

July 2022

agroscope



Agroscope good food, healthy environment



Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

Swiss Confederation

Federal Department of Economic Affairs,
Education and Research EAER
Agroscope



Agroscope conducts intensive research into new Smart Farming technologies for the agricultural sector. These technologies enable optimised processes and reduce workload.



Dear Readers,

Digitalisation in the agricultural sector is in full swing, and is already a defining feature of everyday life. New Smart Farming technologies not only permit continual process optimisation but can also guarantee high product quality, and free human beings from onerous and repetitive tasks. Thus, we conduct intensive research to tailor Smart Farming to the needs of the agricultural sector.

Swiss dairy farms are affected by structural rather than by digital change. We analysed the influencing factors (p. 6).

Carbon in the soil helps protect the climate and achieve good harvests, which is why we have calculated the amount of additional carbon which could potentially be stored in Swiss soils (p. 16).

With nitrogen, it is important to avoid surpluses in the soil. Using drone images and plant samples, we measured plant nitrogen content and adjusted fertiliser application to soil replenishment and plant needs (p. 18). In this way, Smart Farming technology will enable the proper dosage of nitrogen fertiliser in the future.

Product quality and environmentally friendly production are also of paramount importance in breeding. Our multiresistant grape variety 'Divico' not only impresses with the high-quality wines made from it but also improves colour intensity when blended with Pinot Noir (p. 20).

The example of the Engadine sheep (p. 22) shows that progress can also be made without technical tools, since these robust grazers can be used on bush-encroached alpine pastures to care for the landscape.

Wishing you an interesting read,
Nadja El Benni

Head of the 'Sustainability Assessment and Agricultural Management' Research Division





Farm Network is Key Component of 'Nutrient Flows' Experimental Station

Agroscope and its partners at the 'Nutrient Flows' Experimental Station are working together to reduce nitrogen and phosphorus emissions in animal production. At present, Agroscope is collecting a wide range of data from a network of 26 farms in the canton of Lucerne.

4

Other themes

News 8

Portrait 10

Insights into Research 11

State Accounts 24

Agroscope Future Project

Agricultural Economics

Environment

Plant Production

Food

Animal Production

Divico Wines in Blends with Pinot Noir: High Quality, Intense Colour

Divico, Agroscope's new disease-resistant grape variety, is noted for the quality of its wines. Blending trials with the Pinot Noir variety have shown that Divico is also highly suitable for correcting colour intensity in the latter.

20

Hardy Grazing Livestock: Protectors of the Mountain Landscape

Biodiverse mountain pastures are being overgrown by green alder shrubs. A study conducted by Agroscope and ETHZ shows that hardy sheep and goats can stop shrub encroachment. In particular, the traditional Engadine sheep has a taste for green alder.

22

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.

A Look into the Archive



12

Swiss Dairy Farming in Transition

Swiss dairy farms are more strongly affected by structural change than other farm types. An analysis of the farms exiting the sector or switching focus highlights influencing factors.

6

Determining Soil Carbon Storage Potential

Protecting the climate whilst reaping a good harvest is possible if greater amounts of carbon are sequestered in the soil. Agroscope calculated the amount of additional carbon that the soil is capable of storing.

16

Using Sensors to Better Adapt Nitrogen Fertilisation to Plants and Soils

To ensure a good harvest while protecting the environment, a nitrogen surplus must be avoided. Agroscope is investigating how the application of nitrogen fertiliser can be better adapted to soil replenishment and the needs of the plants.

18

Events

21 Jul and 4 Aug 2022, Agroscope, Swiss National Stud Farm SNSF

Thursdays at the Stud Farm

Discover the Swiss National Stud Farm, the centre of excellence for equids

20 Aug 2022, BBZ Arenenberg and Agroscope

Göttingen Day

16 –18 Sep 2022, IENA, Swisshorse, Swiss Franches-Montagnes Association, Agroscope, Swiss National Stud Farm SNSF, Avenches

Equus helveticus; Final Stallion Licensing ZVCH (Swiss Horse Breeders' Assn.)/SNSF Family Day

20 Sep 2022, AGRIDEA and Agroscope
Conference on Animal Production

4 Oct 2022, Agroscope Tänikon
45th Agroscope Agricultural Economics Conference

8 – 9 Nov 2022, Joint Conference of ALB-CH, AGRIDEA, Agroscope and suisselemio

Rural Construction Training Course for Specialists in Construction

[All Agroscope events that are open to the public are advertised on our website.](#)

Farm Network is Key Component of 'Nutrient Flows' Experimental Station

Agroscope and its partners at the 'Nutrient Flows' Experimental Station are working together to reduce nitrogen and phosphorus emissions in animal production. At present, Agroscope is collecting a wide range of data from a network of 26 farms in the canton of Lucerne. Samples of feed and farmyard manures (dung and liquid manure) are studied and the actual nutrient flows analysed. The results will contribute to defining practical measures for reducing environmentally harmful emissions.

Operating in a region with high livestock populations, the 'Nutrient Flows' Experimental Station is entering a new phase of development. A network of 26 Lucerne farms was created and is taking an active part in the station's mission. These farms – primarily dairy and pig farms and producing according to conventional, IP-Suisse or organic standards – form the core component of the experimental station. They play an important trailblazing role for the canton of Lucerne and for Switzerland as a whole, contributing to the acquisition of new knowledge and the implementation of known research findings in practice.

