AgroSCOPE

Annual Report 2015

Agroscope good food, healthy environment

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Additional information on the articles in the online report:
www.annual-report.agroscope.admin.ch

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Mission Statement

Swiss Research for Agriculture, Nutrition and the Environment

Agroscope, the Swiss Federal Centre of Excellence for Research in the Agriculture and Food Sector, is affiliated with the Federal Office for Agriculture (FOAG). Agroscope is strategically managed by the Agroscope Council, whilst the Agroscope Executive Board is responsible for its operative management.

Vision

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.

Aim and Purpose

Agroscope researches along the entire value chain of the agriculture and food sector for a competitive and multifunctional agricultural sector, for high-quality food for a healthy diet, and for an intact environment. Our focus is on research and development for the benefit of the agriculture and food sector; the provision of decision-making bases for federal-authority legislation; enforcement tasks within the framework of the legal provisions in the service of agriculture and the general public; and knowledge exchange and technology transfer with practitioners, agricultural extension, industry, science, the teaching sector and the public.

Agriculture's Balancing Act

Every day, Agroscope searches for ways to produce more food on the same surface area whilst protecting natural resources: soil, water, air, and natural diversity. This undertaking is truly a balancing act, known in technical jargon as 'ecological intensification'.

A prime example of this is described in our cover story, 'Less Fertiliser and Better Milk and Meat thanks to Sainfoin'. This legume fixes air-nitrogen to its roots via rhizobia bacteria, increasing yields in forage production whilst decreasing the amount of mineral fertilisers needed. Thanks to its positive constituents, sainfoin also optimises the quality of milk and meat from herbivores.

The article 'Flower Strips Reduce Pests' shows how Agroscope researchers have been systematically promoting natural diversity, so that pest and disease antagonists can gain strength. Such measures let us save on plant-protection products and reduce the impact of such products on all resources.

The natural diversity of microorganisms is also a resource. Read how their influence on fermented foods such as bread, cheese or wine can be researched, in the article 'Unravelling Lactic Acid Bacteria'. The knowledge acquired here helps us to further optimise the quality and safety of foods.

In future, vines will have to make do with less water and defy new pathogens. The article 'Viticulture in the Face of Climate Change' shows how Agroscope is helping with this delicate balancing act.

Thus, when solutions are needed for protecting the resources of the agriculture and food sector whilst producing more food domestically, Agroscope is the right port of call – since we're already dealing with tomorrow's issues, today.

Michael Gysi
Head of Agroscope

Less Fertiliser and Better Milk and Meat thanks to Sainfoin

Rhizobia bacteria on the roots of legumes enable the latter to fix nitrogen directly from the air. This enables higher yields in forage production and savings on mineral fertilisers. Sainfoin and birdsfoot trefoil, for example, also contain tannins which improve the quality of the milk and meat of ruminants.

Red and white clover, sainfoin and birdsfoot trefoil, alfalfa – Switzerland is home to an abundance of fodder legumes. Among these are species which, in addition to their beneficial properties for the agriculture and food sector, also contain tannins. These bioactive constituents of legumes are the focus of Agroscope research.

Tannins increase unsaturated fatty acids

Feed fats are split in the rumen of ruminants, where the rumen microbes convert them from unsaturated to saturated fatty acids. Consequently, the milk and meat of these animals contain comparatively high proportions of saturated fatty acids – an undesirable situation that it is hoped to change. What we are aiming for are polyunsaturated fatty acids. These not only form part of the essential nutrients – i.e. they are necessary for life, and cannot be synthesised by the human body – but are also credited with a whole range of health-promoting properties. Omega-3 fatty acids are meant to be particularly healthy. For years now, therefore, efforts have been made to increase the unsaturated fatty-acid content in the milk fat and meat of ruminants via their feed. One possibility consists in boosting the intake of unsaturated fatty acids via the feed. Levels of linolenic acid – an omega-3 fatty acid – in meat and milk can be increased, for example, by feeding the animals flaxseed. Moreover, a diet that emphasises grass is more advantageous in this respect than mixed rations based on maize silage.

Another possibility might be to feed tannin-containing legumes to livestock. Tannins can bind with nutrients in the rumen of ruminants, protecting these nutrients from breakdown. What's more, there is evidence that tannins influence the activity of rumen bacteria.

