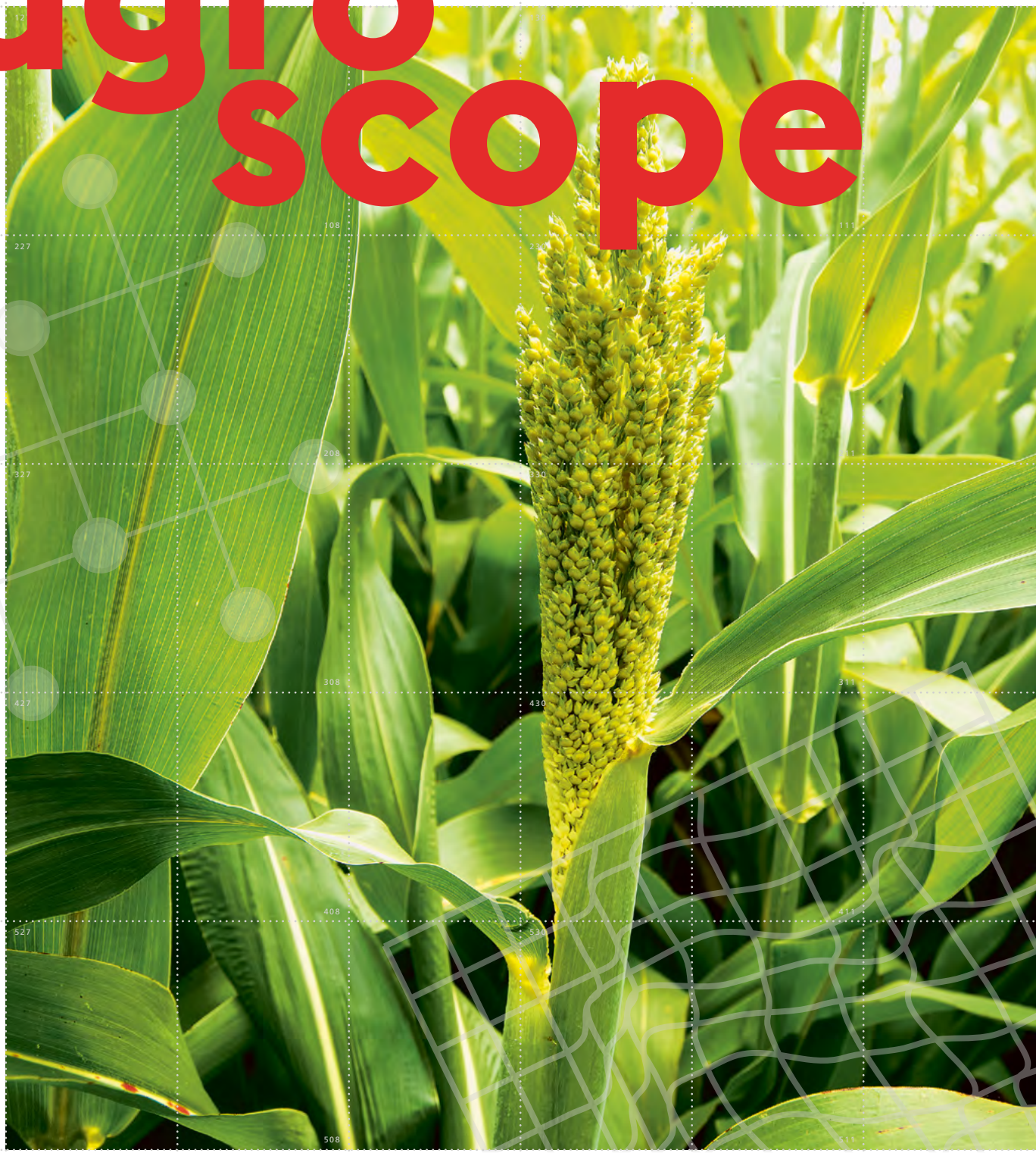
September 2023

agroscope



Agroscope good food, healthy environment

Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
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Federal Department of Economic Affairs,
Education and Research EAER
Agroscope

Agroscope conducts research to enable agriculture to adapt to climate change.
In future, there will be regions of Switzerland where sorghum – a drought-tolerant crop – can be grown (see relevant article on pages 6–7).

Dear readers,

Modern crop protection is a complex matter. It calls for innovative and effective solutions at different levels: preventive strategies such as disease-resistant varieties and adapted cultivation techniques alongside chemical and non-chemical control measures. The aim is to safeguard the quality and quantity of yields while at the same time protecting the environment.

The case of the Japanese beetle clearly demonstrates the importance of monitoring the presence of harmful organisms. This alien species from Asia has managed to colonise the southern Alps in recent years. Recently, careful monitoring enabled a population north of the Alps to be promptly discovered and systematically controlled.

At the 'Neobiota' Experimental Station in Cadenazzo (TI), Agroscope is working with Agridea, WSL and the Canton of Ticino to develop control methods aimed at preventing or at least stemming the spread of new pests and invasive plants (page 4).

Climate change is encouraging not only the spread of alien species. Crop producers are increasingly calling for plants which are adapted to drought or elevated temperatures. Find out more about a promising African species of millet in the article 'Sorghum: Where Can This Drought-Tolerant Grain Be Cultivated in Switzerland?' (page 6).

Agroscope researchers are also involved in innovative projects on the non-chemical control of pests: working with the Swiss Federal Railways (SBB), they investigated the use of a hot-water treatment as an alternative to herbicides in the track area. This method is as effective as glyphosate in controlling annual and young perennial plants (page 18).

We hope you enjoy reading this latest issue.
Alain Gaume
Head of the Plant Protection Strategic Research Division

Other topics

Agroscope is the Swiss Centre of Excellence for Agricultural Research, and is affiliated with the Federal Office for Agriculture (FOAG). Agroscope makes an important contribution to a sustainable agriculture and food sector as well as to an intact environment, thereby contributing to an improved quality of life.

