July 2021

agroscope

Agroscope good food, healthy environment

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Confederazione Svizzera
Confederaziun svizra

Swiss Confederation

Federal Department of Economic Affairs,
Education and Research EAER
Agroscope

Soil Health

Soil is the basis for food production and raw materials;
it filters water and protects us from natural hazards.
It is also home to trillions of microorganisms whose abundance
and productivity are characteristic of a healthy soil.
Agroscope studies Swiss soils in various research projects.

Research for Healthy Foods in a Healthy Environment

The coronavirus pandemic has shifted our collective focus onto the subject of health. For researchers at Agroscope, the health of crops, livestock, the soil, farms, the environment – and thus, healthy food for us humans – has long been of prime importance. Agroscope's slogan – 'Good food, healthy environment' – serves to emphasise this.

High-quality food depends on optimal production conditions as well as many other framework conditions, including economic and social factors. Examples in this issue highlight various research activities aiming to ensure the production of healthy food with sustainable production methods, even under changing framework conditions:

Grass-clover mixtures supply high-quality forage whilst reducing the use of nitrogen fertilisers compared to pure-grass crops. They are therefore ideally suited for the resource-saving production of high yields of animal-based foods (page 18). Are Swiss dairy farms competitive? The study on page 6 provides insights into the contradictory demands made of milk producers. Only farms that intensified production were able to improve their economic performance. New control methods and models for forecasting weed dynamics in arable crops are enabling farmers to reduce herbicide use (page 16). Another study focuses specifically on healthy foods: Swiss cheeses are a major source of vitamin K2, which is important for bone and cardiovascular health (page 20). And did you know how soil health can be investigated by burying underwear? The answer can be found on page 22.

Hoping that this issue of the magazine provides you with a wealth of interesting insights,

Eva Reinhard
Head of Agroscope

A Look into the Archive Dive

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Sustainable Weed Management: Towards New Tools

New tools are being developed to limit the use of herbicides in crops and improve the efficacy of alternative management methods. An update.

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High-Yielding Grass-Clover Mixtures Achieve Numerous Aims

Grass-clover mixtures serve to produce high-quality forage and are mainly grown in arable-crop rotations. A recent study shows that they also perform better than pure-grass crops when many parameters are considered simultaneously.

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Other Themes

Events

21 Aug 2021, BBZ Arenenberg and Agroscope

Güttingen Day 2021

30 Aug – 3 Sep 2021, European Federation of Animal Science or EAAP, Swiss Association for Animal Sciences, Agroscope

72nd Annual Meeting of the European Federation of Animal Science

5 Oct 2021, Agroscope Tänikon

44th Agroscope Agricultural Economics Conference

9 Oct 2021, Agroscope, Swiss National Stud Farm SNSF

Equiday 2021: Science Needs Practice – Awaken Your Spirit of Inquiry!

2–3 Nov 2021, Joint Conference of ALB-CH, AGRIDEA and swissmelio

Rural Construction Training Course 2021

All Agroscope events that are open to the public are advertised on our website.

Agroscope Launches Four More New Experimental Stations

Adopted by the Swiss Federal Council in May 2020, Agroscope's new site strategy provides for the creation of peripheral research stations to strengthen research and practical relevance. The aim of the experimental stations is to answer applied-research questions in their respective geographic contexts, in close cooperation with the agricultural sector and with partners in education and training as well as extension.

Further information on the experimental stations

The representatives of the four partner institutions of the 'Viticulture and Oenology' Experimental Station. From left to right: Philippe Michiels (AGRIDEA), Christophe Darbellay (canton of Valais), Eva Reinhard (Agroscope), Stéphane Kellenberger (Vitival).

The representatives of our partners in Ins. From left to right: Willy Kessler (Agroscope), Nadja Umbricht Pieren (Gemüse-produzenten-Vereinigung der Kantone Bern und Freiburg), Christoph Ammann (canton of Bern) and Christian Hofer (Federal Office for Agriculture).

Viticulture and Oenology in Leytron, Canton of Valais

The new Experimental Station for Viticulture and Oenology in Leytron is being built in close collaboration with the canton of Valais, the Valais viticulture sector and AGRIDEA. The synergy effects between the partners create value-added for the entire Swiss viticulture industry.

The representatives of our partners at the 'Smart Technologies' Experimental Station. From left to right: Ulrich Ryser, (AGRIDEA), Nadja El Benni (Agroscope), Christian Eggenberger (BBZ Arenenberg), Ueli Bleiker (canton of Thurgau), Markus Leumann (canton of Schaffhausen).