Richard Bapst feeds sainfoin pellets to a dairy cow. The high concentration of tannins in the plant increases the proportion of healthy unsaturated fatty acids in milk and cheese.

Tannins affect digestion

In Switzerland, tannins occur in fodder legumes such as sainfoin and birdsfoot trefoil. In a trial, Agroscope researchers fed *inter alia* alfalfa, sainfoin or birdsfoot trefoil pellets to dairy cows. Since sainfoin has a higher tannin content than birdsfoot trefoil, the cows in the sainfoin group consumed more tannins. The result: linolenic acid content in the milk of cows fed the sainfoin pellets was 16% higher than in that of cows fed alfalfa pellets.

In a further trial, the milk of cows fed the sainfoin pellets was made into cheese. Agroscope experts observed a rise in linolenic acid content in the fatty-acid profile of the cheese.

For another trial, Agroscope researchers grew sainfoin and birdsfoot trefoil as well as alfalfa and red clover, and made silage from the first cut at the beginning of July. After this, the researchers fed sainfoin, birdsfoot trefoil, red clover or alfalfa silage to four groups of lambs comprising 12 animals each for four to five months. After slaughter, it was observed that the amount of linolenic acid as well as the sum of all omega-3 fatty acids was significantly higher in the meat of the lambs fed sainfoin silage than in those fed other silages.

Improving sainfoin yield and tannin content

Unfortunately, sainfoin on its own is low-yielding and a poor competitor compared to other species of forage plants – it needs the right partner plants. Moreover, it would be desirable to optimise the content and composition of the tannins in the plant in order to achieve a better effect.

Agroscope researchers studied the performance of 30 sainfoin provenances from all over the world in terms of yield, tannin content and tannin composition. It was observed that there were major differences in all these characteristics that could be systematically used for the improvement of sainfoin through breeding. The cultivated varieties on the market today are higher-yielding, while certain wild types are characterised by an especially high tannin content, or a particularly bioactive composition of the tannins.

In a three-year field trial, perennial ryegrass, meadow fescue and timothy have proven to be particularly promising partners for the cultivation of sainfoin in mixtures. All three supress weeds effectively whilst nonetheless allowing for a significant proportion of sainfoin in the mixture. Furthermore, detailed measurements have shown that the sainfoin performs well in terms of symbiotic nitrogen fixation. This result was not necessarily expected, since only small amounts of sainfoin have been cultivated in Switzerland over the last few decades – for which reason it was feared that the symbiotic bacteria might be missing from the soil.

Sainfoin helps to save on fertilisers

To date, only a few studies have been conducted in Switzerland, and indeed in the

rest of the world, on the effect of tannin-containing legumes in dairy-cow feed. At Agroscope, further studies are planned to explore how these highly promising legumes can best be used in feed. Because it's not just their positive effects on the fatty-acid profiles of milk and meat that make these plants interesting – their tannins also fix proteins in the rumen, allowing ruminants to better utilise proteins in the grass. Naturally, another desirable effect is the potential savings in fertiliser use owing to the ability of the plant roots to fix nitrogen ■

Do Dairy Products Influence Nutrition?

Agroscope experts headed an international team studying the impact of dairy products on inflammatory responses in the human body. To summarise the conclusions of this study, dairy products – despite stubborn prejudices to the contrary – possess a slight inflammation-inhibiting effect, and people with metabolic disorders in particular could benefit from this food group.

Cultivation of Cisgenic Potatoes on the Protected Site

The second field season on the Protected Site – the Swiss federal government's experimental field for studying genetically modified crops – came to a successful close in August 2015. One new development was a preliminary trial conducted by Agroscope with potatoes to which potato late-blight resistance genes from wild potatoes were transferred via a genetic engineering technique. The aim of the project is to investigate the potential benefit for agriculture, as well as any possible environmental risks.

New Instructional Video for Cheese-Dairy Staff

The manufacture of liquid bulk starter cultures in a milk-processing establishment places high demands on the staff. Sound knowledge of lactic acid bacteria, uncompromising hygiene, painstaking work, and compliance with production specifications are the prerequisites for impeccable farm cultures for the manufacture of top-quality cheeses. An instructional video on the Agroscope home page shows how liquid bulk starter cultures for cheesemaking are prepared from Agroscope's Liebefeld cultures.

