs.

The solid fraction (press cake) is fiber-rich and can serve as feed for ruminants or as a substrate for biogas production and biomaterials. Using fresh grass results in higher-quality protein concentrates, whereas ensiled grass offers year-round availability but may result in some protein degradation.

Both the fiber rich press cake and protein rich juice can be used as feed for livestock animals and reduce the need for imported feed ingredients.

- Implementing biorefinery in grasslands wither fewer livestock animals deals with the problem of volume and transportation costs.
- Increased local protein production reducing costs and environmental footprint.
- Gras and clover can be used on cereal dominating areas to improve soil fertility.
- High exploitation of input materials.

SOME PROTEIN EXTRACTION TECHNOLOGIES

Thermal hydrolysis

Involves the use of heat and pressure to break down complex organic molecules, such as proteins, into smaller units. In the context of plant protein extraction, thermal hydrolysis can help break down the cell walls of plant material and release proteins. It can be beneficial for increasing protein yield or improving the digestibility of the proteins. However, it is important to balance the heat and pressure to avoid denaturation of the proteins, which can reduce their functional properties in food production.

Alkaline extraction and isoelectric precipitation

In this method, the pH is adjusted to an alkaline level to dissolve proteins from the plant material. The pH is then lowered to the protein's isoelectric point, where it precipitates and can be isolated.

Enzymatic hydrolysis

Enzymes are used to break down the cell walls of the plant material, releasing the proteins. This provides a gentler process and helps preserve the functionality of the proteins

Water-based extraction

The simplest method where proteins are extracted by mixing plant material with water, often with pH adjustments. After filtration and centrifugation, proteins are separated from the rest of the plant components.

BIOGASS
OSLOFJORD