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Driver for change?

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Chronicle

Increased investments in Nordic and international cooperation

Today's and tomorrow's research questions are becoming evermore complex and interdisciplinary research is essential. However, resources available nationally for research are not sufficient. To strengthen research and knowledge dissemination about organic agriculture and organic food, we need to collaborate across national borders. Collaboration provides inspiration and increased opportunities for funding, but it also requires support and active commitment to be developed. It is easy to talk about increased internationalisation, but more difficult to achieve it in practice.

Mobilisation at all levels

For a change to happen, not only do researchers need to strive to cooperate more, but so do the bodies that fund research – nationally, on a Nordic basis and within the EU – in order to create conditions for larger coordinated research programmes. (It is difficult to collaborate on a project budget of 50,000 euro a year!)

The Swedish Research Council Formas has clearly signalled a move towards increased internationalisation through increased investment in European cooperation via so-called ERA-NETs (Networking the European Research Area), whereby nationally sourced funding is invested in projects in which researchers from several countries collaborate.

Communication over borders

At the same time, I believe that there exists a great challenge in being able to successfully communicate results from international projects to the national agricultural sector and society here in Sweden. Research collaboration is one thing, but results need to be communicated to various target groups in the participating countries. Often knowledge dissemination and communication within agriculture are dominated by results from nationally conducted research. Changes and greater efforts are required in this area.

We have much in common with our Nordic neighbour countries, and it is very positive that we are now strengthening our cooperation on research and communication within organic agriculture through the creation of a network between research centres in Sweden, Denmark, Norway and Finland. There is also a need for meeting places on a Nordic basis, such as the recent NJF (Nordic Association of Agricultural Scientists) seminar held in Denmark; there are already plans for a new seminar, this time in Finland in 2017. ■

January 2014
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DEAD HEAT ON CLIMATE IMPACT FOR ORGANIC AND CONVENTIONAL MILK PRODUCTION:

What other benefits are there?

"When it comes to milk, quite a lot of international studies have been published comparing organic and conventional milk production and they provide good evidence for saying there is no difference between the climate impact of milk from the two of production systems." Thus write the authors, headed by Christel Cederberg, of a report on the climate impact of organic food production[1]. This can be explained by the fact that conventional milk production, although unquestionably burdened by emissions from the manufacture of nitrogen fertiliser (synthetically produced, and also known as artificial nitrogen fertiliser), generally has higher productivity than organic milk production. The end result is that greenhouse emissions on average per kg milk are comparable for organic and conventional milk production.

What conclusions can we draw from this? Admittedly, the authors of the report point out that calculating the carbon footprint of food is still very unreliable, and there is large variation among farms.

Organic milk production in Sweden

- 14 per cent of the Swedish dairy cows are in organic production. 13 per cent of the produced milk was organic (2012).
- According to Swedish law, all animals in milk production, including conventional, must get out on pasture for at least six hours per day for a period in the summer. However, for KRAV-certified organic animals, the requirements for outdoor access and grazing are even more extensive, at least 12.5 hours per day.
- According to EU regulations, cows in organic production shall have free access to roughages and the concentrate proportion is limited. But in Sweden, also cows in conventional production are fed quite high levels of grass/clover roughages.
- Organic herds are bigger than conventional – on average 85 cows on an organic farm and 76 cows on a conventional farm (2013).
- Swedish consumers are generally reluctant to imported milk. Imported milk is most prevalent in processed products, where the origin is less clear.

Photo: Martin Sundberg.

Nevertheless, there is much that indicates that general climate gains from organic milk production cannot be taken as a matter of course. Should we therefore continue with organic production if it is no better for the climate? We can also pose the question like this: If indications are that organic milk, with the regulations that organic production are subject to, can be produced with similarly large (or small) greenhouse gas emissions as conventional milk, what other advantages and disadvantages does organic milk have when compared with conventional milk? In other words, if the carbon footprints are equally large for both forms of production, let us concentrate on other environmental objectives (and other aspects) and see if organic milk production holds its own. In this review, which applies to Swedish conditions, we should always bear in mind that the carbon footprint per kg milk is similar for both forms of production.

Fewer chemicals in the environment

Some differences between organic and conventional production are obvious, others are more debatable. Let us begin with an obvious difference. In organic farming, no chemical plant protection is used. Consequently, in organic milk production there is a lesser risk of spreading pesticide residues in soil and water.

"…but the fact remains that in organic production milk can be produced with similarly small greenhouse emissions as conventional production without using chemical plant protection."

One can discuss how great this risk is, and whether it is negligible relative to other pollutants of waterways such as excessive nutrients, but the fact remains that in organic production milk can be produced with similarly small greenhouse emissions as conventional production without using chemical plant protection.

Better nitrogen management?

In organic farming, use of mineral nitrogen fertiliser is not permitted. Is this an advantage? In the case of milk we cannot claim that this reduces greenhouse gas emissions, because conventional milk production has a similarly small carbon footprint *per kg milk* as organic milk production, in spite of the addition of mineral nitrogen fertiliser (because production is higher on conventional farms). Can we argue that the ban on artificial fertiliser makes it more difficult to "waste" nitrogen, and that it stimulates more effective use of farmyard manure to grow animal feed? Results from a study of Greppa Näringen's ("Focus on Nutrients") nutrient balances undertaken in 2009 show that the surplus of nitrogen per hectare in farm-gate balances on farms in southern Sweden was approximately 40 per cent lower on organic than conventional dairy farms[2]. The size of the surplus is an indicator of the risk of nutrient losses[3], and the cause of the lower risk on the organic farms was lower intensity due to smaller amounts of feedstuffs bought in to farms and smaller applications of fertiliser. On the conventional farms, farmyard manure is supplemented by bought in mineral nitrogen fertiliser, which leads to a higher total application.

Photo: iStockphoto.

Advantageous for biodiversity?

When it comes to biodiversity in general in organic versus conventional production, research indicates that the number of species is higher on organic farms[4]. Whether this difference also applies to organic dairy farms compared with conventional ones has rarely been studied. The factor that distinguishes organic from conventional dairy farms and that can enhance biodiversity is the requirement that 50 per cent of feed must be produced on the farm. As a result grass, cereal and legume crops are all grown on the farm providing a variation that benefits biodiversity. Dairy farms in general, both organic and conventional, enhance biodiversity because their large buildings and the manure produced provide both habitat and food for birds[5]. A negative factor, however, is the fact that the first, early silage harvest coincides with nesting skylarks. Yet biodiversity also depends very much on the surrounding physical landscape; features such as large rocks, bushes, copses of deciduous trees, and uncultivated islands in the arable landscape are important. In this respect, the difference between large and small farms and the difference between farms in lowland and forested areas are greater than any differences between organic and conventional farms. Swedish organic farms have on average more cows than conventional ones.

Not be forgotten is the effect on biodiversity in other countries caused by the import of feed for Swedish milk production. Although organic soya beans are mainly grown in Europe and not directly linked to deforestation in South America, it can be argued that all demand for soya drives the demand for new land to cultivate. Organic dairy farming should to an even greater extent be a model when it comes to using domestic protein feed.

Unclear effect on carbon sequestration

Another aspect that is often highlighted as a benefit of organic agriculture is its ability to bind carbon in soil. The reason for this is more grass cultivation and more comprehensive use of organic fertilisers. There should not, however, be so large a difference between Swedish organic and conventional dairy farms since both systems incorporate a high proportion of grassland and use farmyard manure. On the other hand, more land is used for fodder crops in organic production; land that could be used for bioenergy production, which would both bind carbon and reduce greenhouse emissions from society at large by replacing fossil fuels with bioenergy.