Experimental Housing for Emissions Research Opens to Public

In June 2015, Agroscope's new experimental housing for emissions research opened its gates to the public. The housing is designed to refine promising measures for reducing emissions, as well as to investigate the reduction potential and practicality of said measures, together with the industry, the Empa and the ETH. The experimental housing is a resting cubicle with exercise pen for dairy cattle. A special feature is the modular construction of the housing, with two identical housing compartments for every 20 cows.

Bee Diversity in Protected Areas

According to the Ordinance on Animal Breeding, the Dark Honeybee forms part of Switzerland's animal genetic resources. Agroscope researchers have been studying its genetic diversity and potential hybridisation with other bee breeds. Gratifyingly, many highly diverse pure-bred colonies have been found in the four protected areas. The preservation of genetic diversity is especially important with regard to stress factors such as parasites, diseases, pesticides and future changes in the environment.

Cereals with Coloured Grains

Wheat varieties with red and yellow grains contain high concentrations of anthocyanins and carotenoids with antioxidant properties. For several years now, Agroscope has been breeding varieties like these with high nutritional levels. These varieties also have enhanced resistance to Fusarium head blight and the associated accumulation of mycotoxins. They also have an excellent taste. To conclude: our coloured varieties are healthy, safe and delicious.

Less Lead and Mercury in the Soil

The Swiss Soil Monitoring Network NABO records soil quality for the early detection of harmful developments. Analysis of the first five survey cycles from 1985 to 2009 shows that carbon content in the topsoil has on the whole remained stable. Whilst levels of the heavy metals lead and mercury have decreased, rising concentrations of zinc and copper on intensively managed grassland and several arable sites have been observed. Further increases should be avoided.

Federal Councillor Schneider-Ammann visits Liebefeld

On 21 August 2015, the Head of the EAER visited the Liebefeld site to attend the 'Cheese Valley' event, where Agroscope researchers introduced the Councillor to their work on biogenic amines in cheese, as well as a method utilised in the laboratory specifically to detect the *Lactobacillus parabuchneri* bacterium. In the pilot installation, Councillor Schneider-Ammann was able to familiarise himself with our analytic work in a cheesemaking trial. All in all, the high-level skills and know-how of Agroscope employees as well as the organisation's privileged links with both industry and practice were amply demonstrated.


Agroscop

Flower Strips Reduce Pests

Biological pest control is one way of contributing to the ecological intensification of agriculture. Flower strips can encourage natural antagonists of agricultural pests. This helps to reduce pest infestation and hence damage to agricultural crops, as well as avoiding the use of plant-protection products.

For efficient and sustainable food production, agriculture depends upon various ecosystem services. In addition to soil formation and the provision of clean water, these also include the pollination of crops by insects, or the biological control of pests. It is precisely these ecosystem services, however, that are threatened by intensive management. In particular, certain plant-protection products and a simplified agricultural landscape without hedges, extensive meadows or fallow land threaten important pollinating or pest-regulating beneficials. This can make even more interventions necessary, such as the use of plant-protection products.

Promoting ecosystem services

Instead of threatening ecosystem services, modern production systems can encourage them, with a view to replacing – or at least reducing – anthropogenic inputs. For their development, antagonists of important crop pests, such as ladybirds, ground beetles or hoverflies depend upon floral resources such as pollen and nectar, as well as on undisturbed habitats. By offering these dwindling resources to beneficials, they can be encouraged and used where they are needed.

Matthias Tschumi identifies all the insect species – including numerous beneficials – that inhabit the flower strips and help to reduce pests.

Plants for beneficials

Flower strips tailored to the needs of beneficials could represent a practical tool for farmers, helping them strengthen biological pest control in the field. This was demonstrated by trials with 'tailored flower strips', sown as annual strips with plant species such as cornflower, coriander, buckwheat, poppy and dill next to an arable crop. Densities of the harmful cereal leaf beetle in adjoining winter-wheat fields were 40 to 53% lower than when no flower strip was sown on the field edge. This low pest pressure actually resulted in 61% less damage to the wheat plants.

Fewer pests

A comparable pattern could also be seen with potatoes. In fields next to tailored flower strips, the number of aphids was 75% lower on average than in fields without flower strips. Such measures make it likely that damage will remain low – below the threshold of damage beyond which plant-protection products would become necessary. In this way, tailored flower strips can help to reduce the use of plant-protection products in agriculture. This can even be cost-effective, since it can help save money whilst achieving higher yields.