Centre of Excellence for Neobiota: Stepping up Efforts to Control Exotic Pests

How Does Fat Content Affect Eye Formation in Cheese?

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Reality Check: Has the Neoliberal, Conservative or Agroecological Vision of Swiss Farming Prevailed?

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Events

11 – 13 Oct 2023, Grangeneuve-Fribourg

13th European Farmhouse and Artisan Cheese & Dairy Meeting

7 – 8 Nov 2023, Grangeneuve-Fribourg

Joint Conference of ALB-CH, AGRIDEA, Agroscope and suissemelio

Rural Construction Training Course for Specialists in Construction

10 Nov 2023, Agroscope Liebefeld

1st Swiss Nutrition Research Symposium – Sustainable Diet and Metabolic Health

21 Nov 2023, Agroscope Tänikon

46th Agroscope Agricultural Economics Conference

30 Nov 2023, Agroscope Tänikon

4th Food Sector Innovation Forum

Resource Efficiency – Smart Solutions for Practice

25 Jan 2024,
Agroscope Reckenholz and online

11th Agroscope Sustainability Conference

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

Centre of Excellence for Neobiota: Stepping up Efforts to Control Exotic Pests

Teams from different institutions are collaborating on research projects to proactively control exotic pests.

Non-native (alien) species are on the rise in Switzerland. Some of these organisms can cause damage to farmland. In the southern Alps, a region with a high risk of introduction, Agroscope, the Canton of Ticino and Agridea have stepped up their joint research into these species.

Threat to Swiss agriculture

Non-native species are spreading across Europe and Switzerland at an ever-increasing rate. Among the reasons for this are globalised trade, human mobility and global warming. Some of these undesirable organisms – be they animals, plants or microorganisms – are already causing damage to agriculture, while others could do so in future.

Proactive approach

The Centre of Excellence for Neobiota prioritises 'proactive action' in the control of exotic pests. However, proactive control presupposes that the neobiota and its spreading mechanisms are precisely known. The teams of the partner institutions are tackling this task together within the framework of various projects.

Japanese beetles can cause significant damage to arable crops and grassland.

Centre of Excellence for Neobiota

News from the Other Experimental Stations

Working Together for Tomorrow's Viticulture

It's all systems go at the Viticulture and Oenology Experimental Station set up two years ago. The experimental station's four partners – the Canton of Valais, Agroscope, Vitival and Agridea – are working together to tackle the long-term challenges facing the wine industry.

Controlling Problem Plants in the Alps

From broad-leaved dock to thistles, various plants are creating problems in the Alps. A new publication presents possible control measures based on an expert survey conducted by the 'Alpine and Mountain Farming' Experimental Station.

'Nutrient Flows' Experimental Station – Spotlight on Fodder and Farmyard Manure

The linchpin of the practice-oriented research conducted at the 'Nutrient Flows' Experimental Station is the Canton of Lucerne Farm Network, where the nutrient content of forage and farmyard manure samples is analysed on 26 farms. Here are the interim results after one year.

Further information on the experimental stations

Sorghum: Where Can This Drought-Tolerant Grain Be Cultivated in Switzerland?

Suitable both as food for humans and as livestock feed, sorghum thrives even in an increasingly dry climate. Agroscope has developed maps showing the potential growing areas for silage- and grain sorghum.

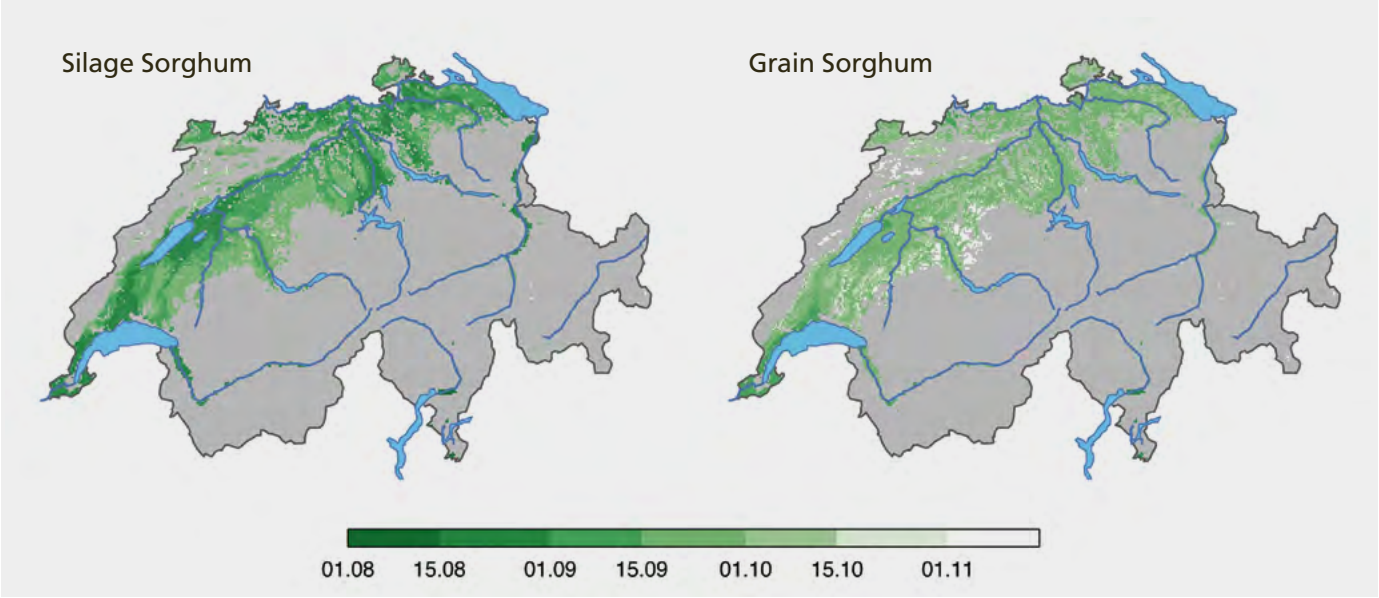
Nicole Bütikofer, Tiziana Vonlanthen, Jürg Hiltbrunner, Annelie Holzkämper, Pierluigi Calanca

A still-little-known crop that is suitable both as food for humans and as livestock feed, sorghum also copes well with drought.