Small differences in cows' welfare

A general difference between organic and conventional animal husbandry is that the animals in the former system have outdoor access. In Sweden, all dairy cows, both organic and conventional, have grazing access according to Swedish animal welfare legislation. According to KRAV (Swedish organic certification organisation) regulations, dairy cows should have grazing access for most of the day, whereas the limit for conventional animals is at least 6 hours. No large differences have been found in the health of organically and conventionally farmed cows[6].

Swedish organic farms have on average more cows than conventional ones.

Healthier milk?

It has been demonstrated that organic milk has a different composition of fatty acids than conventional milk, including a higher proportion of omega 3 fatty acids and a lower omega 6/omega 3 fatty acid ratio,

Photo: iStockphoto.

"In an international comparison, Sweden has an excellent record when it comes to producing milk with low greenhouse gas emissions. (FAO, 2010)."

because organic cows are fed more roughage[7,8]. Looking at the population's actual and desired average intake of fatty acids, these differences seem to show the benefits of organic milk and are of nutritional interest. On the other hand, it is difficult to measure direct health effects and there has been little research in this area. Milk is also only one of many sources of polyunsaturated fats. Thus, until now no large differences between organic and conventional milk for public health have been discovered.

More climate friendly alternatives to milk?

Does Swedish dairy production leave a large or a small carbon footprint? This depends naturally on what we compare it to. In an international comparison, Sweden has an excellent record when it comes to producing milk with low greenhouse gas emissions[9].

From a consumption perspective, in other words, what the consumer chooses to consume, the carbon footprint of milk may be compared with products that serve a similar function. If milk is to function as a drink with a meal that is already nutritionally complete, water would be a much more climate smart alternative. On the other hand, if the consumer is after specific nutrients found in milk, for example calcium and vitamins, milk may be compared with similar products such as enriched oat drink that has a climate footprint of approximately a tenth of that of Swedish milk. In this context, therefore, milk has a bigger climate footprint. At the same time, one has to remember that it is difficult to compare specific foods nutritionally. Oat drink contains less protein than milk, thus to determine if the comparison is relevant the entire diet needs to be considered.

Smaller carbon footprint – at what price?

Milk has such a large carbon footprint from a consumption perspective partly because a cow needs take in more energy as food than she produces in milk and partly because of the methane that she emits. Approximately half of the emissions (converted to carbon dioxide equivalents) per kg milk consist of methane, mainly from the cow's digestive process, and a smaller amount from manure. Approximately 30-40 per cent consist of nitrous oxide mainly from the soil, and the rest is carbon dioxide from energy used to grow feed and in animal housing[9]. It is possible to reduce emissions from manure by collecting methane and producing biogas; energy used in animal housing may be made more effective and renewable energy made use of. However, the two big greenhouse gas sources remain: nitrous oxide from soil due to nitrogen fertiliser and methane from the digestive process. By ensuring good nitrogen use efficiency, large yields from healthy animals and well-balanced feed and reduced feed wastage, we can increase efficiency and also reduce these emissions, but for purely biological reasons the opportunities for achieving large reductions of methane and nitrous oxide are small. If resources are to be allocated to a continuing reduction of greenhouse gas emissions in Swedish dairy production, consideration ought to be taken of the affects on other environmental objectives and also animal welfare. We ought to perhaps ask ourselves: Can we justify the risks that chemical plant protection poses by the fact that its use reduces the carbon footprint by, for example, five per cent? Can the ban on mineral fertiliser in the long term impel better nitrogen management in dairy production, and will such a potential benefit justify a decreased focus on further reductions of the climate footprint (when it already is so small)?

It is easier to find a way to resolve these speculations if we consider the amount by which greenhouse gas emissions must be cut. The overriding goal in Sweden and also in the UN Framework Convention for climate change is:

"The stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system."

To concretise this goal, it has been agreed that the average global surface temperature should not increase by more than 2° C over the pre-industrial average. Much indicates that the 2 degree goal will not be achieved and that we are on the way to an increase of four degrees, with catastrophic results[10]. Emissions must be drastically reduced to zero by 2050. As an interim target Sweden aims to reduce emissions by 40 per cent from 1990 levels by 2020. If one looks at emissions caused by milk consumption in Sweden,

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in other words emissions from what we consume regardless of where it is produced, we find that Swedish emissions are still increasing.

Diet composition plays an important role

How does this relate to milk's carbon footprint? Well, we know that it will be very difficult to reduce the carbon footprint of milk sufficiently to achieve the climate goals set for 2020 and 2050 because it is difficult to control the biological processes (methane and nitrous oxide production) involved in milk production. Consequently, we cannot expect to reach the climate goals by reductions in the production stage alone; but much will be achieved if we can decrease the carbon footprint of milk by 5 - 10, or even up to 20 per cent. However, perhaps not at any price if this involves conflicts with other environmental objectives, because to attain the goals we must at the same time review how much milk we consume per person. The amount of milk we consume relates to the rest of the food we eat. If we greatly reduce our meat consumption, there will probably be room for milk products in a sustainable diet, but not so much as today. It is important to remember that milk and meat production are linked. If the carbon footprint per kg milk is reduced by increasing the milk yield per cow, this means a reduction in beef produced from dairy farms. If this meat is replaced by meat from suckler production, emissions from the beef consumed increases. It would be even worse if the meat were replaced by meat from South America where slow growth and the risk of deforestation result in a very big carbon footprint per kg meat. We need to widen our focus and also pay attention to such indirect effects.

Future focus on robustness

Another aspect which is important to consider is the insecure future we face in many areas. We need to seriously focus on production systems that are robust enough to cope with unpredictable growing conditions and altered global trade and pricing situations. Competition for land and other finite resources is going to increase and with all probability be felt even in Sweden. How are we going to design milk production systems that make even more use of local resources such as pasture and waste products and thereby decrease dependence on energy demanding fertiliser and feed? How will we maximise and most effectively make use of all the products of the system: milk, meat, slaughterhouse waste, waste heat and ecosystem services? How do we design mixed systems that not only give us animal products but also more of the plant foods that a sustainable human diet in the future needs to include so much more of. It is much more important to focus on these questions now than to investigate if the climate footprint for organic milk is five per cent more or less than that for conventional milk. ■

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“Sju Gårdar” leads the way towards climate smarter milk

Although Swedish milk production is among the best in the world when it comes to greenhouse emissions, there is a large potential for improvement. This is illustrated by the work on climate certification of organic milk from Uppland sold under the trademark Sju Gårdar (“Seven Farms”), in which the farm Stabby Gård, outside of Uppsala, is participating.

Elisabeth Gauffin runs Stabby Gård together with her husband and sons. They have a herd of 180 dairy cows and followers. When I phone her at the beginning of November she is busy cleaning the windows in the cow shed and we begin a conversation about the fly season which now seems to continue up to Advent; a small, but telling example of the changes we must expect. Here also lies the motivation that has made Elisabeth one of the driving forces in the work with Sju Gårdar’s climate certification:

Elisabeth Gauffin with husband and sons at their farm Stabby Gård.

– Agriculture is going to suffer – is already suffering – from changes in the climate. I felt that we must do something to somewhat slow the development; start at one end. It's also a question of getting started on adapting to changing conditions.

