



Photo: Nora Adelsköld

Cows in organic herds are treated for udder inflammation as often as cows in conventional herds. They also calve at the same rate.

Organic cows just as healthy and fertile

The health of cows in organic herds is largely the same as in conventional herds. They are treated roughly as often for udder inflammation and calve at the same rate. These are findings of a doctoral thesis completed at SLU, in which udder health, overall level of ill-health, fertility, longevity and metabolism were compared.

The idea of organic milk production is to enable cows to have a healthier and longer life by way of lower milk yields combined with better living conditions. There are elements of organic animal husbandry that could possibly adversely affect animal health, although this study shows this not to be the case.

The study is based on information from databases and studies conducted at various dairy farms, including the Öjebyn experimental farm, where organic and conventional dairy production have been conducted in parallel over a twelve-year period. ■

Nils.Fall@kv.slu.se

New growth model for perch farms

Farmed perch are highly sensitive to shade and other stress factors. Åsa Strand at SLU in Umeå has conducted laboratory experiments showing that growth declined by almost 50 per cent as a result of severe disturbance, with major implications for fish farm profitability.

She also studied growth and energy requirements of the fish at various temperatures, fish size, trough colour and light intensity. The fish were not particularly concerned about the colour of their troughs, but in dim light, the contrast was clearest between the feeding-stuff and the light coloured troughs. This meant that a higher proportion of the food was snapped up by the fish and they displayed better growth.



Photo: Åsa Strand

Farmed perch are highly sensitive to stress.

These fish farming data have been incorporated in a growth model and an energy requirement model, which can be used to calculate perch growth and feed requirements. ■

Åsa.Strand@yfm.slu.se

Fewer species with rising crop yields

While crop yields from European agriculture have doubled, biodiversity has declined. Half of all plant species and one-third of ground beetles and birds have disappeared from the agricultural landscape. This is due to an increase in the use of artificial fertilisers and pesticides, notwithstanding restrictions introduced in the EU in the early 1990s. In particular, according to an SLU-led study of nine European agricultural regions, the use of insecticides and fungicides has led to a marked decline in biodiversity. Biological control with the help of natural enemies (e.g., ladybirds that feed on aphids) was also adversely affected.

Organic farming and other forms of

government support for less intensive forms of agriculture mitigated the negative trend locally. But biodiversity on farms operating on an organic basis may be adversely affected by use of pesticides on surrounding farms, since many birds, mammals, butterflies and other insects look for food over areas greater than individual farms. Researchers believe that far more restrictive use of pesticides will be required in order to retain a rich diversity of species in the European agricultural landscape. ■

Jan.Bengtsson@ekol.slu.se

Amino acids – a significant source of nitrogen

Plants absorb not only nitrate and ammonium. Amino acids, i.e. the small units that build proteins, may be an additional source of nitrogen. One source of amino acids is decaying organic matter in soil.

During her work on her doctoral thesis, Sandra Jämtgård at SLU in Umeå found low concentrations of amino acids in different agricultural soils, although the store of these

acids is probably replenished continually as decomposition progresses. In greenhouse experiments she found that the capacity of barley to absorb amino acids is comparable with their absorption of nitrate and ammonium at the same concentrations.

It was evident that there are special “transport proteins”, which are responsible for absorption in the plant root; one for acidic and one for basic amino acids. The plant is able to adapt to cope with nutrient conditions in the soil in that the genes governing the production of transport proteins are activated in the presence of amino acids, even if nitrate and ammonium are also available. ■

Sandra.Jamtgard@njb.slu.se

Rodents shun mink treated beech nuts

It is expensive to plant oak and beech on clear-cut areas. For this reason, many forest owners still choose to plant spruce or pine. Another, cheaper way of regenerating broad leaf deciduous forest is by direct seeding. Unfortunately, small rodents (bank voles and wood mice) like to eat acorns and beech nuts. Beech nuts contain more energy than acorns, and cannot be sown as deep, which makes successful direct seeding of beech more difficult.

However, if the seed is first treated with mink excrement, it may have a better chance of being left alone. In laboratory tests at SLU in Alnarp, it was found that consumption of treated beech nuts was halved as compared with untreated ones. It was also found that plants established better after direct seeding on large, open regeneration areas, which rodents tend to avoid. ■

Maria.Birkedal@ess.slu.se



Small rodents are very partial to beech nuts.

Virgin forests rarer than previously thought

Northern Sweden is home to some of the last remnants of virgin pine forest in Europe. But how “virgin” are they in fact? As part of the work on his doctoral thesis, Torbjörn Josefsson at SLU in Umeå has



Ancient pine forests show signs of centuries of land use.

studied forest structure and composition, biodiversity and human impact in three ancient forests. He has combined field studies with archaeological finds and historical documents.