Smart Technologies in Agriculture: Experimental Station Launched

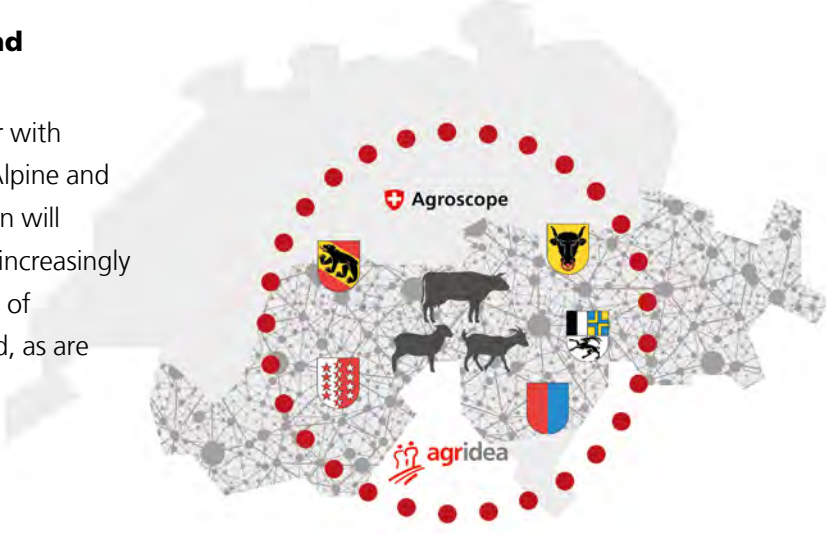
Digital approaches for widely varying challenges: The new 'Smart Technologies' Experimental Station is being set up by Agroscope together with the cantons of Thurgau and Schaffhausen and AGRIDEA. The station will be tasked with the targeted expansion of digitalisation opportunities in agriculture for use in practice. An advisory board consisting of the farmers' associations of both cantons and the Swiss Future Farm will support this undertaking and work strategically alongside the research station.

For Sustainable Vegetables: 'Vegetable Production' Experimental Station in the Bernese Ins

Another important step has been taken in implementing Agroscope's new site strategy: the 'Vegetable Production' Experimental Station, which will focus on key issues regarding sustainable vegetable production, is being launched in Ins, in the Bernese Seeland.

A New Experimental Station for Alpine and Mountain Farming

More research for the Swiss Alpine region: Together with various partners, Agroscope is launching the new 'Alpine and Mountain Farming' Experimental Station. The station will develop solutions for current and future challenges increasingly faced by farms in the mountain region. The cantons of Bern, Grisons, Ticino, Uri and Valais are also involved, as are the industry and extension.



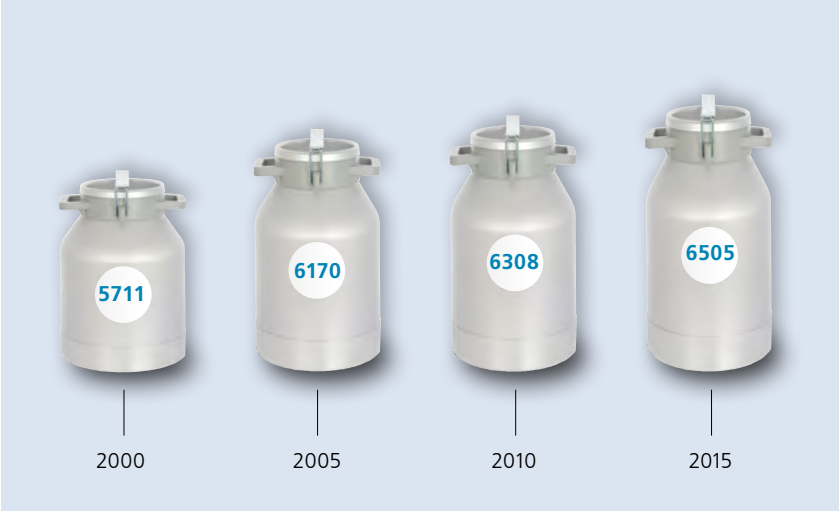
Swiss Dairy Farms – Economic Performance Potential and Limits

In order to increase the competitiveness of Swiss milk production, the performance of the farms must be improved. Agroscope shows that the majority of producers work efficiently, but that the differences in productivity are great.