The work on producing a climate certification has been done by KRAV (Swedish organic certification organisation), Svensk Sigill (Quality certification of Swedish food products), LRF (Federation of Swedish Farmers), Lantmännen (Swedish Farmers' Cooperative), Scan (Swedish meat and charcuterie industry), Skånemejerier and Milko (Swedish dairies). Sju Gårdar decided early on that it suited their concept and applied to be, and became, the first to be officially climate certified.

- I see certification as a way forward to increasing the added value of Sju Gårdar's products, says Elisabeth.

High level of self-sufficiency

In practice this means a higher proportion of feed grown on the farm and a higher proportion of grass in crop rotations. Stabby Gård is 90 per cent self-sufficient and has 70 per cent ley in the crop rotation. Sju Gårdar prompted Lantmännen to produce a concentrated feed with a small climate impact; only Swedish and European raw materials are used in its manufacture.

– Successful crop growing is vital, says Elisabeth. You must have a good crop rotation that gives decent sized yields. Plant nutrition management is important. Climate certification involves doing regular plant nutrition balances that measure nitrogen utilisation.

– I see certification as a way forward to increasing the added value of Sju Gårdar's products, says Elisabeth Gauffin.

Elisabeth explains that the manure storage facilities have been extended, which allows all manure spreading to be done during the growing season.

- The new manure basin has been a large investment, but we believe that we will soon recoup the cost.

Another part of the climate regulations has to do

with energy use on the farm. Electricity must be eco-labelled and efforts must be made to cut down on use of fossil fuels. To do this energy use is first mapped and then analysed: what can be done to reduce energy use?

- The energy mapping was a real eye-opener. We saw clearly what "routine consumption" really means. There is also, of course, money to be saved when you think more carefully about your energy consumption!

Stabby is also implementing somewhat larger changes designed to reduce energy use. Among these is using chopped silage instead of large bales. And at the same time as the cow shed was extended, electric scrapers were installed to avoid diesel-consuming tractor scraping.

"the consumer response has been very positive to the three added values "local", "organic" and "climate certified" that Sju Gårdar's products can boast of."

- It's a question of making both large and small-scale savings, explains Elisabeth.

In the long term she believes that it could be feasible with a biogas plant on the farm. But as things are today they would need a much bigger herd to make such an investment pay.

Having healthy animals that yield well is a factor that reduces the climate impact. Climate certification for Sju Gårdar means that in addition to regular veterinary checks they also have a special vet who follows up the animals' health status.

So far the consumer response has been very positive to the three added values "local", "organic" and "climate certified" that Sju Gårdar's products can boast of.

Finally, Elisabeth emphasises that the threat of climate changes should not lead to resignation. Climate labelling shows that "everyone can do something". She cites the example of Nibble Gårdsgris, a conventional pig farm that has also been climate certified, to show that conventional farms can also reduce their climate impact and offer consumers added value. ■

Climate Certification – what is that?

Climate certification of food is a Swedish system for producers who want to reduce their emissions of climate gases, and demonstrate this to consumers. Rules are continuing to be developed to cover the entire food chain, from production on the farm, to transport, processing and packaging. Climate certification means that producers examine their production, analyse the possibilities for improvement and carry out measures that are scientifically grounded and practically possible. The development of climate certification is financed by the Swedish Board of Agriculture. The work is being carried out by KRAV, Svenskt Sigill, LRF, Lantmännen, Scan, Skånemejerier and Milko.

Read more at www.klimatmarkningen.se/in-english

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Protein utilisation gets better with birdsfoot trefoil

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A CORRESPONDING ARTICLE HAS ALSO BEEN PUBLISHED IN "HUSDJUR" NO 4 2013.

Inclusion of the legume birdsfoot trefoil in silage can improve dairy cows' protein supply. This is shown in trials at SLU.

It is possible to improve dairy cows' protein supply by including birdsfoot trefoil in the sward. Birdsfoot trefoil contains condensed tannins that bind to protein and so reduce degradation of the protein in the ensiling process and in the rumen.

- This means that the amount of AAT, amino acids absorbed in the small intestine, increases, says Torsten Eriksson, researcher at the Department of Animal Nutrition and Management at SLU.

Two-year trial

In a two-year feeding trial financed by SLU EkoForsk (a programme for research projects within organic agriculture and horticulture), he and Nilla Nilsdotter-Linde at the Department of Plant Production Ecology together with Jan Jansson from The Rural Economy and Agricultural Society in Sjuhärad investigated how tannins in grass fodder affect dairy cows' protein supply. If tannins can increase the AAT level and improve the protein balance in the rumen, both the cow's protein supply and utilisation of nitrogen is improved. The results are positive.

Because the cows in this experiment were supplied with sufficient energy but were undersupplied with

protein, the higher AAT level in the silage including birdsfoot trefoil gave a positive result compared with silage from grass with white clover. The protein level per kg milk was 0.5 gram higher and the yield increased by 36 gram protein per day, while the amount of milk increased by 0.8 kg.

- What was totally unexpected, however, was that the milk urea content and the amount of urea in urine was somewhat higher with birdsfoot trefoil, contrary to what one would have expected with an improved protein balance in the rumen. In spite of that, the cows' ability to utilise nitrogen showed a tendency towards improvement, says Torsten Eriksson.

Digestibility decreased

The results also show that the digestibility of fibre decreased with the birdsfoot trefoil ration, explaining why the amount of energy supplied per kg dry matter was a little less with the birdsfoot trefoil. This was more than compensated for by the improved protein supply.

- The rate of passage through the rumen was also the same for both feed rations, so there is no indication that the cows' food intake could have been inhibited by the lower fibre digestibility of birdsfoot trefoil. Otherwise this is usually seen as a potential disadvantage of plants containing tannins, says Torsten Eriksson.

The silage used in the trial came from a sward sown with the birdsfoot trefoil variety Oberhaunstaedter (12 kg per hectare) and perennial ryegrass, variety Condesa (8 kg per hectare) and a second ley sown with the white clover variety Lena (3 kg per hectare) and perennial ryegrass Herbie (20 kg per hectare).

- Condesa, a tetraploid, was chosen as a birdsfoot

"It should not be harvested too often, nor fertilised too much: two harvests, possibly three in southern Sweden."

NILLA NILSDOTTER-LINDE

trefoil companion crop because of its fairly weak competitiveness compared with the diploid Herbie, which due to its dense growth competes well with white clover. The aim was to have the same legume content and thereby approximately the same raw protein and fibre content, says Nilla Nilsdotter-Linde.

International research

International research is also being done on the affect of tannins on protein availability. In Wisconsin, USA, a trial was carried out recently with birdsfoot trefoil in which silages with low and high tannin contents were compared.

- Silage with the highest tannin content also had the largest effect on yield. The amount of milk, ECM* level, protein and fat yields – all parameters – were higher in silage with birdsfoot trefoil than for lucerne with which it was compared in this trial, says Professor Glen Broderick, guest researcher at SLU in 2013.

A difference was also seen in the American trial between high and low tannin contents: a high content gave 2 kg more in the milk yield.

But fibre digestibility increased in line with the tannin content, which is the total opposite of the findings from the Swedish trial, says Glen Broderick.

A coming legume

Birdsfoot trefoil is quite an uncommon legume in Swedish, intensively cultivated grasslands because of its fairly weak competitiveness.