Sorghum bicolor (L.) Moench, also called 'great millet', originated in Africa. Nowadays it is cultivated throughout the world, with about 95 % of production stemming from Africa, America and Asia. In Europe, France and Italy in particular are important producer countries. In Switzerland, however, the total area devoted to sorghum cultivation is less than 350 ha – this despite the potential cultivation areas being disproportionately larger. With a view to the possible expansion of sorghum cultivation, we looked at which areas of Swiss arable land would be suitable for growing silage sorghum or grain sorghum, based on the plant's warmth requirements.

Different warmth requirements for silage and grain sorghum

We derived the necessary key figures regarding the thermal requirements of silage and grain sorghum from information in the literature and Agroscope's trials at its Reckenholz site. The experiments with grain sorghum took place from 2009 to 2011, those with silage sorghum from 2018 to 2022. The results of the trials show that with an early-May sowing and the choice of a base temperature of 8 °C, silage sorghum requires an accumulated



Map of the average maturity date of silage- and grain sorghum on Swiss arable land. Dark-green scores show areas in which the necessary accumulated temperatures are reached early. Light-green zones indicate late maturity, and hence a greater probability that maturity will not be achieved every year. Areas outside of present-day arable land are in grey. Areas in white are those in which, according to present-day climate calculations, sorghum would only reach maturity after 31 October.

temperature of around 1150 °C to ripen, whilst grain sorghum requires an accumulated temperature of around 1350 °C.

Silage sorghum could be grown on all of the arable land

The regional evaluation of accumulated temperatures based on grid data of the Federal Office for Meteorology and Climatology for 2001–2020 showed that practically all of the arable land available today is suitable for growing silage sorghum. According to our estimates, maturity would occur almost every year between mid-August and late September, with a delay of about one week in the case of a later mid-May sowing.

Favourable land for cultivating grain sorghum is limited

For grain sorghum, however, the probability of maturity being reached before the end of October rapidly decreases with increasing altitude. Very-favourable-to-favourable areas are limited to locations below about 550 m.a.s.l.

Conclusions

- Accumulated-temperature maps show that the thermal requirements for the cultivation of silage sorghum are already met on most of the arable land in Switzerland.
- Favourable areas for the growth of grain sorghum can be found in low-lying regions along the Lake Geneva–Lake Constance axis, as well as in the Valais, the Rhine Valley and south of the Alps.
- With a late sowing, there is an increased risk of grain sorghum only achieving maturity towards the end of the year, if at all.
- The breeding and introduction of early-maturing sorghum varieties can support the cultivation of grain sorghum in Switzerland.

Scientific publication:
Swiss Agricultural Research, 14, 24-33, 2023

Tremendous Challenges Facing the Sugar Beet Sector

The beet yellowing virus transmitted by the peach-potato aphid, Myzus persicae, is creating havoc in the Swiss sugar beet sector. Agroscope is investigating possible remedies.

→ Video

What Makes Swiss Cheese Unique?

British YouTuber Tom Scott looks behind the scenes of cheese research at Agroscope.

→ Video

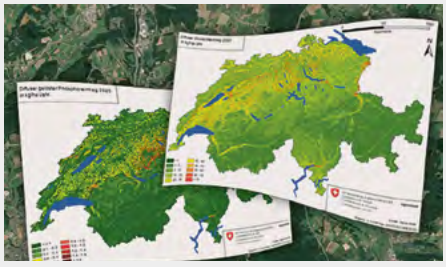
Bacteria Welcome!

Our gut microbiota is important for our health. The more diverse the microbial composition, the better. The Polyfermenthealth project aims to find new bacteria for yogurt production in order to bring more bacterial and nutrient diversity back into our diet.

→ Video

Microbiological Safety of Raw-Milk Yoghurt

The consumption of raw-milk products is considered to be healthy, but is not entirely risk-free due to the possible presence of pathogenic bacteria. Agroscope and BFH-HAFL investigated the microbiological safety of raw-milk yoghurt and showed that this is protected in several respects by fermentation.



Nitrogen and Phosphorus Inputs in Water Bodies: New Estimates for Agriculture

Agroscope researchers calculated the nitrogen and phosphorus inputs into Swiss water bodies for the year 2020. Although these inputs decreased in comparison to 2010, the 'agriculture' environmental target for nitrogen inputs was missed by a significant margin.

How Do Different Arable Crops Affect Erosion Risk?

To calculate erosion risk in Swiss field crops, the effect of different arable crops on the risk of erosion was determined. Calculations for the whole of Switzerland show that although erosion risk is on average low, it is not negligible everywhere.

Improved Crop Variety Mixtures Made Possible by Scientific Breakthrough

In an article recently published in Nature Communications, Agroscope and partners resolved a positive diversity effect in genotype mixtures to a single gene. This breakthrough will facilitate the design of improved crop variety mixtures.

Life Cycle Assessment Platform

Positive contributions made by the Life Cycle Assessment method range from scientific support for the development of quality labels and advisory tools for practitioners, to the assessment of policy scenarios.

→ Presentations

Using Modern Technology to Optimise Plant-Protection Application

The aim of the PFLOPF project is to reduce plant-protection use by at least 25%. This is to be achieved with Precision Farming technologies, including online forecasting tools, GPS steering systems, and sensor-controlled plant-protection and hoeing machines.