Swetlana Renner and Nadja El Benni

In order to increase the competitiveness of Swiss milk production, the performance at farm level must be improved. The question therefore arises as to what measures can be taken to enhance the productivity, efficiency, and ultimately the income of the farms.

Agroscope analysed the performance of specialised Swiss dairy farms and their development over time, investigating whether the farms could be grouped according to the production technologies they used, and whether productivity varied between the different technology categories. Another focal point was whether the farms were able to increase their yields by enhancing efficiency, i.e. through improved management practices. Finally, Agroscope studied the extent to which Swiss dairy farms have succeeded in improving their performance over time, and what measures were taken to achieve this. The information base consists of the accountancy data of specialised dairy farms in the Farm Accountancy Data Network over the period 2003 to 2013.



Growth in milk yields (milk produced in kilograms per cow and year) of Swiss dairy farms.

Swiss dairy farms can be grouped into three technology categories

Compared to the rest of the dairy farms, farms in the most productive technology category, Class 1, are larger, produce more intensively, keep more dairy cows (both total number and number per hectare) and have higher milk yields as well as higher economic yields from the sale

of milk and other products. They are mainly situated in the plain or hill region, tend to use freestall-housing systems entitling them to participate in the voluntary state-subsidised animal welfare programme, and usually produce silage-free milk used for raw-milk cheese production. By contrast, farms in the least productive technology category, Class 3, are more often located in the mountain regions. These dairy farms are comparatively small, produce extensively, tend to used tied housing, and usually produce drinking milk.

The 'average' Class 2 lies between these two extreme technology categories in terms of the indicators studied.

The majority of Swiss dairy farms operate efficiently

When analysing performance it is important to bear in mind the natural production conditions, since these determine how productive a farm can be and how efficiently it uses inputs.

The analyses show that the majority of Swiss dairy farms operate very efficiently. Thus, the potential for increasing the efficiency of the farms in Technology Class 1 stands at 2%, in Technology Class 2 at 4%, and in Technology Class 3 at 12%. In other words, without a substantial change in production technology, no major improvements in efficiency can be achieved or expected.

Improved performance only possible with a change in technology

The analysis shows that an improvement in productivity can be achieved by a change in technology. If a Class 2 farm were now to begin working efficiently with Class 1 technology, it could increase its output by 20%. If farms from the least productive Class 3 were to use Class 2 technology, they could increase their output by 27%. With Class 1 technology their output could actually be increased by 39%. However, the analyses also show that the majority of farms have not substantially adapted their production technology over time.

Conclusions

- Without a change in production technology, the potential for improved performances in Swiss dairy production is low.
- The considerable differences in productivity are largely due to the natural production conditions; only on a small percentage of farms are they due to an inefficient use of production factors.
- Only farms which intensified their production were able to achieve an improvement in their economic performance.

Improvements in performance and intensification are essential for a stable or better income

Farms remaining in the most productive category, Class 1, were able to significantly increase their production, work productivity and income over time. By contrast, farms in the second and third class were not in a position to increase their production and productivity level to the extent that income was increased (or at least maintained) over the entire period under consideration.

The few farms that switched over to a more productive technology in the period observed produced in an increasingly intensive manner, and the share of direct payments out of agricultural income fell accordingly. The share of off-farm income out of household income fell, whilst agricultural income increased as a whole.

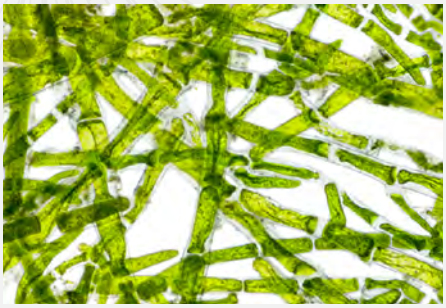
For the few farms that switched to a less-productive technology class, labour productivity and production intensity fell, and the share of direct payments and off-farm income increased. —

Scientific article at agrarforschungschweiz.ch

Biodiversity Recorded for the First Time

Agroscope's monitoring programme 'ALL-EMA' records species and habitat diversity in the Swiss agricultural landscape. This is the basis for understanding the state of habitats.

→ Publikation



Algae – Local Protein Source of the Future?

Agroscope is launching a research project studying the use of locally cultivated algae as a livestock feed additive. The aim is to use the microorganisms as a sustainable protein source for cattle and pigs, thereby improving the life-cycle analysis of meat and milk production.