The ancient pine forests showed signs of land use and human influence over a very long period. Even though centuries had passed since ancient forms of land use had ceased, signs of it could still be found in the forest. For instance, there are far fewer large, old trees and dead trees left standing or lying on the forest floor around abandoned settlements than are found in the surrounding forest landscape. Signs of prolonged and intensive reindeer husbandry can also be clearly seen in the forest.

Large areas of forest, where neither forestry nor agriculture has ever been practised, and which have only locally been impacted by preindustrial activity, are very rare indeed. Thus, even though the pine forests studied are not genuine virgin forest, they should be excluded from forestry, since they are not only ecologically valuable; they also represent the last remnants of an ancient rural landscape, with unusual archaeological remains and signs of human activity. ■

Torbjorn.Josefsson@svek.slu.se

Russian larch gaining ground?

Larch has a high proportion of heartwood, which makes it an attractive alternative to pressure impregnated timber in various outdoor environments, such as playgrounds, jetties, verandas and facade panelling.

Most larch planted in southern Sweden nowadays is a hybrid – a cross between Japanese larch (*Larix kaempferi*) and European larch (*L. decidua*). Russian, also called Siberian, larch (*L. sukaczewii*) is planted in northern Sweden. Hybrid larch grows more rapidly, but is less hardy and produces timber of poorer general quality than the Russian larches.

However, there are differences between the Russian species. A doctoral thesis by Lars Karlman of SLU in Umeå concludes

that the western Russian species *L. sukaczewii* is the one that should be planted in northern Sweden. Moreover, seeds for plant production should come from the more maritime areas of Russia, since these are better adapted to the Swedish climate. He compared five-year-old saplings of *L. sukaczewii* with three other Russian species. *L. sukaczewii* survived best in the field, coped with frost best and displayed good stem quality. Older stands of the same species have grown well on soil of good bonity, but on poorer soils, pine does better. In small-scale trials, hybrids of Siberian and European larch have shown even higher yield potential than *L. sukaczewii*. ■

Lars.Karlman@jll.se

Timber assessed using image analysis

Sawmill scalers can now use cameras and computer image analysis to count the annual rings in timber. This enables inspectors to spend their time assessing other quality criteria, such as size, crookedness and damage – saving sawmills money in the process.

The image analysis method has been developed at SLU in Uppsala and involves use of a camera that photographs the ends of logs on the sawmill conveyor belts. The log ends are often dirty, dry and roughly sawn, which makes it more difficult to count the annual rings. The images must therefore be enhanced and sharpened before they can be analysed. Kristin Norell used and modified existing image analysis methods and developed a new mathematical calculation method for determining the distance between annual growth rings. The method works with both pine and spruce. ■

Kristin.Norell@cb.slu.se

Plants used to filter leachate

Phosphorus and organic substances leach from piles of watered timber and may cause eutrophication and oxygen deficiency in lakes, rivers and streams. Åsa Hedmark at SLU has been studying the efficiency of soil infiltration in order to reduce concentrations of phosphorus and organic carbon in timber leachate. The experimental infiltration systems were planted with alder, Salix, perennial ryegrass or reed canary grass. Infiltration was found to be an efficient means of removing organic substances (52–79 per cent) and phosphorus (37–88 per cent). The different species were equally effective.

Timber leachate was also channelled

onto an area of artificial wetland adjacent to a sawmill. However, the wetland did not clean the leachate, which may indicate that it was too small, or that the leachate was too poor in oxygen.

It was found that storm-felled timber that had lain in the forest for a year and had then been stored and watered at sawmills gave rise to greater phosphorus emissions than timber transported straight to the sawmills after being felled. This is because the storm-felled trees had begun to decompose and lose their outer bark in the forest. This information is highly relevant today, since storms are expected to become more frequent in the future, and sawmills will need to be prepared to stockpile greater quantities of storm-felled timber. ■

Asa.Hedmark@sprod.slu.se

Diatoms reflect lake quality

Stationary diatoms reveal whether a river or stream is eutrophied, acidified or affected by organic pollutants. Researchers at SLU in Uppsala are now determining whether the method using diatoms as an indicator in watercourses also works in lakes.

Diatoms are unicellular organisms found in both fresh and salt water, used as an environmental indicator in most types of rivers and streams in several European countries. The method is based on the fact that different diatom species have a specific tolerance or preference for nutrient abundance, organic pollutants or pH.