- It should not be harvested too often nor fertilised too much: two harvests, possibly three in southern Sweden. It does not compete so well and amounts will decrease if we apply fertiliser due to increased competition by the grass component. If you seek the largest forage yields, you should not use birdsfoot trefoil, says Nilla Nilsdotter-Linde.

She considers that the southern Swedish system of three harvests works best if birdsfoot trefoil is grown with perennial ryegrass, but in the central Sweden system of two harvests it is better grown together with the competitively weaker timothy. In other words, the cultivation method needs to be adapted in order to harvest a large amount of birdsfoot trefoil.

Facts, birdsfoot trefoil

- Nitrogen-fixing, drought-tolerant legume. By not harvest too often and not fertilize too much, it can be long-lived in the sward.
- Contains condensed tannins. These bind to the protein in the feed and slows its degradation in the rumen.

Further reading...

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Previously it was not thought possible to obtain sufficiently large amounts of tannins in silage from birdsfoot trefoil grown in a mixed sward in Sweden. Trials have shown that varieties with a high tannin content seem not to be as winter hardy as varieties with a low tannin content.

- We have shown that even the low tannin contents found in Swedish mixed swards have a positive effect on protein utilisation, says Torsten Eriksson.

- Birdsfoot trefoil is a valuable complement to other legumes if you are looking for a more long-lived sward than with red clover. The variety Oberhaunstaedter combines quite a high tannin content with a satisfactory overwintering ability. Nevertheless, I would like to see more plant breeding to develop birdsfoot trefoil varieties better suited to our climate, says Nilla Nilsdotter-Linde.

*ECM=energy corrected milk

A ration rich in roughages can give the same amount of milk

An "organic" ration with up to 70 per cent roughage gives as much milk as a feeding plan with 50 per cent roughage, furthermore it is more profitable. This was demonstrated by Mikaela Patel's Ph.D. thesis.

For two year Mikaela Patel from SLU studied 92 dairy cows. During the first three months the proportion of roughage was constant. Then it was increased successively during lactation up to a maximum of 50, 70 or 90 per cent dry matter in the later stages of lactation.

- Today's settlement price for milk is low, while the price of concentrates is high which makes it difficult for producers to make a profit and feeding large amounts of concentrates is therefore not always economically viable, says Mikaela.

Better amino acid composition in milk

She also found positive effects on the milk's fatty acid composition when there was an increased proportion of silage in the feeding plan. However, when the cows ate up to 90 per cent roughage, milk yields decreased.

- If the silage has a high nutritional content, which it is possible to achieve today, a high level of concentrates in the feeding plan isn't necessary, says Mikaela.

- Roughages are much better nowadays than it was 30-40 years ago and although cows produce much more milk, they can manage large proportions of high quality roughage in their feed. Cows are designed to eat grass, so if they eat more roughage, it is also better for their health.

Mikaela Patel studied 92 high-yielding dairy cows that gave as much milk when the proportion of silage was increased up to 70 percent compared to when fed half silage. Photo: Gunilla Helmersson

Read more

In the thesis "Effects of Increasing the Proportion of High-Quality Grass Silage in the Diet of Dairy Cows"

Only cereals and silage

– profitable in organic production?

Feeding crushed cereals as a complement to high quality silage may give a better net economic result in organic milk production than a concentrate ration of protein concentrates.

In a two-year trial Eva and Rolf Spörndly, SLU, tested feeding plans including silage with different protein contents in combination with just cereals and with cereals and concentrates.

Better protein efficiency

The cows that did not receive any concentrates gave less milk, but with a higher fat and protein content. Calculated as energy corrected milk (ECM) they produced 10 per cent less. A calculation of protein efficiency, in other words, the amount of nitrogen from feed recovered in the milk, showed an on average 16 per cent higher efficiency when the cows were given cereals alone as a complement to silage.

At today's prices for organic milk and feed, the net economic result of not feeding concentrates was positive.

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Reinventing locally produced feedstuffs for pigs

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Stricter regulations requiring 100 per cent organic feed and an increase in feed self-sufficiency are creating a need for new feed crops for organic pigs. In two research projects, studies were done of the feasibility of fava beans and grass/clover silage once again becoming valuable ingredients in pig feed.

A fundamental idea within organic agriculture is that production should be based on local resources. Consequently, there is an ongoing tightening up of the regulations on locally supplied feed in organic animal production. One problem with this is that it can be difficult to grow fodder crops containing sufficient protein quality to meet pig requirements locally. Above all, it is the amino acid lysine that is the "bottle neck" when feeding pigs. Insufficient lysine levels in feed affects growth and muscle development negatively, and there is a risk of compensating for this by feeding too much protein, which can lead to nitrogen losses to the surrounding environment.

At a meeting in Stavanger in Norway organised by the European Association for Animal Production (EAAP), the preliminary results from two Swedish research projects financed by SLF (The Swedish Farmers' Foundation for Agricultural Research)

Preliminary results show no differences in sows production results when they are fed with locally grown fava bean instead of imported soybeans. Photo: Lars Birger Johansson.

on "new-old" locally produced pig feed that could supply the required protein were presented. The projects are not merely of interest for organic pig production, but also for the development of long-term sustainable pork production generally – whether certified or not. Both trials were carried out at SLU's research station at Funbo-Lövsta.

Are fava beans as good as soya?

White-flowering fava beans are a protein source with a good amino acid profile for pigs, especially sows. Because the high tannin content of older fava bean varieties made them less palatable and reduced nutrient uptake, as well as being suspected of leading to smaller litters and lower milk production in breeding sows, this source has not been utilised to any great extent in Swedish pig production during recent decades. Maria Neil at the Department of Animal Nutrition and Management, SLU and Kerstin Sigfridsson from Svenska Lantmännen carried out a trial comparing a conventional feed mixture, in which protein for the sows mainly came from imported soya, with one in which soya was replaced by fava bean. To succeed with optimal feeding, the content of other feedstuffs – e.g. barley, wheat and oilseed rape flour – in the feed mixture was varied between the treatments, but the overriding protein supply for the sows came from either soya or fava bean in the respective treatments (approximately 10 per cent of the feed ration on a dry matter basis). In the trial the researchers followed 40 sows and their piglets through two gestations and the ensuing suckling periods; the sows were divided equally between treatments (soya and fava bean).

Because protein quality and digestibility are lower in fava bean than in soya, it was expected that sows fed on fava beans would perform less well than those fed on soya. Preliminary results from the first gestation and suckling periods showed, however, no difference in the production result between the two treatments. In both treatments, the sows gave birth on average to 14 live piglets, with 10 remaining at weaning. Piglet growth was the same in both treatments and the piglets weighed on average 11 kg at weaning (5 weeks after farrowing) and on average between 27 and 28 kg at 9 weeks of age; nor when the researchers studied the total litter weight was there any difference between sows fed on fava bean, or soya feed. The sows' weight and body condition were measured at mating, farrowing and weaning and although the sows fed on fava beans were slightly lighter and thinner at weaning, the difference was not statistically significant.

In the second stage of the trial, the same sows receiving the same feed as in the first stage were followed in the ensuing gestation and suckling period. When the researchers have analysed these results as well, they will be able to evaluate the more long-term effects of feeding fava beans, for example, whether sows fed on fava beans are able to compensate for body resources (weight and fat) lost during suckling in the next gestation period, so that milk production and piglet growth maintain the same high level during the next suckling period.