Tailored flower strips can help to reduce the use of plant-protection products in agriculture.

The project '100 tailored flower strips in practice' is currently investigating these results more closely. In order for annual flower strips

to fully develop their potential, it is important for them to be well connected to perennial habitats with hedges, extensive meadows and wildflower strips; and to be combined with a management approach that protects the beneficials.

Diverse value-added

In addition to the antagonists of cereal leaf beetles and aphids, other animal as well as plant species benefit from these flowering habitats. Moreover, the diversity of hoverfly species in tailored flower strips and adjoining crops was significantly higher than in crops without flower strips. What's more, flower strips are an aesthetic asset for agricultural landscapes.

Since 2015, farmers have been able to create 'flower strips for pollinators and other beneficials' as biodiversity-promoting areas (BPAs) for ecological compensation. Together with its partner institutions FiBL, HAFL and SBV, Agroscope coordinates the further development of flowering habitats in the agricultural landscape via the 'flowering habitats' platform ■

Grapevine Rust Mite: a New Forecasting Model

Agroscope and the Staatliches Weinbauinstitut Freiburg in Brisgau, Germany have together developed Vitimeteo Rust Mite, a new mite-infestation forecasting model. The at-risk periods and favourable windows for treatment of the infestation are highlighted, and the graphs generated enable us to optimise the intervention periods. In this way, Agroscope is expanding the range of models available at www.agrometeo.ch and contributing to a more targeted and effective application of plant-protection products in viticulture.

Less Greenhouse Gases thanks to Point System

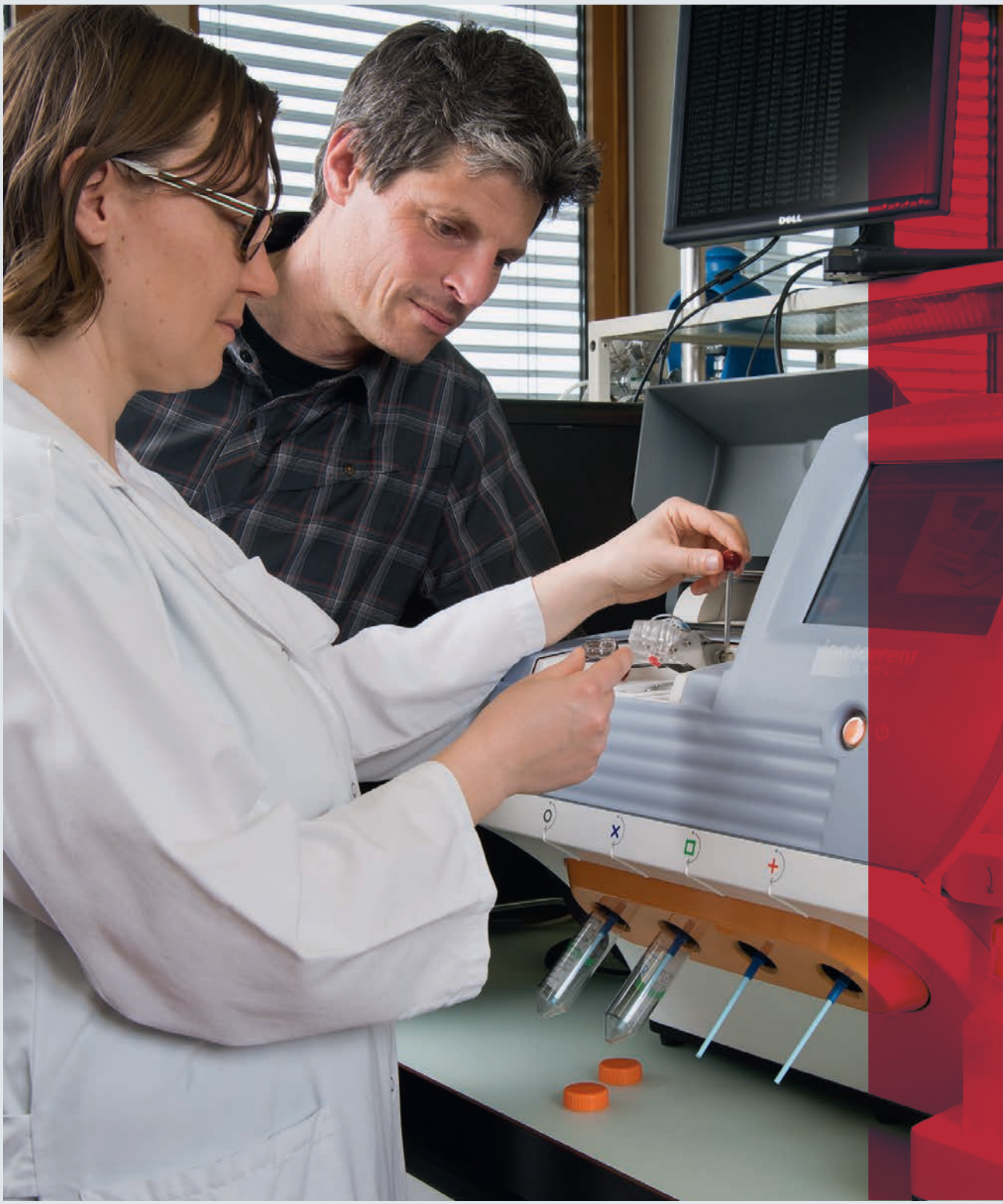
Agroscope has studied the potential of 20 different measures to reduce greenhouse-gas emissions from agriculture. The effect of the measures is often dependent on a farm's structure. For the assessment, it is essential to bear in mind the effects on the production of the whole farm. The 20 measures form the basis of the Climate Protection Point System, which is meant to help IP-SUISSE farmers lower their greenhouse-gas emissions in future.