→ News

Cockchafer Control Campaign Launched in Thurgau, Grisons and Bern

Agroscope, plant-protection agencies and affected farmers launch the 2021 campaign for controlling cockchafers in the mountain region with naturally occurring fungi.

→ Video

Innovation in Apple Varieties

Major demands are made of new apple varieties: they must be disease-resistant and climate-resilient, but also taste good and be suitable for various types of cultivation. Initial milestones have been reached.

→ Publication

Modernisation of Agrometeo for Optimised Plant Protection

The environmentally friendly production of high-quality foods is one of the greatest challenges facing us today. The Agrometeo website provides decision-making tools and information enabling producers to optimise crop protection.

→ News

Research for Swiss Sugar Beet Cultivation

Together with various partners (FiBL, Swiss Federation of Sugar Beet Growers etc.), Agroscope has set up a research network for safeguarding Swiss sugar beet cultivation, which has been hard-hit by the abandonment of certain plant-protection products.

→ Press release

Nighttime Illumination also Affects Diurnal Plant Pollination

Street lights and other forms of nighttime illumination alter the number of flower visits made by insects during the day as well as at night.

→ Publication

Characterisation of Raclette du Valais PDO

Agroscope has comprehensively characterised the cheese variety Raclette du Valais PDO (Protected Designation of Origin). With the reference values obtained, cheese-dairy advisory services will be able to identify cheese defects more easily in future.

→ Publication

Digital Measurement of Disease-related Changes in Livestock

Early detection of disease-related changes in livestock can promote their welfare and reduce suffering. Many health-related indicators can already be assessed automatically.

→ Publication

The Population of Ticino Helps to Control Japanese Beetle

Agroscope is launching an innovative Citizen Science tool to monitor the spread of the Japanese beetle in Ticino. Everyone is asked to photograph any Japanese beetles they spot and to report them on the digital platform japankaefer.ch .

→ Press release

For good, healthy and environmentally friendly food

Working together with three other partners from the private sector, Agroscope coordinates the Horizon 2020 project OptiSignFood, which aims to provide the basics for more efficient, more environmentally friendly food production.

→ News

Manuel Boss: Aiming for a Wholly Sustainable Agriculture and Food Sector

Manuel Boss took over the reins of the 'Plants and Plant Products' Competence Division on 1 June 2021. He brings his extensive network and his experience in science and agricultural policy with him to Agroscope.

Manuel Boss would like to focus on developing innovative approaches to expediting the transformation of the present-day agriculture and food sector into a thoroughly sustainable system, from production to food. According to Boss, it is only by reducing the many trade-offs that the major challenges facing the Swiss agriculture and food sector can be met.

Although there is no tradition of farming in his family, there is no lack of fascination for scientific issues and contexts. Manuel Boss was born on 13 August 1986 in Port near Biel (Bienne), Switzerland; his mother was a biology and mathematics teacher, his father a doctor. As a child, he initially wanted to work in an area involving animals, because at the time he found plants rather boring. His biology studies at the Universities of Bern and Freiburg radically changed this attitude. "I was especially taken with plant food production" Boss confides.

Before taking up his current post, Boss was the Embassy Counsellor for Agriculture at the Swiss Mission in Brussels. Prior to this, he worked at the Federal Office for Agriculture and at Syngenta in agricultural policy and in research and development.

Together with his network of contacts, this wide-ranging experience will serve him well in his capacity as the new Head of the 'Plants and Plant Products' Competence Division.

In his new role, Boss wants to place the focus on interrelationships and trade-offs, and continue to network, develop and raise the profile of his competence division. "I'd like to make the Division and its services indispensable: for the employees, for Agroscope, for the Swiss agricultural sector and the Swiss population" says Boss, summing up his goals. A networker by nature, he looks forward to post-pandemic times when direct contact is once again possible, allowing him to channel his verve and enthusiasm into implementing the vision of a wholly sustainable agriculture and food sector. —

1 Mechanical weed control with the tined weeder
2 Alpine dairy on the Praditschöl Alp, Val S-charl | 3 Wheat seedlings in the seed laboratory