Grass/clover silage contributes to nutrient supply in growing pigs

Grass/clover mixtures are often an important element in crop rotations and they are a locally produced feed already grown and available on the farm. Pigs in organic herds are fed grass silage as a supplement feed to give them the opportunity to perform typical pig behaviour, e.g. foraging and rooting. Additionally silage is often used as an important source of nutrition for sows and can contribute to about 50 per cent of the nutritional requirement. It is less common to see grass silage as a source of nutrition for growing pigs. In cases in which ley crops have been studied as a nutritional source for growing pigs, consumption has only been a few per cent of the feeding allocation on an energy basis.

Photo: iStockphoto.

In a recently completed trial, Magdalena Presto from

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the Department of Animal Nutrition and Management at SLU investigated how grass/clover silage can be used as a nutritional source for growing pigs. In the trial, an early silage crop made up 20 per cent (on an energy basis) of the feeding plan for growing pigs, while the rest of the feed allocation consisted of commercial cereal-based feed. Pigs were fed the silage in three different ways: chopped silage was mixed with the commercial feed and fed as a complete feed ration (SM); long-stranded silage was fed separately in feed racks while the commercial feed was fed in troughs (SS); and as complete ration pellets whereby the silage was dried and mixed with the commercial feed to form complete ration pellets. In addition, a control group was included in the trial and fed 100 per cent commercial feed on an energy basis. The pigs received free amounts of feed up to 60 kg and thereafter were limited according to Swedish recommendations. In total 128 pigs were included in the trial: 8 pigs per box, 2 boxes per treatment and production cycle, and two production batches.

Preliminary results from the first batch show that the pigs in the SM and SS treatments did not eat all the silage and therefore did not consume as much energy and protein as the pigs fed complete ration pellets and the pigs in the control group. Consequently, growth in those pigs was lower. On average over the entire feeding period, the pigs fed on complete ration pellets grew slightly slower than the pigs in the control group. When, however, growth was recalculated as lean meat growth (meat is central in pork production), there was no difference between pigs fed on complete ration pellets and those fed only commercial pig feed. On inspection of the carcases, it was found that the pigs fed chopped or long-strand silage had a higher proportion of lean meat on the carcases, which is desirable, but lower carcase weights and total amount of meat on the carcases.

The results indicate that grass silage is a valuable nutrient source (20 per cent on an energy basis) when included in the diet of growing pigs, but that pigs can only consume limited amounts. If fed as pellets, free allocation during the whole growing period is probably an alternative for maintaining production at the same level as with a conventional feeding plan. We are now waiting with anticipation for the results of the second production cycle.

- Grass silage's positive effect on the pigs' behaviour as well as its potential to be a locally produced feed source should be weighed up against the somewhat slower growth of the pigs. Its added value is a strong argument from an ethical point of view and that of long-term sustainable production; this can compensate for possible loss in production, says the project leader Magdalena Presto.

Contact persons: Maria Neil (maria.neil@slu.se) och Anna Wallenbeck (anna.wallenbeck@slu.se)

Read more

Book of abstracts from EAAP Meeting, Stavanger 2011: http://www.eaap.org/Previous_Annual_Meetings/2011Stavanger/index.html (see sessions 33 +50).

Presto, M., Rundgren, M. & Wallenbeck, A. 2013. Inclusion of grass/clover silage in the diet of growing/finishing pigs – Influence on pig time budgets and social behaviour. Acta Agriculturae Scandinavica, Section A – Animal Science.

Organic pig production in Sweden

- Approximately one percent of the slaughtered pigs in Sweden are organic.
- Most of the organic pig production in Sweden is certified by the KRAV organization whose regulations for pigs are stricter than the EU regulations.
- In KRAV's regulations for pigs, at least 50 per cent of the feed must be homegrown.
- KRAV:s regulation for pigs require grazing for all pigs during the grazing period.

Food production and self-produced energy on a small farm – what is possible?

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It is theoretically possible for a small-scale Swedish farm to be self-sufficient in energy and at the same time supply "its share" of the world's population with food. This by combining the use of horsepower with cultivation of rapeseed oil for tractor operations. But that would mean major social challenges to get enough manpower for such a diversified production, and to solve the distribution of food. This is evident in a study conducted by Sheshti Johansson at SLU.

The research farm Ekeby in eastern Sweden was used as a model for different scenarios. Ekeby has 11.5 hectares of arable land and pastures. The animals are reared solely on grazing and roughage. The research question was about how biomass based tractive power affects food production on a farm. The four investigated scenarios were i) diesel-powered tractor, ii) rapeseed oil for tractor operations combined with draught horse power, iii) the tractor running on ethanol from wheat (where ethanol was produced in large scale elsewhere), and iv) the tractor running on potatoe-ethanol produced at the farm.

Enough food in horse scenario

Globally, there are 0.2 hectares of arable land per person. This means that the studied farm would need to produce food for 58 persons. With the scenario where the rapeseed oil is combined with horsepower it is possible to produce this amount of food while being self-sufficient in energy. In contrast, ethanol takes too much acreage to produce enough food. Benefits of horses as draft animals compared with the cultivation of energy crops is also that ley to feed horses is easier to get into a crop rotation and causes less soil compaction. Furthermore, the total energy used at the farm is less in the horse scenario.

Potassium deficiency in all scenarios

The flows of plant nutrients were also calculated. All scenarios were balanced in terms of nitrogen. The rapeseed oil & horse scenario showed a small deficit of phosphorus that could be adjusted through return of bones from slaughtered animals. In all scenarios, there was a significant lack of potassium, which is not a problem on the sedimentary clay soils in Sweden, but elsewhere demands a solution for recirculation.

Efficient dairy cows

The study also shows that milk production, even with low-producing cows, is an efficient way to produce food from grasslands. With only sheep and no cows, only half as many people can be supplied on the same acreage .

Photo: Wikimedia commons

When Sheshti Johansson presented her study at the NJF conference "Organic farming as a driver for change", she brought up for discussion if it is possible to optimize this kind of small-scale systems for higher yields. She pointed out that higher yields are leading to faster turnover of nutrients. She also discussed the need for labor for food production in Sweden, based on similar small-scale systems. With today's salaries, it is an equation that does not add up.

– But what is work and what is leisure in the future, Sheshti asked. For example, to take care of horses many do for free already today.

Read more
Johansson, S. & Belfrage, K. 2013. Self-sufficiency of fuels for tractive power in small-scale organic agriculture. Proceedings from NJF Seminar 46. p 107–108.


Foto: Camilla Mathiesen.

NJF seminar 461: Organic farming systems as a driver for change

"Organic farming systems as a driver for change" was arranged in Bredsten, Denmark during August 21-23, 2013. The seminar was arranged by Nordic Association of Agricultural Scientists (NJF) in cooperation with International Centre for Research in Organic Food systems, ICROFS in Denmark, and EPOK. 120 active researchers and advisors from 15 European countries, and three colleagues from as far away as the Republic of Korea, participated. More info at www.njf.nu

Organic farming systems:

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Driving for change – or digging in the same old dirt?

A recent seminar arranged by the Nordic Association of Agricultural Scientists (NJF) in Denmark discussed the theme "Organic farming systems as a driver for change" over three days. The conclusion after 47 oral presentations, 33 actively discussed posters and visits to productive and inspiring organic farms was: research contributes to innovation, and farmers believe in an organic future.