Horses Relieve Stress by Cribbing

Agroscope researchers carried out a study with horses exhibiting stereotypic behaviour in the form of cribbing. Surprisingly, they discovered that although cribbing animals react more strongly to stress, they also seem better able to relieve this stress by cribbing. In a nutshell: it is counterproductive to prevent horses from cribbing. Instead, preventive measures promoting high-welfare housing and treatment and which improve the wellbeing of cribbing horses are what is needed.

Drosophila suzukii: Little Damage to Soft Fruit

After 2014, when the spotted-wing drosophila, commonly called by its scientific name '*Drosophila suzukii*', created major problems in all soft-fruit crops, 2015 has come and gone without too much damage. As soon as the presence of this pest was confirmed, preventive and control measures were put into place. Moreover, the high temperatures of summer 2015 helped to limit damage, since this pest has a problem with heat and dry conditions, and thus sought refuge in shady, humid zones. The control strategies developed by Agroscope and the high summer temperatures therefore enabled the effective control of *Drosophila suzukii* in 2015.


DELL

Unravelling Lactic Acid Bacteria

Lactic acid bacteria are important in the production of fermented foods such as bread, sauerkraut, yoghurt, cheese and wine. Today, using modern genomics, we can draw conclusions about the metabolism of bacteria based on their genome. In this way, bacterial diversity can be used to further optimise the safety and quality of fermented foods.

Lactobacillus casei is characterised by a variety of metabolic activities, allowing this lactic acid bacterium to live in various habitats, e.g. in plant material, in the human gut and in dairy products. As it is one of the most common bacterial species in mature Swiss raw-milk cheeses, we may assume that its metabolic activity influences the quality and flavour of cheeses. In partnership with the University of Bern, and using state-of-the-art sequencing technologies, Agroscope scientists have decoded the genome of 40 strains of this bacterium, all of which come from milk and cheese.

High bacterial diversity

The analysis showed a different size of genome for each of the 40 bacterial strains, ranging from 2501 to 3078 genes. The strain with the most genes is therefore characterised by the fact that it possesses a full 577 genes more than the strain with the fewest genes. Genes present in all strains were identified from the data. They form, so to speak, the constant part, referred to as the 'core genome', and account for about 60% of the genome on average. The other 40% are variable, i.e. are not present in all strains. This explains why such a wide variety of metabolic activities are observed in *Lactobacillus casei.*

Claudia Wenzel and Stefan Irmler analyse the genome of lactic acid bacteria, which influence the quality and flavour of cheese.

The molecular reason for the variable part of the genome was traced back to horizontal gene transfer. This is a mechanism whereby the bacteria exchange genetic material within their own species and with other bacterial species.