Nutrient Losses in Agriculture – What is at Stake?

According to the requirements of the Swiss Confederation, agriculture should significantly reduce nutrient losses of nitrogen and phosphorus over the next few years. But where and how do the losses occur and why are they a problem? Find out more in the explanatory video.

→ Video

Measuring Heat Stress in Dairy Cows

When does heat stress become critical for dairy cows? An index makes this measurable. Agroscope has recently performed calculations for four of its own sites.

Climate Change Leads to Longer Growing Seasons and Favours Farmland at Higher Altitude

With increasing global and regional temperatures, even Switzerland's growing season has lengthened considerably. Using data from the Federal Office of Meteorology and Climatology, Agroscope has traced the development of the growing season since the start of the last century.

→ Further News Topics

How Do Grazing Dairy Cows Respond Physiologically to Heat Stress?

Even in temperate climate zones, an increase in the ambient temperature and solar radiation can cause heat stress in grazing dairy cows. Agroscope and its partners studied the physiological changes in cows caused by increasing heat load.

Alice Pontiggia, Andreas Münger, Stefanie Ammer, Chantal Philipona, Rupert M. Bruckmaier, Nina M. Keil, Frigga Dohme-Meier

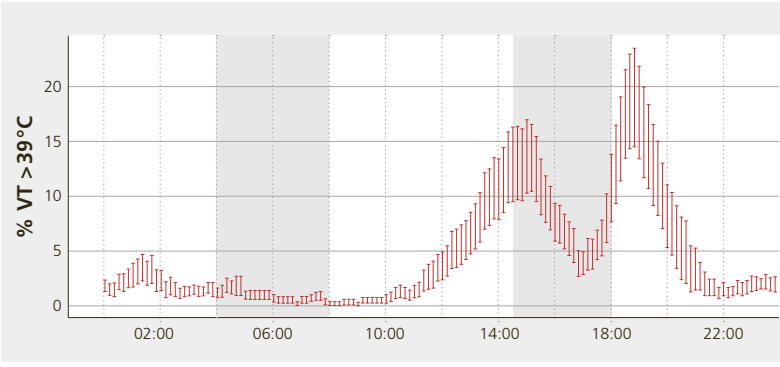
Society's desire for sustainable animal production that takes account of natural animal behaviour is constantly increasing. Pasture-based milk production systems would seem to be ideal for fulfilling this desire. Not only is pasture-based milk production cost-efficient, but it also helps reduce feed-food competition. However, grazing cows are particularly susceptible to heat stress, since they are exposed both to the increasing ambient temperature and to direct solar radiation.

Body temperature, blood and milk of grazing dairy cows monitored

Over two consecutive summers, 38 lactating Holstein dairy cows were studied in a full-time grazing system. Data were collected during ten experimental periods of up to three consecutive days with temperatures in the 13-to-24 °C range. Sensors were used to monitor the vaginal temperatures of the cows as a measure of body temperature as well as to monitor heart rate. Blood and milk samples were collected at afternoon milking. Fat, protein, lactose, urea nitrogen, cortisol, Na^+, K^+ und Cl^- concentrations were analysed in milk, and beta-hydroxybutyrate, glucose, non-esterified free fatty acids, urea nitrogen, thyroxine and triiodothyronine were analysed in blood.

Body temperature follows a daily pattern

The body temperatures of the cows changed markedly over the course of the day and rose with increasing heat load. Cows with a vaginal temperature above 39 °C were



Percentage of vaginal temperature (VT) measurements above 39 °C over the course of the day over 26 measurement days. The white areas represent time periods when cows were on pasture, the grey areas represent two time periods when cows were inside the barn.

Grazing cows are particularly susceptible to heat stress.

assumed to be suffering from heat stress. Such cows exhibited an elevated average heart rate and increased plasma glucose and milk cortisol concentrations, as well as decreased plasma thyroxine and plasma triiodothyronine concentrations. Na^+ concentrations in milk were lower and K^+ concentrations in milk tended to be higher in cows with higher body temperatures. Urea nitrogen and protein concentrations in milk varied greatly, and inter-animal variance was high.

Na^+ and cortisol levels in milk can serve as possible heat-stress indicators

In summary, it can be said that the changes observed in the milk and blood probably indicate the short-term physiological responses to moderate heat stress. In particular, milk cortisol and Na^+ could be useful traits for the timely detection of heat stress in individual cows, since their inter-individual variances are relatively small and samples can be taken non-invasively. —

Conclusions

- Heat stress can occur in grazing cows even with a moderate heat load, and can adversely affect their welfare.
- Because susceptibility to heat stress can vary greatly from cow to cow, it is essential to monitor animal-related traits that are sensitive to heat load.
- Cortisol and electrolytes in milk are potential physiological indicators for the short-term assessment of heat stress. Electrolytes could even be measured automatically in future.

Scientific publication:
Animal 17(3), 100718, 2023

Managing Exotic Animals and Plants: Study, Monitoring, Control

To manage invasive species, Agroscope and its partners pursue a two-pronged approach: proactive, to evaluate the risk of species gaining a foothold in Switzerland, and reactive, to monitor and keep in check populations of individual species already present in Switzerland.

Dominique Mazzi, 'Neobiota' Research Group

Last July, the first Japanese beetle population north of the Alps showed how quickly invasive species could gain a foothold. Agroscope is therefore working on various projects to protect the agricultural sector from the damage caused by this species.

What is Agroscope doing to keep invasive species in check?

Agroscope has aligned the 'Neobiota' research group to the new challenges in 2021. The research group operates on the Cadenazzo campus together with three partners – WSL, Agridea and the Swiss Federal Plant Protection Service. The Research Group deals with emerging exotic species that pose a potential risk to the agricultural sector – so-called alien species or neobiota.