The seminar was organised on four tracks, called Societal and Economic Viability; Transition to Renewable Resources; Nutrient Sufficiency and Management in Farming Systems; and Productivity and Sustainable Production Levels in Animal and Crop Production Systems. Within each track, an invited expert contributed in all sessions to keep the overview, bring up central topics in the discussions, and summarize the tracks in the final plenary session.

Two different research perspectives

Niels Halberg, director of ICROFS, lead the final plenary discussion, and presented the twin perspectives of research in organic farming systems. Researchers may either:

- Develop organic agriculture as a laboratory for general agriculture, or
- Develop organic agriculture solving inherent challenges, and in relation to IFOAM's* four basic principles of health, ecology, fairness and care.

As an example of the first perspective, Halberg mentioned the success of significantly decreasing the use of antibiotics in organic dairy cows in Denmark, to a level being only 10 per cent of the conventional use. Perma-culture inspired organic egg production, where laying hens are combined with orchards, or

*International Federation of Organic Agriculture Movements

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Societal and economic viability – *"take home" messages*

- Overall, organic farming represents a good opportunity to maintain a living for small-scale farmers in developing countries.
- Organic farming contributes to empowerment of small-scale producers
- The whole value chain can also drive growth. Eating is part of agriculture
- Organisations supporting organic farming are very important
- Promising new management practises are being developed, e.g. combining trees and livestock
- Interesting new tools to work with farmers are developed, such as a picture tool to discuss weed management
- The various customers, from consumers to retailers, research funders and policy-makers, all want value(s) for money. Values can be externalities, so documentation is required!

The four experts: Tommy Dalgaard, Susanne Padel, Elizabeth Stockdale och Paolo Bàrberi. Photo: Anita Land.

coppiced willow as energy crop, is an example of the second perspective. Both enterprises benefit from the other, since the trees or willows utilize the manure and weeding capacity of the animals, who enjoy shading and protecting from the vegetation. Halberg then asked whether the seminar had proved that organic farming systems are in fact a driver for change.

The four invited experts summarized some of the most inspiring and relevant results from the tracks and sessions that they followed. Important "take home"- messages were derived, and are shown from each track (text boxes). Susanne Padel from the Organic Research Center in UK pointed out that research has a different role for different actors, although the boundaries are fuzzy. Farmers and advisors need demonstrations and knowledge generation, whereas policy makers need an evidence base. Susanne left open the question what is the role for researchers.

Sufficient attention to the development?

She also pointed out a another very important question to the researchers: Have we kept up with the extremely rapid development of agricultural structure, or are we too much bound by romantic images of small-scale farming? Specialization is now a reality and farmers need to respond to dynamically evolving markets if they want to stay in business.

Need for good arguments

Susanne proposed to emphasize research into evidence of positive long-term effects of organic farming such as soil carbon stock and biodiversity. Farmers need good arguments to understand how they can invest in sustainability.

More research on multifunctionality

Tommy Dalgaard from Aarhus University, Denmark found many promising approaches among the contributions. He suggested more research on the effect of (bio)diverse systems, e.g. with respect to resilience towards climatic changes, and how to cover the temporal variations in energy and resource needs when renewable resources and energy get more common. Methods should be developed to assess trade-offs between services (e.g. producing energy) and multifunctionality.

Holistic view on plant nutrition

Elizabeth Stockdale from Newcastle University, UK challenged us to consider whether true "stockless" organic farming in the long-term was possible or even desirable. Many of the presentations in the track had linked cropping and livestock systems through manure; more innovations are needed to optimize the balance between cropping and stock densities often at regional, rather than farm scales. Management of nutrients cannot be considered alone, and raises issues covered in the other tracks such as dinitrous oxide emissions, soil physical conditions and consequences for plant nutrient uptake, and links between nutrient management strategies and selection of specific crops/varieties. Issues such as the proportion of home produced versus purchased feed, demand for protein feed and costs for fertilizers have recently become concerns for conventional farming too, and organic farms and farmers have been frontrunners in inventing solutions such as integration of legumes in carefully designed crop rotations. However, organic farming may need to innovate further and find appropriate ways to sustainably integrate the use of human wastes into farming systems to fully integrate the nutrient cycle.

Specialization may involve risks

Important advice was given by Paolo Barberi, who suggested that future studies should compare environmental performances of organic farming systems over time, instead of comparing conventional and organic systems. Barberi was worried by several trends that threaten the diversity of organic farming, such as reduced diversity of habitats, species and varieties in specialized vegetable production, and increased use of concentrates and silage, reduced grazing, synchronization of calving season and suboptimal working/

Transition to renewable resources – *"take home" messages*

- Organic regulations may in fact foster innovations, because creativity is used to cope with the restrictions. This may support development of more resource-efficient organic farming systems.
- Linking livestock to crop production, and recycling nutrients back to agriculture, is crucial. Biogas may be a useful measure!
- Present organic farming systems demonstrate high variation: From very good, to very bad resource efficiency and sustainability impact
- Organic farming systems foster whole system-thinking, and aims at reducing the input of non-renewable resources

On study visit to the farmer Anders Lund. Photo: Camilla Mathiesen.

living environment for workers and animals in specialized dairy farming. On the positive side, it was reported during the seminar that milk yields can be high even with "only" 30 per cent concentrates in the fodder ration, and new fodder sources as well as breeding approaches emphasizing diversity are under way.

Another seminar in four years?

The seminar participants were generally very satisfied, and mentioned especially inspiring farm visits and engaged discussions during poster workshops as very good elements of the seminar. All posters had a short oral presentation during sessions organized along the four tracks. Another organic NJF seminar in 4 years was unanimously welcomed, and the Finnish institute of organic farming offered to host the next seminar. ■

Björn Ringselle discusses his poster on resource-efficient control of the weed couch grass. Photo: Pelle Fredriksson.

Nutrient sufficiency and management in farming systems – "*take home" messages*

- Are stockless organic production systems really possible, or even desirable?
- For all innovations proposed for better nutrient management, the authors should consider whether they are economically viable, practically possible within a farming system, and whether the framework and regulations are supportive (for instance, with respect to sewage sludge).

Productivity and sustainable production levels in animal and crop production systems – "*take home" messages*

- We still need a lot of basic bio/ecological knowledge! Focus should be on interactions between taxa for instance clover fatigue, where nematodes, fungi, plants and bacteria are all involved
- Future research should be allowed to be visionary!
- There is still a significant need to communicate the importance of long-term experiments, interdisciplinarity and system approaches to funding bodies and other stakeholders
- Long-term experiments should be designed flexible enough to allow for short-term testing of technical innovations
- National research evaluations should be de-conventionalized, looking for innovations, not only publishing activities.

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Organic research in the Nordic countries - An engine for development?

Research alone is not sufficient to drive development. There is a gap between research and practice that needs to be bridged with the help of demonstration plots, field visits and other activities that can be difficult to fund and not meritorious for researchers to take part in. It is however important that researchers, advisors and farmers work together, ideally with a participatory approach. For research to be fully effective, a programme with guidelines and funding is crucial. These were some of the conclusions of a workshop on research as a driver for change.

In Denmark and Sweden there are special research program for organic agriculture, while on Island there are virtually no such research. Photo: iStock.