Exceeding limits

The function of genes is revealed *inter alia* in external (phenotypical) characteristics such as e.g. metabolic activities. Genome-wide association studies explore how bacterial genes correlate with phenotypical characteristics. This has led, for example, to the discovery that some strains of *Lactobacillus casei* can convert the sulphur-containing amino acid methionine into another sulphur-containing amino acid, cysteine. Rarely described to date, this bacterial metabolic activity is important for the formation of sulphur-containing flavour compounds in cheese.

This genome study has now armed Agroscope with important basic knowledge.

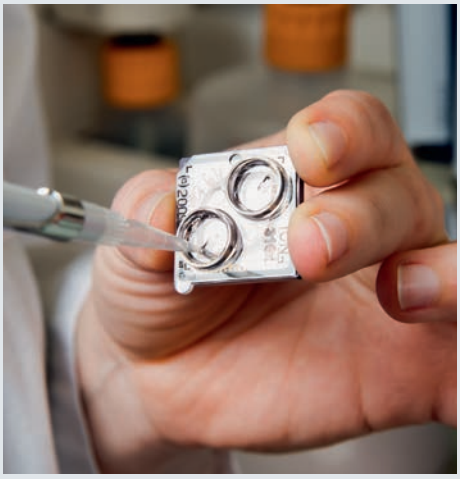
In addition to enabling important new knowledge to be obtained from complex genome datasets, this approach will also be used in future to explore issues such as antibiotics resistance, survival when exposed to heat and oxidative stress in the fermentation process, the formation of flavour and gases in foods, and health-promoting properties.

Low costs

The technology applied in this project is often referred to as 'next-generation sequencing', and is based on the fact that millions of sequencing reactions are carried out in parallel

in miniaturised form. The sequence of the building blocks from which the genome of an organism is composed is then readable in the computer. This makes it possible to decode the genome of different bacteria in just a few days and at a relatively low cost.

This genome study has armed Agroscope with important basic knowledge that allows us to address bacterial and biotechnological problems posed by fermented foods, thereby enabling the quality and safety of these foods to be further optimised ■



First 'Swiss Agricultural Outlook' Published

For some time now, medium-term model-supported projections have made an international contribution to providing an entrepreneurial focus for forward planning. Now, for the first time, Agroscope has published such a projection for Switzerland. Revolving around the agent-based model SWISSland, 'Swiss Agricultural Outlook' shows how the Swiss agricultural sector might develop based on international and national framework conditions, for the timeframe up to 2024.

New Analytics in Feed Inspection

Agroscope's official Feed Inspectorate checks whether feed companies observe legal provisions, and whether the feed marketed in Switzerland conforms to these provisions. In 2015, the NIRS (near-infrared spectroscopy) methodology was introduced in order to obtain information on constituents quickly and cost-effectively. Based on light absorption, this method is increasingly used for food- and feed-quality inspections.

Application of Plant-Protection Products in Greenhouses

The effectiveness of plant-protection products depends, among other things, on the application technique used. Agroscope has developed a model for calculating the spray volume suited to the leaf-wall area of greenhouse crops in order to guarantee a better rate of leaf coverage. The application of this model, developed for trellised market-garden crops (tomatoes, cucumbers, aubergines and peppers), improves the efficacy of the products without increasing residues on the fruits. Moreover, the use of vertical bars with air assistance improves the quality and efficacy of plant-protection product application.

European Network against Quarantine Organisms

International trade has led to an increased risk of introduction and spread of quarantine organisms (insects, nematodes, bacteria, fungi). Through validated methods for detection and identification, national reference laboratories can prevent further introductions. In order to develop and implement diagnostic tests, reference collections are essential. The Q-collect project aims to improve the status of European reference collections by conducting inventories, developing guidelines for quality standards, and establishing a network for better accessibility. This will guarantee the prevention of future introductions through efficient diagnostic methods.


TRAIN

Viticulture in the Face of Climate Change

Swiss viticulture is distinguished by its alpine character, its exceptional landscapes, a multitude of microclimates, and a wide range of grape varieties. Agroscope experts work on projects that address the consequences of climate change and the adaptation of grapevines to these new conditions, for sustainable production.

In Switzerland, grapevines develop on south-facing slopes, along the lakes, and in alpine valleys. The area where they are established has been defined by generations of winegrowers for specific aims and within highly varied socio-economic contexts. The result is a wide range of grape varieties.