What projects are conducted by the 'Neobiota' Group?

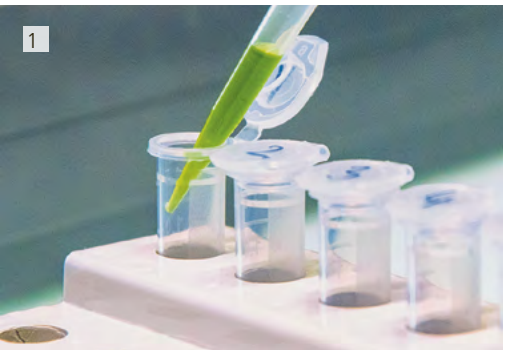
A common species in Switzerland, the meadow froghopper is the primary vector of the *Xylella fastidiosa* bacterium.
Since there are no direct methods for controlling the bacterium, measures are first and foremost preventive in nature.
To control flavescence dorée (grapevine yellows), Agroscope is developing so-called habitat-management measures to reduce the risk of infection in vineyards.
In addition, Agroscope is studying the potential of native parasitoids for controlling the newly arrived grape leafminer moth.
Researchers are developing strategies for the early control of common milkweed, an invasive neophyte, and are evaluating its dispersal potential. Agroscope is taking part in a Euphresco network project that assesses the benefits and risks of releasing natural antagonists of harmful neobiota.

What approach is taken by Agroscope to control neobiota?

Wherever possible, Agroscope follows a proactive approach. This means that researchers assess the risk and instigate monitoring before pathogens become established here in Switzerland. Once neobiota have gained a toehold, the reactive approach aims to monitor their dispersal and numbers as well as develop and implement control strategies and assess their efficacy. Because damage and control costs increase steeply after an exotic species takes root, a proactive approach saves time and resources.

Impressions of current applied research activities for the agriculture and food sector.

1 Selecting new grape varieties
2 Colorado potato beetle larvae
3 Vegetable cultivation on the Orbe Plain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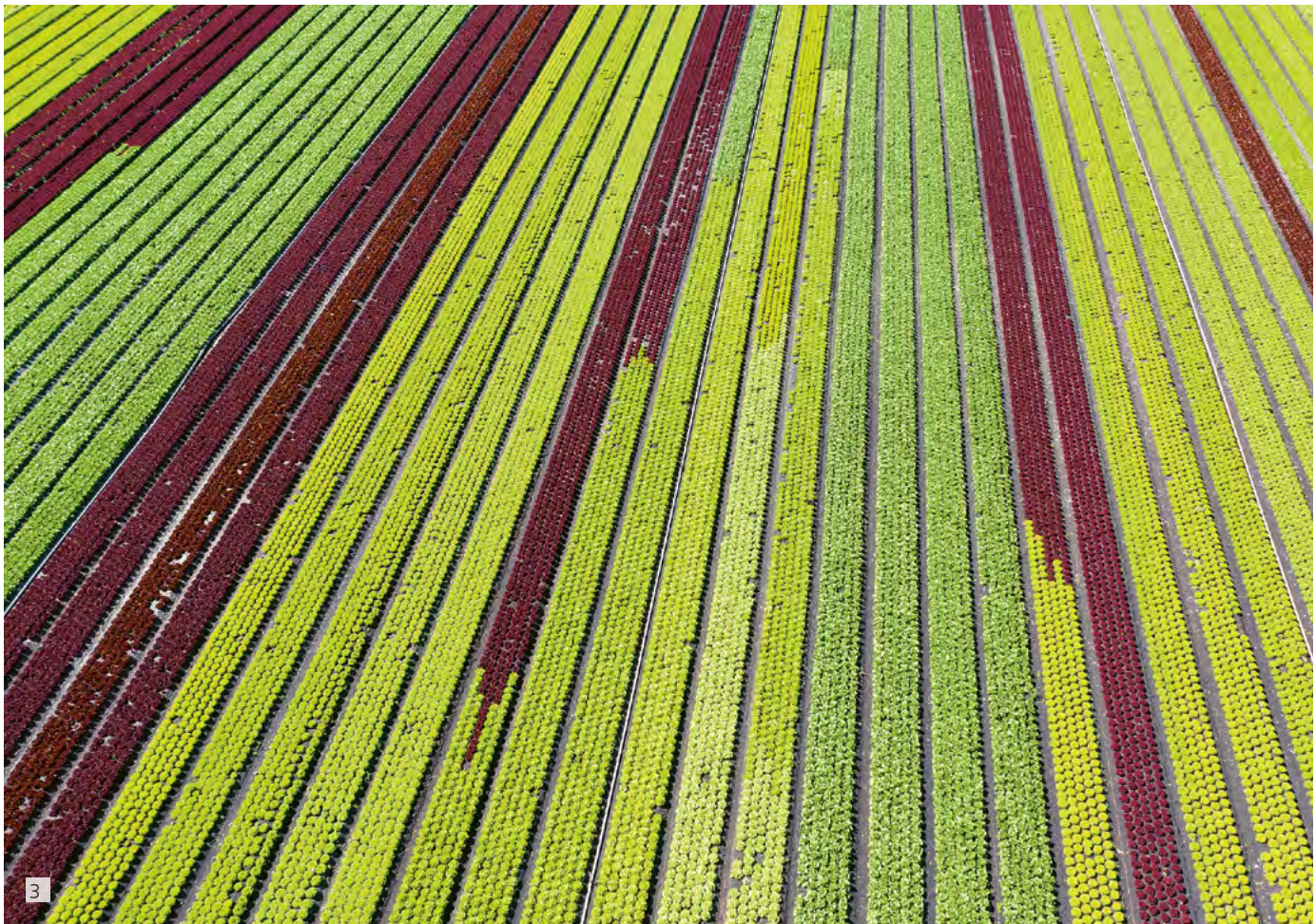
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Archive image: sugar beet harvesting