Large differences

During a workshop at the conference "Organic farming systems as a driver for change" in August 2013, representatives from the Nordic countries and Estonia described how research in organic agriculture is organised and funded as well as the current aims and priorities in their respective countries. The differences are large. Only in Denmark and Sweden is there funding specially allocated for research in organics and research agendas that give directions for priorities. In Denmark, an evaluation was done recently of the three research programmes looking at the organic food chain than had been running for a total of 15 years. The evaluation showed that the programmes have had a large effect on the sector's development. The main reasons for this are that the projects have been in keeping with the branch needs and many of the projects have been run in close contact with advisors and farmers. Furthermore, already in the planning stages projects were designed to ensure that the measures tested were relevant and as practically workable as possible, without on that account compromising scientific standards.

Finnish focus on the food chain

In Finland a new institution for research in the organic food system has been started in collaboration with Helsinki University and MTT Agrifood Food Research Finland. The new institute will coordinate actors in the food chain and researchers in order to develop the organic food system in Finland from a scientific perspective. Previously, Finnish research in organics was quite narrowly focussed on the agricultural sector. Now the intention is to achieve multi-

A new Finnish Institute will work with the whole organic food chain. Photo: iStock.

disciplinary, perhaps even holistic research inputs on the whole chain from soil to table.

The new Finnish institute is building networks with researchers interested in organics, picking up signals from actors in the food chain about their wishes for research directions and communicating with research funding sources.

Norway, Iceland and Estonia fighting an uphill battle

In Norway there is no national programme with funding earmarked for research in organics, so organic research has to compete with other research in the food chain. Bioforsk Organic, where the largest part of organic research in Norway is carried out, sees research on sustainability, environmental effects and animal welfare as strategic areas. Bioforsk Organic works closely with advisory organisations.

On Iceland there is scarcely a single research project with an organic focus. Advisors and organic farmers must to a large extent rely on student projects and a lot of older research from the time before modern inputs became common in Icelandic agriculture.

In Estonia 15 per cent of agricultural land is cultivated organically and domestic demand for organic products is on the rise. However, much of the organic production is extensive and products do not reach the market. Processing and distribution are underdeveloped and this is where research needs to focus at present.

How should research be organised?

Research in the organic food system can be done at special institutions or an institute such as Bioforsk Økologisk in Norway or, as in Sweden and Denmark, at institutes offering the ordinary research disciplines. During the workshop the advantages and disadvantages of this was discussed. A separate institute risks being isolated and not having access to the leading disciplinary expertise, whereas with researchers who also carry out research on conventional production there is the risk that the, for organic production, important holistic view is lost and that special methods for organic research are not developed. Yet what is most important for research in organic farming to be a strong driver for change is that there are targeted programmes with funding. ■

Read more
NJF Seminar 461. Organic farming systems as a driver for change. 2013. p 89–101.

Meeting between centres

At the NJF conference ”Organic farming systems as a driver for change” in August 2013, Nordic centers tasked with coordination of research on organic food and farming held brief meeting with two representatives each from the Norwegian Bioforsk Organic, Swedish EPOK, Danish International Centre for Research in Organic food Systems (ICROFS) and the new Finnish Institute for research in organic food systems.

The organizations presented their respective activities and discussed forms and areas for future cooperation. This may involve exchange of research information and promotion of joint Nordic research projects. Initially a compilation where various Nordic research strategies in the area are compared. ■

From left: Niels Halberg &; Ilse Ankjær Rasmussen, ICROFS; Atle Wibe, Bioforsk Økologisk; Maria Wivstad, EPOK; Jaakko Nuutila, Finnish Institute for Organic Food; Karin Ullvén, EPOK; Pirjo Siiskonen, Finnish Institute for Organic Food samt Kristin Sørheim, Bioforsk Økologisk.

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CORE Organic II: Nordic partners in eleven of fourteen projects

In CORE Organic II European countries are combining their funds to make better use of resources and carry out research with high quality and relevance over national borders.

CORE Organic II is a transnational European research collaboration supported by the European Commission. It is a so-called ERA-NET which has the aim of developing and strengthening national and regional research programmes. Twenty six partners from twenty one countries are participating. The International Centre for Research in Organic Food Systems (ICROFS) in Denmark is responsible for coordination. Participating partners prioritise research areas within which thematic calls for proposals are made and then decide which projects to grant funding. Each country then funds, after negotiations, its own researchers. In the last of the three CORE Organic II research calls, however, the participating countries pooled their project funding, regardless of which nation it was eventually allocated to. A requirement for the projects has been that they should be run in project consortia of participants from at least three countries.

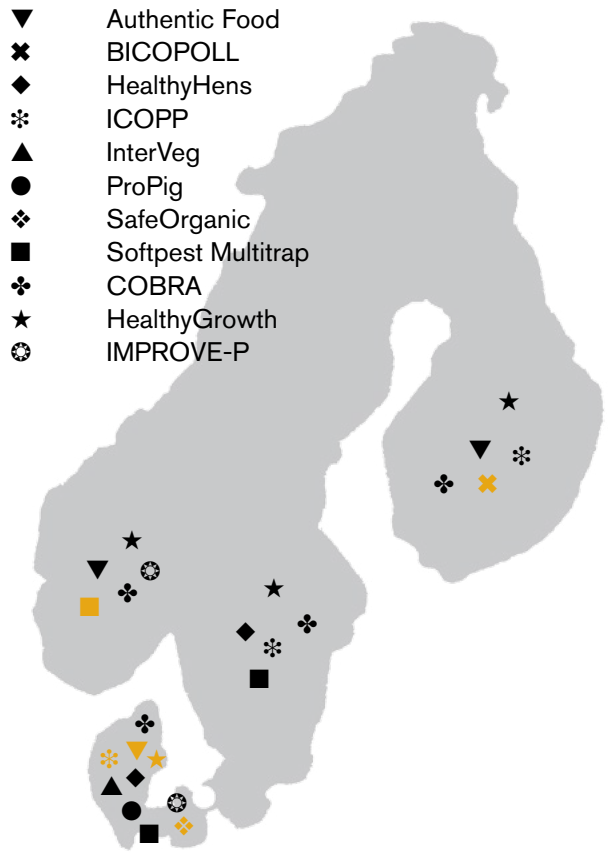
To be continued – the latest news!

All funding in CORE Organic II has now been allocated but a so-called ERA-NET Plus project was announced in December. The EU Commission is contributing additional funding for this new research call so that the total budget will be 10 million Euro. ■

All CORE Organic II-projekt:

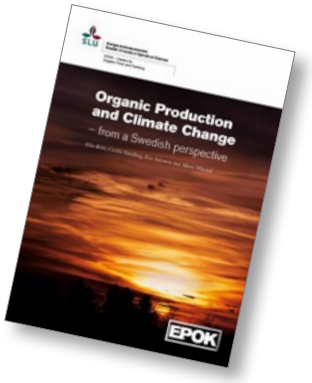
- Authentic Food – Fast methods for authentication of organic plant based foods
- BICOPOLL – Targeted biocontrol and pollination enhancement
- BIO-INCROP – Innovative cropping techniques to increase soil health in organic fruit tree crops
- HealthyHens – management of health, welfare and environmental impacts in organic laying hens
- ICOPP – Developing sustainable 100 % organic feed strategies for pigs and poultry
- InterVeg – Enhancing multifunctional benefits of cover crops – vegetables intercropping
- ProPig – Strategies to reduce environmental impact by improving health and welfare of organic pigs
- SafeOrganic – Restrictive use of antibiotics in organic animal farming – a potential for safer, high quality products with less antibiotic resistant bacteria
- Softpest Multitrap – Management of pest insects in organic strawberry and raspberry fields
- TILMAN-ORG – Integrating reduced tillage and green manures in organic cropping systems
- Vineman.Org – Enhancing organic grape production through a more efficient control of the grape diseases
- COBRA – Supporting and developing European organic plant breeding and seed production
- HealthyGrowth – Value-based growth of organic food chains
- IMPROVE-P

Nordic participation is shown in the figure to the right.