Now wetter, now drier

Since time immemorial, climatic conditions have evolved along with the rhythm of the seasons, and perennial plants have felt their effects, adapting to them as best they could. For over 20 years, meteorological records have indicated a tendency to warming, with more or less precise future temperature-progression scenarios. For precipitation, the modelling is less precise, forecasting seasons that are sometimes wetter, sometimes drier. Precision irrigation, as a function of crop-management practices and the wine researched, becomes increasingly important during a particularly dry vintage, as in 2015.

Longstanding data

The Agroscope Viticulture Research Centre in Pully has been recording climatic parameters and the phenology of the Chasselas grape variety since 1925. During this long observation period, it has been noted that bud burst has shown a slight tendency to delay, with extremes of precocity in 1990 (19 March) and lateness in 1956 (5 May), a year marked by a historic winter frost.

The onset of flowering tends to be earlier, with extremes of precocity in the years 2011 and 1948 (5 May) and lateness in the year 1980 (7 July). The same tendency can be observed for the onset of ripening, when grapes change colour.

The random sampling of Chasselas on 20 September shows an average of 69.8 °Oe, with a clear upward trend, the outliers being 49 °Oe in 1939 and 85.7 °Oe in 2015, as well as 85 °Oe in both 1945 and 1947.

Agroscope's Divico variety requires at least two to three fungicide treatments.

Good adaptive capacity

These results show that vines readily adapt to changes in climate, and in the case of Switzerland benefit from warmer conditions. At present, they are certainly one of the crop plants best adapted to climate change. Despite all this, questions remain as to the optimisation of the harvest date as a function of the parameters determining wine quality. Said parameters differ according to crop-management practices and type of wines studied, pedoclimatic situations, grape varieties and clones. It is not enough to harvest earlier to preserve the best possible sugar-acidity balance – it is also necessary to define

Vivian Zufferey measures photosynthesis in grapevines to determine carbon dioxide uptake.

the ripeness of other compounds such as anthocyanins, polyphenols and tannins.

Greater flexibility in grape varieties

Climate change increases pressure from fungal pathogens, as well as from recurrent and emergent pests. In this context, the selection of the best-adapted grape varieties and clones forms part of Agroscope's viticulture research priorities, underlying practically all of the clones entered in the national list for the production of certified planting material.

The creation of grape varieties resistant to fungal diseases, such as Divico (Gamaret x Bronner), available since 2013, is another result of research in response to the adaptation of varieties to climatic conditions with a view to sustainable and environmentally friendly production. This variety requires at least two to three sprays with fungicide, compared to seven or eight for the usual grape varieties.

New problems in prospect

Climate is not constant, and the warming that has been measured for over 20 years directly influences the behaviour of the vine and of microorganisms. The latter will always win the battle thanks to their flexibility, which provides them with an especially dynamic capacity to adapt both to the climate and to plant-protection products. Grape varieties with polygenic resistance are the only prospect for loading the dice in favour of the vine, and risk prediction as a function of microclimates allows for the precise management of plant-protection inputs.

Despite all this, liberalised trade in plant material tends to confront us with new plant-protection problems requiring solutions, as in the case of flavescence dorée phytoplasma, *Drosophila suzukii*, or *Xylella fastidiosa*, the bacterium responsible for Pierce's disease of grapevines which is not yet present on European territory, but whose subspecies are gradually spreading into Europe and are capable of infecting over 200 host plants.

In the context of global warming, the Swiss wine economy will continue to adapt in order to guarantee original, high-quality wines from sustainable production systems to consumers – thanks to Agroscope's innovative research projects, conducted on the basis of a wide range of grape varieties ■

Two Perennial Ryegrass Varieties Bred

A cross between Italian ryegrass and perennial ryegrass, hybrid ryegrass is an important component of clover/grass mixtures where a fast-growing, competitive grass of greater persistence than Italian ryegrass is desired. In comparative trials with a total of 26 varieties, Agroscope has identified two new breeds of hybrid ryegrass that are of interest for Swiss forage production: the new variety G 0373, and G 0366.

Milk Replacer for Low Birth-Weight Piglets

Improved reproductive performance of sows has resulted in larger litter sizes. Larger litters, however, also mean greater numbers of low birth-weight piglets. As part of a European project, Agroscope investigated whether weaning these piglets early and feeding them with milk replacer enriched with specific amino acids improves their growth and survival rate. Results show a mortality rate of 0% and an improved growth performance trend over the first 28 days of life.