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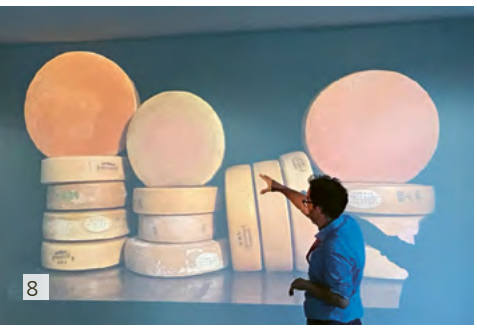


4 Working at the 'Vegetable Production' Experimental Station
5 Assessing cereals
6 Stink bug eggs and their parasitoids
7 Pollinating pear trees for new varieties
8 'Cheese and Science' event in Bern-Liebefeld
9 Measuring methane in rice cultivation
10 Testing dairy cows

Controlling Plant Growth in the Track Area with Hot Water

By 2025, the SBB (Swiss Federal Railways) aims to control the vegetation in the track area without herbicides. Agroscope tested the effectiveness of hot-water treatments in a three-year trial and rates this method as a suitable alternative to herbicides.

Aurélie Gfeller, Frédéric Tschuy, Lukas Tanner, Gunter Adolph, Judith Wirth

Prototype of the hot-water spray train developed by the SBB (Swiss Federal Railways).

For safety reasons and to maintain the railway system it is important to keep the vegetation in the track area under control. Since the mid 1990s the SBB has been using glyphosate to limit or prevent plant growth on track installations. Since this herbicide has come under fire and may no longer be available in future, alternatives for controlling vegetation are being sought.

Hot-water treatment as an alternative to herbicide use

Hot water treatment of plants is being considered. It is known that hot water can successfully control the growth of many annual plants and limit the growth of perennials. The hotter the water, the more quickly an effect can be achieved.

Effectiveness of hot-water treatments varies

In the SBB trials, the efficacy of the individual hot-water treatments ranged between 74 % and 100 %. Thus, the effect can be rated as moderate to very good. Small annuals were controlled most effectively. The comparative control of plant growth without the use of herbicides or hot-water treatments exhibited a steady increase in vegetation over the three years of the trial.

Botanical surveys after the treatments

Botanical surveys were carried out in 2020 and 2021 before and after the treatments to assess the effects of the hot-water treatment on vegetation growth. A total of 63 different plant species were found on the tracks. At the end of the 2020 and 2021 growing seasons, 23 different plant species were found to be partially alive on the tracks treated with hot water. At the end of September 2021 an average of four to ten plants per counting frame were present on the treated tracks. By contrast, an average of 169 plants per counting frame were counted on the control track at the same point in time.

Conclusions

- It appears that repeated hot-water treatments are similarly effective to glyphosate in controlling annual and young perennial plants in the track area.
- Without control measures, the vegetation on the tracks increases steadily.
- The high logistical and operational effort involved limits the large-scale use of hot-water treatments on the SBB rail network, however.

The Herbiscope trial:
maximum reduction of herbicide use (admin.ch)

Scientific publication:
Swiss Agricultural Research 14, 76-85, 2023

Reality Check: Has the Neo-liberal, Conservative or Agro-ecological Vision of Swiss Farming Prevailed?

Agroscope studied the changes in the agricultural sector over the past twenty years in three Swiss regions and compared them with the visions of three associations: Avenir Suisse, the Schweizer Bauernverband and Landwirtschaft mit Zukunft.

Gregor Achermann, Julian Helfenstein, Chinwe Ifejika Speranza, Felix Herzog

Opinions differ as to how the Swiss agricultural sector should develop in future. Agroscope experts have studied the changes in agriculture over the past twenty years in three different regions of Switzerland – in the lowlands (Reusstal), in the Prealps (Entlebuch) and in the mountain region (Urserental).