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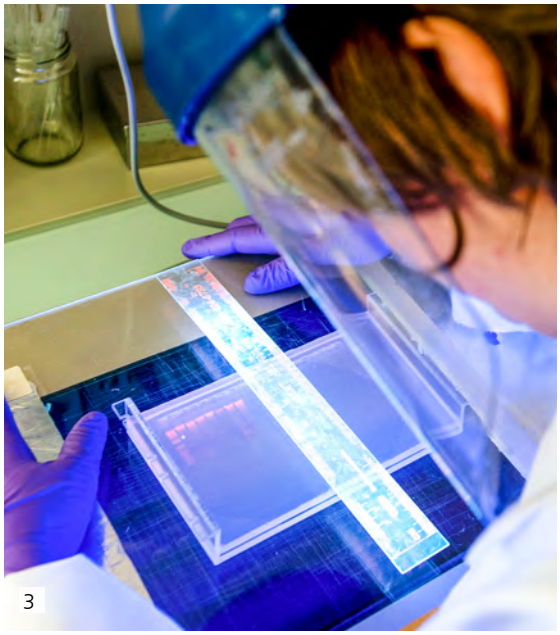
2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6


7

1 Growing trials with cereals | 2 Viticulture
3 Soil laboratory | 4 Rape-stem weevil | 5 Soil analysis in the laboratory
6 Soybean harvest | 7 Highland cattle

Sustainable Weed Management: Towards New Tools

New tools are being developed to limit the use of herbicides in crops and improve the efficacy of alternative management methods. An update.

Sandie Masson, Bruno Chauvel, Christophe Carlen and Judith Wirth

Combining different weed-control measures enables lower herbicide use in arable crops.

The tool currently recommended to farmers for weed management in crops is the "economic weed threshold": beyond a certain weed density, herbicide intervention is considered to be less costly than the losses otherwise incurred. This tool is useful for identifying the individual harmfulness of weed species, but on its own does not permit sustainable and optimal management of weed flora. For that, preventive and curative measures are essential, applied at the scale of each crop and rotation, and based on the principles of integrated plant protection. The implementation of these measures requires new decision-support tools based on criteria other than weed density, to enable farmers to manage weeds with the lowest amount of herbicides possible.

Relevant alternative indicators

New indicators have been developed which are now being used by researchers to improve harmfulness evaluation. The most pertinent of these are the period of weed emergence compared to the growing stage of the crop, total and per-species weed cover, and total and per-species weed biomass. The challenge now is to be able to use these indicators in practice, in a simplified but reliable form. Agroscope's weed science research group is currently developing a visual method for estimating the volume of weeds, which should be amenable to improvement with the aid of the new imaging technologies.

Conclusions

- "Economic weed thresholds" are useful for identifying the individual harmfulness of species, but do not permit sustainable and optimal management of weed flora on their own.
- Weed density is not an adequate indicator for explaining harmfulness. Other indicators exist, and methods are being developed to enable their use in practice.
- Modelling the effects of cropping systems on weed flora and yield is the basis for the development of powerful decision support tools.

Next stage: designing models

The next stage in providing decision-support tools to farmers is to design models suitable for sustainable weed management. The FLORSYS model developed by the INRAE already allows researchers to evaluate the effect of cropping systems on weeds and yield on a virtual plot over several years. Work is still in progress to incorporate the results of this model into a simpler, faster decision-support tool intended for farmers. —

Scientific article at agrarforschungschweiz.ch

High-Yielding Grass-Clover Mixtures Achieve Numerous Aims

Grass-clover mixtures serve to produce high-quality forage and are mainly grown in arable-crop rotations. Their advantages over heavily fertilised pure-grass crops in terms of nitrogen efficiency are well known. A recent study shows that they also perform better when many parameters are considered simultaneously.

Matthias Suter, Olivier Huguenin-Elie and Andreas Lüscher

Using a new integrative approach, Agroscope experts investigated the multiple functions of grass-clover mixtures in terms of production, forage quality, weed suppression and sustainability in a three-year field experiment, and compared them with those of pure grass and clover crops. The four selected species differed in their ability to fix atmospheric nitrogen (N) and in their physiological development rate. In addition, all stands were managed at several nitrogen fertilisation levels. To determine multifunctionality, a new measure was developed that avoids the problems of previous methods (see box).

Advantages of the mixtures lead to high multifunctionality

Balanced mixtures with two grass and two clover species showed 61% greater yields than the pure crops, as well as lower yield fluctuations over time and thus higher yield stability. They also had 81% less weed biomass, 46% higher N-use efficiency and 96% higher nitrogen fixation, but almost no nitrate in the soil water. All of these positive effects were achieved along with a high forage quality. Calculated across all functions, multifunctionality of the mixtures was almost twice as high as that of the pure grass and clover crops. The advantage of mixing crops was so strong that a balanced mixture fertilised with 50 kg nitrogen per hectare and year had an equal or even higher degree of multifunctionality than a pure grass crop fertilised with 450 kg nitrogen per hectare and year. Moreover, high N-fertilisation rates generally reduced the advantages of the mixtures.