Initial results suggest that existing diatom indices for streams can also be used to assess lake water quality. The variation between different sites in the same lake falls within the margin of error, which means that a single sampling site is expected to suffice for assessment of an entire lake. The variation over time is greater, but the reasons for this have not yet been examined. ■

Maria.Kahlert@vatten.slu.se

Emissions trading around Baltic basins

Toxic algal blooms, dead sea bottoms and declining fish stocks have become a daily reality for people living along the shores of the Baltic Sea. Agreements reached thirty years ago to reduce emissions of nutrients, particularly those of phosphorus and nitrogen, have not yielded the desired results. New, ambitious targets were set by the *Baltic Sea Action Plan* (BSAP) in 2007. These targets are based on clear water treatment standards in each catchment area to be



Photo: Nona Adelsköld

Trade in emission rights could be an economic way of saving the Baltic Sea.

achieved by individual countries bordering seven defined areas of the Baltic Sea, called "marine basins". The targets set by BSAP to reduce nutrient emissions would involve very costly measures in some countries (including Sweden), whereas measures in other countries (such as Finland and Germany) would not be as expensive.

In a recent report, Katarina Elofsson at SLU in Uppsala proposes that a geographical reallocation of measures between the countries should be allowed by way of trade in emission rights. This will enable the targets to be achieved while potentially saving SEK 7 billion (i.e. 16 per cent of the total cost of meeting the BSAP targets). Belarus and Ukraine, which contribute to eutrophication, but which are not included in BSAP, could be involved by separate agreements between them and other, "more costly" countries in the region. ■

Katarina.Elofsson@ekon.slu.se

Spotlight on photosynthesis in marine plankton

The conditions for photosynthetic carbon fixation in the sea differ from those on land. Most carbon occurs in the form of water-soluble carbonates, which must be converted into carbon dioxide before it can be used for photosynthesis. Aquatic phytoplankton have developed special microcompartments for this purpose, known as carboxysomes, to which the carbonates are transported and converted into carbon dioxide. The concentration of carbon dioxide may be a thousand times higher inside the microcompartment than in the surrounding cell, which enhances the effect of the photosynthesis enzyme Rubisco*.

Most phytoplankton is produced in the polar regions. Inger Andersson, a structural biologist at SLU in Uppsala, has previously mapped the structure of Rubisco. Her research team has gathered phytoplankton from Svalbard, and is now making a detailed study of the structure

of the proteins in the carboxysomes and how they interact. It is already known that special proteins transport the carbon dioxide and carbonates into the microcompartment, and prevent leakage into the surrounding cell. SLU researchers are now studying the way this barrier works.

Marine phytoplankton account for half of all carbon fixed during photosynthesis. This means that the photosynthesis carried out by these phytoplankton has a major impact on the earth's carbon flows. ■

*Rubisco is a protein (enzyme) needed for photosynthesis. It assists in the process of converting carbon dioxide into carbohydrates. All organisms that photosynthesise, i.e. plants, bacteria, cyanobacteria and algae, use this enzyme, on land and in the sea.

Inger.Andersson@molbio.slu.se

Land quest bad for African women

Increasing demand for food and fuel places considerable stress on land and water, especially for poor women in Africa.

The food crisis of 2007 – 2008 arose when issues of climate change were high on the agenda in richer countries. It is estimated that biofuels accounted for 30 per cent of the increase in grain prices from 2000 to 2007. The growing demand for biofuels is partly a result of the EU *Climate and Energy Package*, aimed at cutting greenhouse gases and energy consumption. Subsidies have provided an incentive for rich countries to engage in the production of ethanol or biodiesel crops.

To meet fuel, food and animal feed requirements, investors from rich nations require large areas of land. This quest for land has implications far beyond the economic crisis on Wall Street. Poor women in Sub-Saharan Africa bear the brunt of these new priorities. They are responsible for over 70 per cent of the food obtained for household use, yet they have very weak property rights to land, water and other natural resources. ■

Linley.Karlton@sol.slu.se



Photo: Linley Chinoma Karlton

Poor women in Africa need land to grow food for their families, e.g. cassava.



Some mosquitoes no longer smell a commonly used repellent odour.

Mosquitoes undeterred by repellent ingredient

The active ingredient of mosquito repellents used throughout the world is no longer as effective. Researchers at SLU in Alnarp, working with their colleagues in the UK, have discovered that under laboratory conditions, females of the yellow fever mosquito (*Aedes aegypti*) no longer smell the repellent odour of the active ingredient DEET (N,N-diethyl-m-toluamide), used in several commonly sold mosquito repellents.