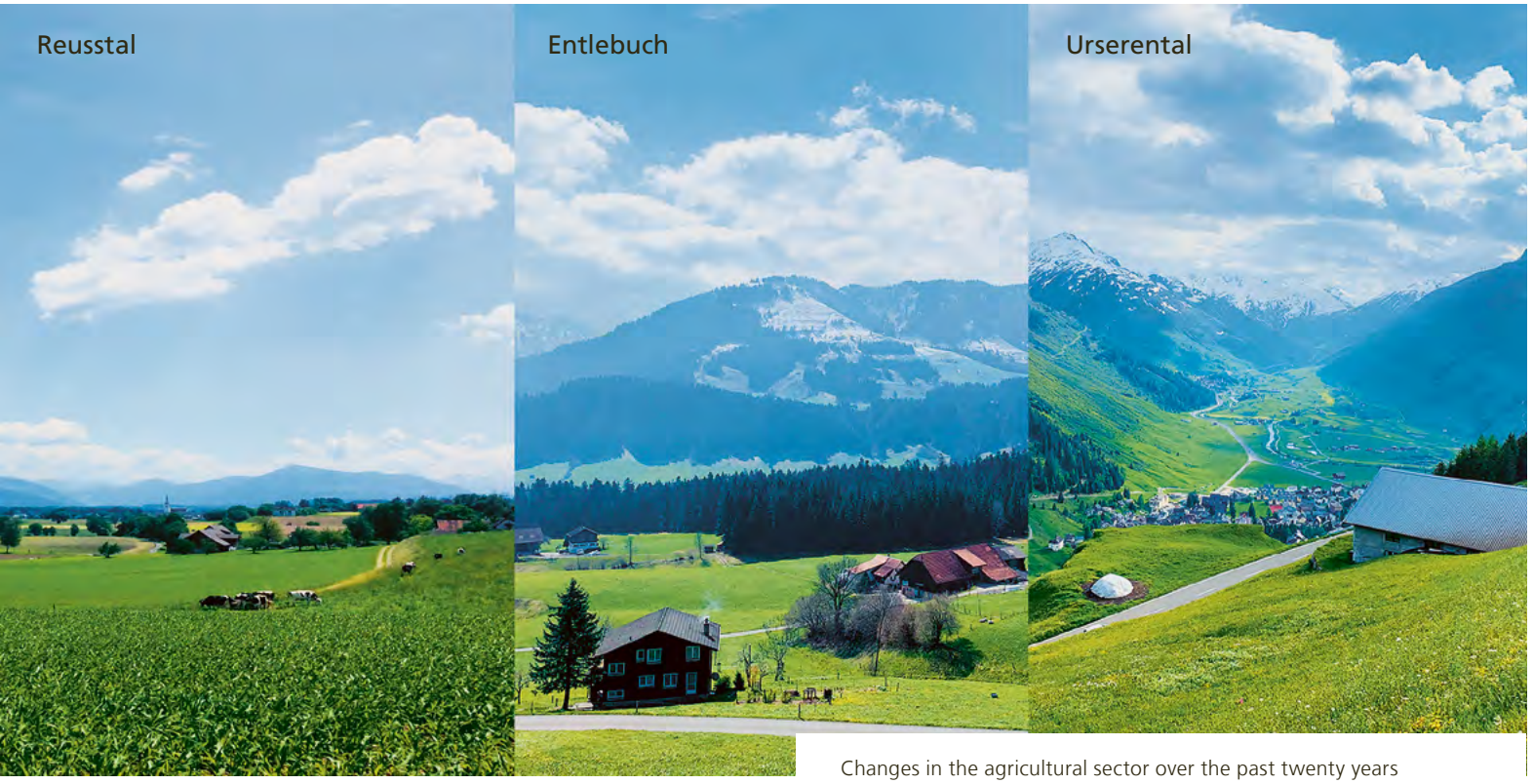
To assess developmental trends in the agricultural sector, the current situation was compared with the visions of three different associations: Avenir Suisse (AS) (= 'Foundation for the Future of Switzerland', a neo-liberal think tank), the Schweizer Bauernverband (SBV) (= 'Swiss Farmers' Union') and Landwirtschaft mit Zukunft (LmZ) (= 'Agriculture with a Future', a federation of agro-ecological movements).

Two of the three regions developing in line with Avenir Suisse proposals

In just twenty years – less than a human generation – significant changes have occurred with far-reaching implications for individual farms and for the agricultural landscape as a whole. These changes are the result of the reconciliation of the interests of various stakeholders, represented here by the three organisations, AS, the SBV and LmZ. In two of the three regions, general agreement with the aims of AS is strongest (Reusstal 70 %, Entlebuch 68 %). Agreement with the vision of the SBV (59 and 56 %) and LmZ (40 and 41 %) was lower. Only in the mountain region (Urserental) have the pro-status quo forces closest to the aims of the SBV prevailed (58 %), with AS and LmZ coming a close second and third (54 and 53 %). The 'green' visions gained the least acceptance in all three regions (Reusstal 40 %, Entlebuch 41 %, Urserental 53 %); however, there were also major differences between the individual farms in all three regions.

The objective: to boost productivity while conserving resources

The observed developments arise in combination with various influencing factors such as technical progress, costs and prices, regulations, agricultural policy and direct payments, farm structures and the subjective preferences of the individual farmers. The impact of these drivers on the observed developments was not explicitly investigated.



Changes in the agricultural sector over the past twenty years were studied in three Swiss regions: the Reusstal, Entlebuch and the Urserental.

Climate change, the biodiversity crisis, resource scarcity and social trends will lead to agriculture continuing to change and having to adapt in future. The aim is for agriculture to remain productive and even increase its productivity whilst consuming less environmental resources, protecting the climate and biodiversity, and guaranteeing good soil and water quality. Although the majority of stakeholders would most likely declare their agreement with this objective, there is disagreement as to how it should be achieved. The various stakeholders, represented here by Avenir Suisse, the Schweizer Bauernverband and Landwirtschaft mit Zukunft, will continue to pursue a reconciliation of interests. —

Scientific publication:
Swiss Agricultural Research 14, 130-140, 2023

Conclusions

- Agricultural development in the Reusstal (lowlands) and in Entlebuch (Prealps) was characterised by progressive structural change, and matched the vision of Avenir Suisse most closely (Reusstal 70 %, Entlebuch 68 %). Agreement with the aims of the Schweizer Bauernverband (SBV) was around ten percentage points lower (59 % and 56 %). The lowest agreement was with the Landwirtschaft mit Zukunft vision (40 % and 41 %).
- In the Urserental (mountain region), agreement between the three stakeholder groups was more balanced. The highest agreement was with the vision of the Schweizer Bauernverband (SBV) (58 %), although agreement with Avenir Suisse (54 %) and Landwirtschaft mit Zukunft (53 %) lagged only slightly behind.
- The ‘green’ visions gained the least acceptance in all three regions.

How Does Fat Content Affect Eye Formation in Cheese?

A quarter-fat Appenzeller cheese usually has significantly more holes ('eyes') than a full-fat Appenzeller. Is this really due to the fat content? Agroscope researchers looked into this issue.

Marie-Therese Fröhlich-Wyder, Dominik Guggisberg, Walter Bisig, Ernst Jakob, Remo S. Schmidt

A reduction in the fat of Emmentaler cheese results in a dramatic increase in CO_2 formation, and hence in greater eye formation.