Conclusions

Conclusion: Grass-clover mixtures with complementary species can achieve high yields of high forage quality with high efficiency and low emissions. In other words, they offer several advantages at the same time. This makes them ideally suited for productive, resource-efficient agriculture.

Grass-clover mixtures serve as a high-quality forage, and are mainly cultivated in arable-crop rotations.

No trade-offs between functions

The researchers were surprised to find no trade-offs between the functions. For example, they would have expected higher yields for the mixtures to be closely associated with a decrease in forage quality and yield stability, but this was not the case. Likewise, increased nitrogen fixation in the stands (with a high proportion of clover) and the consequently higher nitrogen availability might have led to more nitrate in the soil water. This was not found either, and nitrate concentration in the soil water of mixtures under standard fertilisation was negligible. This points to the high nutrient efficiency of grass-clover mixtures, coupled with a low negative impact on the environment. In addition, the comparison of multifunctionality of mixtures under low nitrogen fertilisation with that of highly-fertilised pure grass crops underscores the large savings potential of nitrogen fertilisers that can be achieved with grass-clover mixtures. —

Scientific article in Scientific Reports, Springer Nature 11:3835, 2021, 1–16.

Demonstrating multifunctionality of ecosystems

'Multifunctionality' refers to the ability of an ecosystem to perform several functions simultaneously, such as producing biomass, making nutrients available and storing carbon. Agroecological systems should provide other functions in addition to food production, such as maintaining soil fertility. Individual functions of grassland systems such as forage yield, forage quality or the reduction of nitrate leaching have been well studied. However, no study has yet investigated the multifunctionality of productive grasslands in an integrated approach that could also be tested statistically. Previous indices of multifunctionality were based on scaling the studied functions equally and calculating a mean value across all functions, which was then related to environmental factors (e.g. management intensity). However, the analysis of scaled mean values as a measure of multifunctionality makes it impossible to reveal relations between individual functions and environmental variables and to explain the underlying processes of multifunctionality. Moreover, it has been shown that such analyses sometimes led to erroneous conclusions.

In the present work, a new approach was developed that overcomes these problems. The data were first analysed with a multivariate model, which made it possible to capture the relationships between all functions and their dependence on environmental factors (here: plant diversity and N fertilisation). Based on this model, a measure of multifunctionality was defined (the mean log response ratio across all functions) that also takes into account the correlations between the functions in the statistical tests.

Swiss Cheeses Are an Important Dietary Source of Vitamin K2

Vitamin K2 plays a key role in blood coagulation as well as having a positive influence on bone and cardiovascular health. Cheese is an important dietary source of this microbially produced vitamin.

Barbara Walther and Remo Schmidt

Vitamin K was discovered in connection with its key role in blood coagulation. Today, its contribution to other spheres such as bone and cardiovascular health or anti-inflammatory response is recognised and increasingly researched. The microbial origin of vitamin K2 highlights fermented foods as a source of nutrients, including cheese – a food known from the literature for relevant amounts of this vitamin.