A certain type of sensory cell on the mosquitoes' antennae is no longer active, which may be the result of a mutation in the protein that responds to DEET. The researchers have called for restraint in the use of repellents containing DEET, at least in large doses over a small area.

The olfactory signals emitted by a human determine how attractive that person is to a mosquito. Humans produce 300 – 400 olfactory signals, although mosquitoes only seem to be able to recognise a few of them. The research team had already identified twelve olfactory signals that mosquitoes react to. Unexpectedly, it was found that people who were attractive to mosquitoes gave off a substantially smaller quantity of olfactory signals than did people to whom mosquitoes were not attracted. This may explain why some people are bitten by mosquitoes, while others are left alone.

Rickard.Ignell@ltj.slu.se

Social life promoted in urban oases

A new phenomenon, known as the community garden concept, may serve as a breeding ground for ecological awareness, creativity and social life in the urban environment. The gardeners themselves decide what form the garden should take and how it should be used, managed and developed. Marie Larsson at SLU in Alnarp regards these user-managed gardens as an excellent means of addressing sustainability issues in practice. Produce from the garden also helps people to be more self-sufficient.

The community garden concept may be compared with the ancient custom of common land and other spaces for communal use.

One way of encouraging the establishment of community gardens is for the municipality to employ a gardener to act as a cultivation expert and guide in the process. Once the process has been set in motion, the momentum will keep it going. ■

Marie.Larsson@ltj.slu.se

Mixtures of substances disrupt hormone production

Hormone disrupting substances are present in the food we eat, in medicines, in pesticides and in pollutants. They may impair our reproductive capacity, our health, and our early development in the womb. Since we are exposed to a mixture of substances, it is difficult to determine their combined effect.

Åsa Ohlsson at SLU in Uppsala has examined the effect of some thirty chemicals on adrenocortical production of various steroid hormones. She used human adrenal gland cells and recorded the effects of the chemicals on the production and secretion of the hormones cortisol* and aldosterone** in the cell cultivation medium. The most common effect was that the chemicals inhibited secretion of these hormones, although in some cases it increased it.

She selected two groups of chemicals to study the effect of mixtures – imidazoles (fungicidal agents used in agriculture and medicine) and flavonoids (which occur naturally in food, e.g., soya beans and parsley). The results of these tests on

adrenal gland cells were compared with mathematical models, which are usually used to theoretically assess the effects of mixtures of various chemicals. It was found that the models essentially worked well for both these groups of chemicals. ■

*Cortisol regulates the metabolism of carbohydrates and proteins.
**Aldosterone regulates salt concentration, and thus also blood pressure.

Asa.Ohlsson@bvf.slu.se

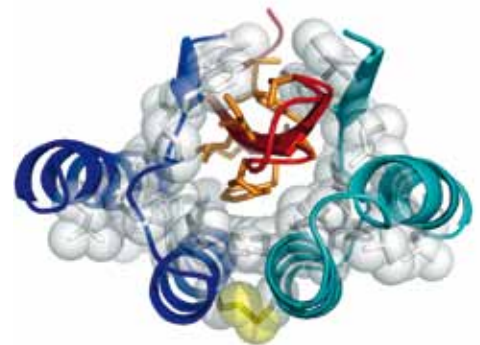
Protein technology – a weapon against Alzheimer's

In future, adding an artificial protein to the blood could stop the onset of Alzheimer's disease. In the early stages, the symptoms of this form of senile dementia are memory loss, caused by damage to nerve cells in the brain. The damage is caused when certain substances form plaque in the brain.

Molecular biologists at SLU are among those studying the way in which an artificial protein (Affibody) can neutralise the substance giving rise to the disease. However, before a drug can be developed, the properties of the Affibody protein will have to be altered somewhat so that it is tolerated by the body's immune system.

Another way of preventing Alzheimer's is to use protein technology to stop the harmful substances before plaque begins to form in the brain. In order to study these short-lived "oligomers", scientists have now created a stable oligomer having the same harmful properties as its original counterpart. Further studies are being conducted with a view to eventually producing a vaccine against Alzheimer's. ■

Torleif.Hard@molbio.slu.se



An artificial protein neutralises the harmful substance (orange) causing Alzheimer's.

FINDINGS IN BRIEF from the Swedish University of Agricultural Sciences (SLU) has been produced in 2010.

Editor: Nora Adelsköld, +46 18 67 17 07, Nora.Adelskold@adm.slu.se

Address: SLU, Division of Communication, Box 7077, SE-750 07 Uppsala

Web address: www.slu.se/popularscience