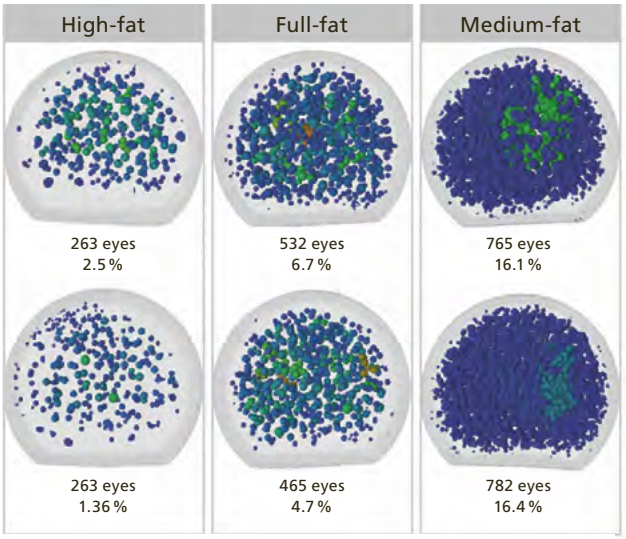
Hole or 'eye' formation is a distinguishing feature of many cheese varieties from Switzerland, such as Appenzeller®, Tilsiter and Emmentaler PDO. The size, number and nature of the eyes are key parameters for assessing the quality of the cheese. Eye formation is the result of a complex process that is dependent on a wide range of parameters such as the filling of the curd into the mould, the pressing of the curd, the aggregation of the curd granules, CO_2 formation through a starter culture or adjunct culture, the presence of eye starting points – the nuclei –, the texture and much more. Despite this, the importance of the composition of cheese has scarcely been studied to date. It is known that CO_2 has good solubility in both water and in fat. This solubility is temperature-dependent: as the temperature rises, CO_2 becomes less soluble in water and more soluble in fat. Knowing about the influencing factors allows cheese producers to steer eye formation in the desired direction.

Amount and solubility of CO_2 in cheese determine eye formation

But it is not just the question of how much CO_2 can dissolve in the main constituents of the cheese that is critical for eye formation. The amount of fermentable material converted into CO_2 by the bacterial community in the cheese is also important. The investigations took account of the fact that adjusting the fat content always had an effect on composition, and hence on the availability of fermentable material.

Fat affects eye formation in semi-hard cheeses …

Appenzeller-type semi-hard cheeses were manufactured in various fat levels. A facultatively heterofermentative adjunct culture with *Lacticaseibacillus paracasei* ensured that CO_2 was produced from citrate. With decreasing fat content, more CO_2 was formed owing to the altered composition (more fermentable citrate thanks to the expansion of the water phase). At the same time, it was shown that in the cheeses with a lower fat content, less CO_2 was dissolved than had been formed, owing to the lower solubility of the CO_2 in the water phase as opposed to the fat phase. Consequently, more undissolved CO_2 was present in the cheese and each effect intensified the other: eye volume increased markedly with decreasing fat content.



Eye formation in Emmentaler-type cheeses of varying fat levels, visualised on CT scan.

… and in Emmetaler-type cheeses

Emmentaler-type hard cheeses were also manufactured in varying fat levels. In this case, strains of *Propionibacterium freudenreichii* were responsible for the CO_2 formation from lactate. Compared to Appenzeller or Tilsiter, significantly more CO_2 was formed in Emmentaler cheese, which explains the markedly larger eyes of the latter. The change in composition of the cheese resulting from the reduction in fat led to a dramatic increase in CO_2 formation, and hence in eye formation. At the high fat level, CO_2 formation and CO_2 solubility remained in balance, with the result that few holes were formed.

Conclusions

- Adjusting the fat content of cheese always affects eye formation because of the change in composition.
- Reducing the fat content leads to an expansion of the water phase and hence to an increase in fermentable material. Consequently, both CO_2 formation and eye formation increase.
- An increase in fat content leads to increased CO_2 solubility, and hence to a reduction in eye volume. These effects are increasingly observed at warmer temperatures. This is particularly apparent during the ripening of Emmentaler.
- Knowing about these interactions enables production facilities to monitor the quality of eye formation.

Scientific publication:
International Dairy Journal, Volume 144, 2023

Agroscope Strengthens its Expertise in Agroecology

Lucius Tamm is responsible for the strategy process as preparation for the 2026–2029 Work Programme, as well as for the further development of international collaborations.

Born in 1962, Lucius Tamm studied Agronomy at the ETH Zurich and earned his doctorate at the University of Basel. As a scientist he then played a key role in the creation of the FiBL, where he was a member of the Executive Board from 2002 as well as Deputy Director from 2015 to 2021. He has served as Head of the Department of Crop Sciences with a staff of around 50, in which capacity he has sat on numerous expert groups in the national and international arena.

Bringing past experience to new challenges

On 1 June 2023 Lucius Tamm took up his appointment in Agroscope's Corporate Strategy Division, a staff unit reporting to Head of Agroscope Eva Reinhard. One of Tamm's main tasks ist to manage the strategy process for the new 2026–2029 Work Programme together with the Executive Board. The strategic work in this regard kicks off over the course of 2023. "To my way of thinking, taking the best from established approaches and developing new solutions from them is a necessary yet interesting challenge that I am more than happy to take on" commented Tamm.

International collaboration gaining in importance

To ensure that the agriculture and food sector develops and pursues a more sustainable approach to diet and nutrition, problems in the system as a whole must be investigated. International experts agree on this. Many countries are facing similar challenges. Enhanced cooperation across specialisms and institutions, both national and international, is thus advantageous.
Here too, Lucius Tamm brings the ideal background to the table for expanding collaborations, being ideally networked both nationally and internationally. —

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agroscope.ch

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Agroscope Communication
info@agroscope.admin.ch

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‘Wherever possible, Agroscope follows a proactive approach to control neobiota. This means that researchers assess the risk and instigate monitoring before pathogens become established here in Switzerland.’

Dominique Mazzi, Agroscope’s ‘Neobiota’ Research Group

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