Could you explain how you developed an interest in this area of research, and how the project took its current form?

My main interest is the non-traditional feeding of sheep and cattle. Together with a colleague who works with seaweeds, we developed the idea of testing different species of seaweeds on different animals (including sheep, pigs and poultry). The feedback we got was that we should also include terrestrial plants. As I also have an interest in using locally sourced plants in this project, we decided to incorporate legumes as the terrestrial plants in question. Following this, we developed an international network through our personal networks, and so the AltPro project came about.

What are your motivations for pursuing this area of study?

My motivation for working with locally produced feed is twofold. First of all, there is an environmental and climate-related issue, due to the import of soya, which is produced at the expense of rainforests. Second, we were interested in using new feeds that can be introduced into a traditional production system, in addition to being environmentally friendly.

Why did you choose to focus on locally produced legumes and seaweeds as alternative protein sources? What advantages do they have over other potential alternative sources?

Legumes are nitrogen-fixing plants and thus need less artificial fertiliser. They are used broadly across Europe, but in Norway their use is mostly limited to white and red clover in combination with grasses. However, due to climate change, we believe that more species could be of interest, and therefore we want to find out more about this potential, in particular under the Arctic conditions found in the north of the country.

Seaweed is a growing industry with a lot of potential in Norway, as it can be grown along the coast, and in addition capture and bind carbon. In the same way that there are many different terrestrial plant species, there are also many different species of seaweed, and so there is a need to investigate their possible feed value. For me, all new potential feeds for ruminants are of interest, and I think we will never fully comprehend the issue of livestock feeding.

What are the potential environmental benefits of this project?

Other research has concluded that the inclusion of seaweed in the diet for sheep decreases enteric methane emission, when compared with no seaweed inclusion. These are promising results in terms of the greenhouse gas debate. However, those results come from Australia, and therefore the researchers used a very different species of seaweed, which was tested on a different breed of sheep.

The other key point is that if we discover protein-rich feedstuffs in Norway that are competitive in nutritional values, as well as being competitive in terms of price compared with the imported soya, there will certainly be benefits at an environmental level.

All over Europe, there is a trend of using pastures and locally produced feeds instead of imported soya. Norway alone cannot change or stop the production of soya at the expense of the rainforest, but we can do our bit, and
The hunt for a local protein source

With a mission to find locally produced and environmentally friendly protein sources for sheep and cattle, an international team has set up the AltPro project. It is conducting experiments that will determine whether seaweeds and legumes make viable alternatives to the imported soya that currently dominates the market for livestock feed.

IN ORDER TO grow, livestock needs a good source of protein. While on the face of it this may seem straightforward, in recent years it has been a real point of contention, particularly in Europe.

When the bovine spongiform encephalopathy (BSE – commonly known as ‘mad cow disease’) crisis struck parts of the continent in the 1990s, the EU brought in stringent measures to crack down on its spread. One unlikely side effect of this was that fish, meat or bone meals were no longer allowed to be used as protein sources in the concentrates fed to livestock, owing to the use of slaughterhouse waste in the fish industry. This led to increases in the importation of soya to provide protein for concentrates.

This has become controversial in recent years, as soya bean agriculture is tied inextricably to deforestation in South America, and transporting soybeans halfway across the world to Europe is not exactly a low-carbon solution. In response to these issues, European countries have begun looking for better and local protein sources.

Norway is currently doing better than most countries, attaining 40 per cent self-sufficiency in its concentrates production, but it still has some way to go before it can be said to produce environmentally friendly protein sources for its livestock. To do that properly, scientists need to turn their gaze inwards, and investigate protein sources on Norway’s own doorstep.

SEAWEED AND LEGUMES
Taking up this mantle, a team of Norwegian researchers led by Dr Vibeke Lind at the Norwegian Institute of Bioeconomy Research (NIBIO) joined forces with colleagues from Denmark, Switzerland and Spain to form AltPro, a task force to find suitable alternative protein sources for sheep.