Increasing Efficiency in Apple Breeding

As part of the 'Fruitbreedomics' EU project, Agroscope conducted pilot studies on increasing efficiency in apple breeding. The focus here was on the breeding of varieties with high fruit quality, good yields, and two different scab resistance genes – two for long-lasting effectiveness. Modern SNP markers – in some cases developed in-house – allowed for the identification of specific genes for quality and resistance, thereby enabling selection of the most promising plants at an early stage of the breeding process.

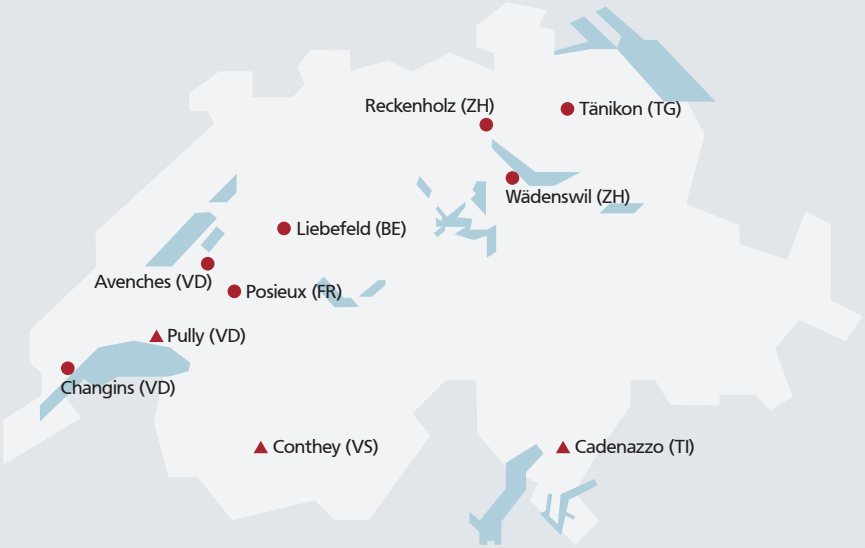
New Methods for Promoting Raw-Milk Quality

Over the past few years, Agroscope has developed various molecular-biological methods (qPCR) enabling the specific, sensitive and rapid detection of undesirable bacteria such as *Staphylococcus aureus* GTB, dairy propionic acid bacteria and *Lactobacillus parabuchneri* in milk. These methods are transferred to interested organisations and laboratories so that they can be applied without delay in practice, and thereby contribute to the further improvement of milk quality.

State Accounts 2015

Statement of Financial Performance	Accounts 2014	Accounts 2015	Divergence 2015/2014	Divergence 2015/2014
	in CHF	in CHF	in CHF	in %
Functional earnings				
Financially impacting	21,607,187	23,116,663	1,509,476	7.0 %
Non-financially impacting	413,832	–606,554	–1,020,386	–246.6 %
Total Revenues	***22,021,019***	***22,510,109***	***489,090***	***2.2*** %
Functional expenditure				
Financially impacting	139,147,801	140,241,926	1,094,125	0.8 %
Non-financially impacting	4,977,577	4,970,696	–6,881	–0.1 %
Service accounting between offices	49,800,378	50,740,188	939,810	1.9 %
Total Functional expenditure	***193,925,756***	***195,952,810***	***2,027,054***	***1.0 %***
Statement of Investments				
Investment income	15,507	16,979	1,472	9.5 %
Investment expenditure	4,525,507	5,091,291	565,784	12.5 %
Reserves				
Creation of earmarked reserves	93,776	507,000	413,224	440.7 %
Use of earmarked reserves	170,000	––	–170,000	–100.0 %
Third-Party Funds				
Acquisition of third-party research funding	14,759,260	15,233,280	474,020	3.2 %

Sites



Key Figures 2015

943 people on average were employed by Agroscope in 2015, based on financially impacting expenditure.

411 of these were women, corresponding to a 44% share.

58 trainees were employed.

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1328 items were published during the year under review.

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2544 classes and lectures at universities and technical colleges were given by staff during the past year.

–

15.2 million Swiss francs of outside funding were obtained for research by Agroscope in 2015.

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