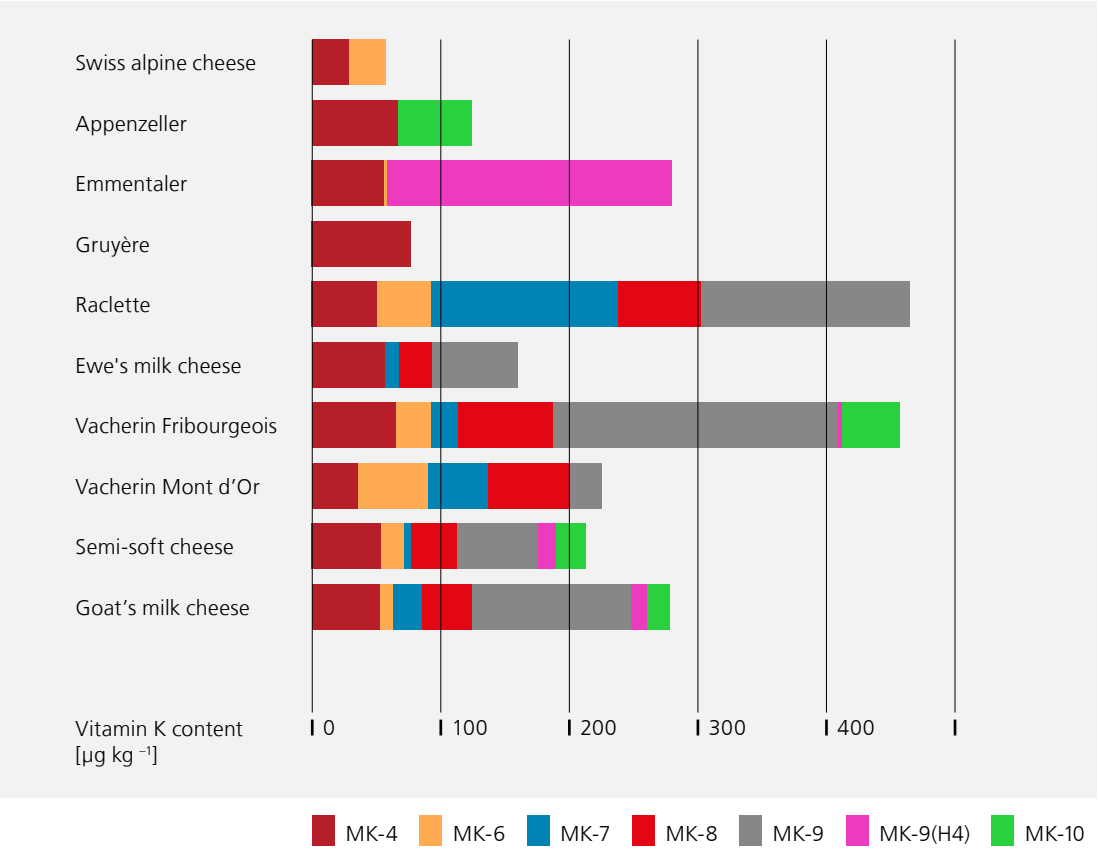
High amounts in Raclette, Vacherin Fribourgeois and Emmentaler

To date, an overview of the vitamin K2 content of different varieties of Swiss cheese that would allow us to rank their contribution to the diet of the Swiss population has been lacking.

A total of 121 samples were collected, which were then condensed into ten groups. The fat and water content as well as the amounts of the different types of vitamin K2 – the so-called menaquinones (MK-4 to MK-10) – were determined for all the samples. Where possible, details of the cheese cultures used were also collected. The analyses were conducted at the stage of maturity at which the given cheese variety was typically consumed.

The highest average vitamin K2 content was found in Raclette (465 µg/kg), Vacherin Fribourgeois (456 µg/kg) and Emmentaler (280 µg/kg). Gruyère and alpine cheese supplied the lowest levels.

Raclette, Vacherin Fribourgeois and Emmentaler are potentially good sources of Vitamin K2.



Average content of the various menaquinones (MK-n) in Swiss cheese varieties.

Factors influencing vitamin K2 formation in cheese

The main factors influencing vitamin K2 formation are the bacterial strains used and the scalding temperature, which has a direct influence on the bacterial species. Mesophilic lactic acid bacteria such as Lactococcus and Leuconostoc species are known for their menaquinone formation potential. Thermophilic bacterial strains as well as high scalding temperatures lead to reduced amounts of menaquinones. In Emmentaler, 'eye'-forming propionic acid bacteria are responsible for the formation of MK-9(H4), which is typical of this variety.

Contribution to daily requirement

With the Swiss population's average cheese consumption of 40g per day, men can consume 14–17% and women 13–14% of the recommended daily requirement for vitamin K2. Traditional cheese dishes such as raclette and fondue supply large quantities of vitamin K2 per meal, even in excess of the daily requirement.

Conclusions

- Vitamin K plays a key role in blood clotting and in bone and cardiovascular health.
- Cheese, and semi-hard cheese in particular, is an important source of this microbially synthesised vitamin.
- The highest levels of vitamin K2 are found in Raclette, Vacherin Fribourgeois and Emmentaler.
- The consumption of Swiss cheese can cover an average 13–17% of the daily vitamin K requirement. Traditional cheese dishes such as raclette and fondue actually provide amounts in excess of the daily requirement.

Scientific article at agrarforschungschweiz.ch

Citizen Science Project: How Healthy Are Swiss Soils?

Researchers at Agroscope and the University of Zurich have launched Switzerland's largest Citizen Science project to date, designed to study soil quality. Farmers and gardeners were invited to bury underpants and teabags in their fields, meadows and flowerbeds.