Nordic participation in ongoing and recently finished projects. Black symbol means that at least one partner from the country is participating in the project. Yellow symbol means that the project is coordinated from the country in question.

In brief



Compilation about climate impact of organic agriculture

Last summer EPOK published a knowledge synthesis that describes the climate impact of organic agriculture in a Swedish context, its potential to contribute to reducing the climate gas emissions and additionally future research needs. The report, which is only published in Swedish, has now been summarized in a brochure in English.

Download from EPOK's website

Mustard can clean soil from pea-root rot

White mustard *(Sinapis alba)* can be used to decontaminate soil that is infested with the pea-root rot without affecting the nitrogen-fixing bacteria. This was shown by the SLU researcher Shakhawat Hossain in his doctoral thesis.

Cruciferous catch crops that are already used in some cropping systems to reduce nutrient runoff and prevent soil erosion, can also be used to suppress certain soil borne pathogens. Most brassicas contain glucosinolates which in various forms can be highly toxic to soil organism. Various vegetative parts of the plant and various brassica have different chemical profiles.

The researchers found that white mustard clearly inhibited the development of pea-root rot in an experiment where white mustard were grown for 11 weeks in a contaminated soil. The main limiting factor appeared to be hydrolysis products of glucosinolates produced by white mustard's roots. Laboratory experiments showed that the for the peas so important nitrogen-fixing organisms where not inhibited by mustard.

Read more in the thesis

Hossain, H. 2013. Impact of Brassicaceae Cover Crops on Pea Root Rot (Aphanomyces euteiches) in Subsequent Peas. Acta Universitatis Agriculturæ Sueciae 2013:78.

Organic scampi produced in Sweden

A Swedish company has developed a method for growing organic king prawns in Sweden. The goal is to reach the market with a certified prawn for Christmas 2014. The approach is to use a rotation based microbial feed and waste heat from heating plants. The company Vegafish is working together with the Swedish University of Agricultural Sciences.

Read more at www.vegafish.com

Guidelines for ecological recycling agriculture

Guidelines for ecological recycling agriculture in the Baltic Sea region has been developed within the BERAS project. They are divided into guidelines for farming, finance and marketing.

BERAS stands for Baltic Ecological Recycling Agriculture and Society. It is an EU-funded project that has been going on since 2007.

Read more at beras.eu

Organic farming has greater impact on pollinators in monotonous landscapes

Pollinating insects thrive in varied landscapes and the agricultural system has less bearing on the number of species. But in more monotonous farmlands can organic farming contribute to a wider range of pollinating insects.

"How does the agricultural system and type of landscape affect the species composition of pollinators?" This question researchers at Lund University tried to answer in a study conducted in southern Sweden. They found that in crop fields in more varied landscapes, there were more species of pollinating insects, and the species number declined as the landscape became less varied. This decrease was most pronounced in field grown conventionally while organic fields where more able to maintain the width of pollinating insects also in monotonous landscapes. However, there was no clear difference in the species composition of pollinators between organic and conventional fields if they were in a varied landscape.

Read more in
Andersson, G., Birkhofer, K., Rundlöf, B. & Smith, HG. 2013. Landscape heterogeneity and farming practice alter the species composition and taxonomic breadth of pollinator communities. Basic and applied ecology.

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Variety mixtures to reduce pest problems

Growing a mixture of varieties may have many advantages for the farmer, for example, reduced spread of fungal diseases, less crop damage and more stable yields. By mixing varieties in the field, the varieties' resistance to disease can be increased, in other words, resilience is not so easily broken down.

The effect of variety mixtures has mainly been studied on cereal crops and fungal diseases spread by the wind. When varieties with differing susceptibility to, for example, mildew are mixed in the field both physical and plant chemical barriers are created to the spread of the harmful fungi.

Variety mixtures can also have an effect on insect pests and natural enemies. This has been demonstrated by researchers at SLU and Stockholm University in a collaboration within the research programme PlantComMistra.

With the right variety mixtures of spring barley, communication between the varieties was increased making the crop less attractive to aphids. Natural enemies were also benefited by the variety mixtures; for example, some combinations of spring barley varieties were more attractive to ladybirds and attracted them to the crop even before the plants were attacked by aphids.

Read more at www.mistra.org/en/mistra/research/completed-research/plantcom-mistra.html

Aphids avoid ladybugs

Aphids can sense where ladybugs have stayed. A new study from SLU shows that aphids avoid establishing themselves on plants where their archenemy the ladybug has been.

It has previously been shown that aphids can emit alarm substances, making other aphids to escape. In the latest study from SLU researchers conclude that they also avoid plants that have been visited by ladybugs.

Read more in
Ninkovic, V., Feng, Y., Olsson, U. & Pettersson J. (2013). Ladybird footprints induce aphid avoidance behaviour. Biological Control 65(1), 63–71

Poo-eating maggots can be animal feed

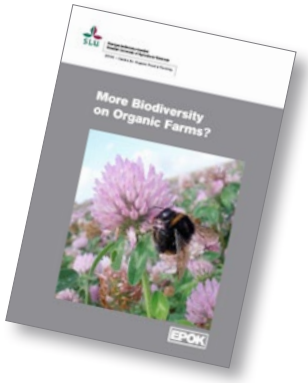
Maggots can convert latrine waste into animal feed, according to a study done at SLU. The larvae of the black soldier fly, as used in the study is an excellent source of protein in animal feed, while the volume of the treated waste is drastically reduced. Larvae treatment of waste also reduces bacteria, including salmonella.

Read more in
Lalander, C., Diener, S., Magri, M.E., Zurbrügg, C., Lindström, A., Vinnerås, B. 2013. Faecal sludge management with the larvae of the black soldier fly *(Hermetia illucens)* – From a hygiene aspect. Science of the Total Environment, 458–460(0), 312-318

Trimming increases nitrogen losses from green manure leys

Nitrogen fixation in green manure leys increases if they are trimmed during the season. A portion of the nitrogen is however lost after trimming if the plant material is left in the field. This is shown in a report from SLU. Mixed leys and harvesting instead of trimming is the advice to reduce nitrogen losses.

Read more about the project at www.slu.se/en/collaborative-centres-and-projects/ekoforsk/projects-2005-2007/red-clover-nitrogen-fixation/



Organic agriculture, biodiversity and ecosystem services

Last year EPOK published a knowledge synthesis on organic agriculture, biodiversity and ecosystem services in a landscape perspective. It summarizes recent research on the impact of organic agriculture on biodiversity in the agricultural landscape and on some ecosystem services as pollination, decomposing of plant material and biological control. The report is only available in Swedish, but the results are compiled in a brochure in English.

Download from EPOK's website

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Maria Wivstad is the director of EPOK and has a background as researcher in the area of cropping systems with a focus on nutrient management and organic production. Her doctoral thesis was about green-manure crops as a source of nitrogen in cropping systems. Maria has also worked to popularize research and with communication between research and practice.

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