Their first idea was to use seaweed, which sheep are already known to eat given half a chance. Norway has an extensive coastline, and a rich array of seaweed species that are both high in minerals and easy to cultivate. It is not even as if seaweed farming is a new idea; in countries like Japan, China and Korea it is commonly grown by aquaculture owing to its popularity in certain Asian cuisines. Moreover, seaweed has long been used by Norwegian farmers as a supplementary feed for sheep during winter.

However, several factors must be addressed before Norway launches its own seaweed-based economy. There are huge variations between seaweed species, as well as variations due to the season and year in which seaweeds are collected, when it comes to digestibility, bioactive compounds and, crucially, protein content. In order to assess
LEGUMES AND SEAWEED AS ALTERNATIVE PROTEIN SOURCES

OBJECTIVE
To test if locally produced legumes and seaweeds could be suitable, sustainable and environmentally friendly national protein sources as alternatives to imported sources such as soya.

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VIBEKE LIND is a researcher in the Division of Food Production and Society at the Department of Grassland and Livestock in NIBIO, Tjötta. Her expertise lies in sheep and cattle, with a particular focus on feeding, production systems, lamb meat quality and enteric methane emission due to feeding regimes. She obtained her PhD in 2009, in which she explored the effects of pre-slaughter fattening systems and gender on the sensory profile and fatty acid composition of meat from lambs.

which, if any, species are appropriate for the purpose of feeding ruminants, the team must undertake experiments.

The second arm of the group’s research involves exploring legumes as another protein source. There are many benefits to these plants: they are very digestible, rich in protein and do not require much fertiliser because of their nitrogen-fixing qualities. Furthermore, they may even contain compounds that reduce both parasite burden and methane emission in the animals or improve the quality of the animal products.

To this end, the researchers intend to test both white clover – commonly found growing in combination with grasses – and Bird’s foot trefoil (Lotus corniculatus), another legume that has never been grown full scale in Norway.

TESTING THE PROTEIN SOURCES
The team began by investigating the relative merits of various seaweed species as feeds. “We have now found a potential seaweed that is high in digestibility and protein, and notably is also high in protein digestibility both in the rumen and intestine of the animals,” explains Lind. “We are now testing this seaweed in feeding trials, in order to ascertain the growth rate and enteric methane emission of the animals.” Importantly, the seaweeds being tested showed marked differences in protein concentration between spring and autumn, something that will certainly have to be accounted for if they are to be implemented.

Methane emission is one of the key factors being tested because, as Lind herself puts it, this is a “big deal” at the moment. The idea that methane emission by livestock is a major contributor to the greenhouse effect has given red meat and milk a bad name, so it is imperative to find feeds that produce less methane when they pass through the digestive system of the animals in question.

The hypothesis the AltPro team has put forward is that alternative food sources could reduce ruminal methanogenesis, owing to induced changes in the microorganisms involved in methanogenesis.

As the experiments with sheep and seaweed go ahead, further trials are being undertaken with legumes to assess similar factors and compare the results with the seaweed.

WINNING HEARTS AND MINDS
Besides the practical issues that need to be tested when finding a novel source of protein, the researchers are aware that to ultimately create major change within the farming industry, there is an important group of people that must not be forgotten: the farmers themselves. One of the project’s work packages involved interviewing representatives from a variety of farms across northern Norway, in order to understand their outlook and find ways to make the project run more smoothly.

Lind and her colleagues are very positive about the outcomes their research could have in Norway and Europe as a whole. They are deeply aware of the impact farming has on the planet, as well as the tension between increasing output and decreasing environmental harm. “The Norwegian policy, so far, has been to have agriculture all over the country, including grazing animals, as they can utilise areas not suitable for production of food for human consumption,” explains Lind. “The negative consequence of all this could be increased enteric methane emission.”

To maintain populations of sheep and cattle, and ensure that the meat and milk industries continue in a more environmentally friendly manner, it is vital to keep investing in research in this field. With promising results already emerging, the AltPro project in Norway could well be an important step towards a brighter future.