Marcel van der Heijden

On 7 April 2021, researchers at Agroscope and the University of Zurich launched a nationwide Citizen Science project. The aim is to produce a systematic record of soil health. In the largest project of its kind in Switzerland to date, a total of 2,000 samples and measurements are to be taken between Geneva and the Engadine.

The more decomposed the underpants, the healthier the soil

As the title 'Proof by Underpants' suggests, the project employs a rather unusual method of measurement. The first 1,000 participants to register were sent a package containing two pairs of cotton underpants. Anyone else who was interested was provided with instructions explaining how to carry out the tests themselves. The underpants were to be buried in a field, meadow or garden. After two months, they were collected again. The faster the underpants decompose, the more living organisms are active in the soil and the healthier the soil is – at least, that's the hypothesis the project is designed to test. The project will enable the researchers to collect much more data than they could if they had to do it all themselves.

Comparing teabags with underpants

Farmers in Canada have been using underpants as a simple indicator of soil health for many years. "But so far no-one has checked whether this method meets scientific standards. No-one knows how accurate it is and whether there really is a clear relationship between underpant decomposition rate and soil quality," explains project leader Marcel van der Heijden, a soil ecologist at Agroscope and the University of Zurich. To find out, the participants also buried a variety of teabags. "This is a well-established method in soil research. We know how long it takes for different types of teabag to break down. We can then

Private gardeners and farmers are jointly researching soil quality in Switzerland in a Citizen Science project by burying underwear and tea bags in their fields, meadows and beds for a given length of time.

compare this with the underpant cotton," says project coordinator Franz Bender. To do this, the rotted underpants will be photographed and digitally evaluated. "This will enable us to accurately determine the degree of decomposition," he explains. The citizen scientists will also be asked to take a soil sample, which can then yield additional information on soil quality.

The world's most precious resource is under threat

Without the soil, life on earth would be impossible for us humans. Soil is the basis for food production and raw materials; it filters water and protects against natural hazards. It is also home to trillions of tiny organisms, accounting for a quarter of the world's biodiversity. Abundant and productive organisms are signs of a healthy soil. However, this most precious of all resources is under serious threat worldwide, including in Switzerland. Erosion, overuse of agrochemicals and urban development are shrinking the productive land area every day. At global level annually, an area two and a half times the size of Switzerland is degraded to such an extent that it can no longer be used for agriculture. —

Further information at agroscope.ch

	2019 CHF	2020 CHF	Divergence CHF	Divergence in per cent
Functional Earnings				
Financially impacting	20,575,200	28,493,268	7,918,068	38,5%
Non-financially impacting	1,961,291	–7,062,412	–9,023,703	–460,1%
Total revenues	22,536,491	21,430,856	–1,105,635	–4,9%
Functional Expenditure				
Financially impacting	136,277,092	140,210,888	3,933,796	2,9%
Non-financially impacting	5,147,978	5,495,979	348,001	6,8%
Service accounting between offices	44,568,499	44,605,375	36,876	0,1%
Total functional expenditure	185,993,569	190,312,241	4,318,672	2,3%
Statement of Investments				
Investment income	–54,062	–36,250	17,812	
Investment expenditure	7,607,529	4,373,588	–3,233,941	–42,5%
Reserves				
Creation of earmarked reserves	2,165,675	4,063,000	1,897,325	87,6%
Use of earmarked reserves	3,551,987	1,140,026	–2,411,961	–67,9%
Third-Party Funds				
Acquisition of third-party research funding	14,306,739	23,061,709	8,754,970	61,2%

770
lectures and posters

1497
lessons (universities, technical colleges, vocational schools and courses)

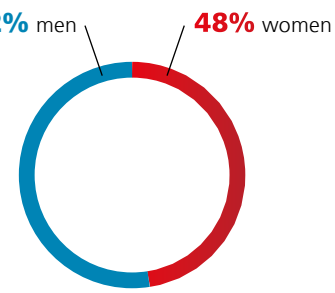
80
supervised dissertations

76
supervised semester, bachelor and master theses

1335
publications, including 536 practice-oriented publications; 540 scientific publications

894 full-time positions (FTE) with
1058 employees

41 trainees
37 internships
36 postdoc



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“Only by reducing the many trade-offs can we meet the great challenges in the agriculture and food sector: climate change, loss of biodiversity, overuse of natural resources, feeding a growing population and maintaining competitiveness.”

Manuel Boss, Head of the ‘Plants and Plant Products’ Competence Division at Agroscope

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