Practice and research: creating new knowledge together

What do these pilot farms have in common? The aim of joining together with scientific researchers – with whom they share knowhow, experience and ideas – to champion sustainable agriculture. Co-creation, i.e. the joint development of knowledge, plays a key role at Agroscope. It expands research options and benefits all involved stakeholders.

From feed to liquid manure

Specifically, the experimental station measures, as precisely as possible, nutrient inputs and outputs: in other words, what goes into the animal (feed) and what comes out of it (farmyard fertiliser). To do this, the daily quantities of feed fed to livestock are carefully documented. Experimental station staff pay regular visits to each farm to take samples of feed and farmyard manure. These samples are then sent to the laboratory, where their nutrient content is analysed.

Cutting-edge technology

Researchers also measure liquid-manure composition in real time, right on the farm itself, using a cutting-edge tool equipped with an NIR (near-infrared) sensor. This state-of-the-art mobile measuring station regularly accompanies the experimental station team on visits to the individual farms. At the same time, researchers collect data concerning the structure of the farm (size, type, animal production, feed, storing and spreading of farmyard manure).



The 'Nutrient Flows' Experimental Station is in full swing. A data collection campaign is currently underway on 26 pilot farms in the canton of Lucerne. A presentation in Inwil (Lucerne) on 13 June 2022 outlined the various projects of the Experimental Station.

Achieving the environmental objectives set by the Swiss Confederation

The data thus collected will help to define practicable and effective measures to improve nutrient efficiency and reduce nitrogen and phosphorus surpluses. These measures are key to achieving the aim set by the Federal Council of reducing nutrient surpluses by 20% by 2030. —

Partners

- Agroscope
- Canton of Lucerne
- Lucerne Farmers' Association (LBV)
- Central Swiss Milk Producers (ZMP)
- Suisseporcs
- Agridea, the agricultural extension centre

[More information on the Agroscope experimental stations](#)



Swiss Dairy Farming in Transition

Swiss dairy farms are more strongly affected by structural change than other farm types. An analysis of the farms exiting the sector or switching focus highlights influencing factors.

Alexander Zorn, Franziska Zimmert



In terms of their numbers and production value, dairy farms represent the most important type of farm in the Swiss agricultural sector.

Measured by their numbers and production value, dairy farms are the most important farm type in the Swiss agricultural sector. Compared to other farms, their numbers are decreasing relatively sharply. Whilst dairy cow numbers are shrinking, however, the number of suckler cows is steadily increasing. In view of the manifold challenges posed by agriculture and the entire food system, it is important to understand structural change in the sector. Suckler cow production, for example, is more attractive because it allows for a less labour-intensive use of grassland.

Primarily younger farm managers switching to suckler cow production

To study this development, we compared dairy farms exiting agriculture and farms switching to suckler cow production with the rest of dairy farms. The analysis of the time period 2000 to 2018 shows that it is primarily older farm managers exiting agriculture. By contrast, it is mainly younger farmers as well as dairy farms already familiar with organic and free-range production that switch to suckler cow production.

Higher exit rate in hill and mountain regions

The exit rate from agriculture is higher in the hill and mountain region, where production conditions are more difficult and work and earning opportunities outside of agriculture are better. Farms also switch more frequently to suckler cow production under these conditions. By contrast, large dairy farms, 'quality label' producers (to organic or PAS and ROEL animal welfare standards) and those in receipt of higher direct payments tend to remain in the sector.

The areas in which milk can be produced for the manufacture of Raclette and Gruyère cheeses were specifically considered in the analysis. There is a higher probability of exit in these regions. This might be explained by greater competition; in both regions, dairy-farm growth rates are higher than for the rest of Switzerland.

Findings on evolution of farm types help with agricultural policy

To date, analyses of agricultural structural change have focused in particular on farm exit or increase in size. This analysis sheds light on intrasectoral change in Swiss agriculture, thereby offering new insights. There is an opportunity to influence development via agricultural policy measures and advice at the stage before the age limit is reached, or the stage after which the younger generation has taken over the farm. —

Conclusions

- ▶ It is mainly younger farm managers and quality-label producers (organic and animal-welfare standards) that switch from dairy to suckler-cow farming.
- ▶ Small and conventional farms more often exit completely from agriculture than large farms and quality-label producers.
- ▶ Qualitative differentiation (quality-label production) contributes to farm continuation, but can also favour the switch to suckler-cow production.
- ▶ Both the stage before the age limit is reached and the stage after farm handover – stages at which important strategic decisions are made – offer an opportunity to influence the development of the agricultural sector.

[Scientific article in Agricultural and Food Economics 10, 7, 2022.](#)

► Digital Technologies in Agricultural Training

Digitalisation is playing an increasingly important role in agriculture. What knowledge is imparted in the Farm Manager course? An online survey shows where there is a need for expansion.

► Developing an Environmental Calculator for the Swiss Agricultural Sector

Agroscope and the Institute for Agroecology are developing a practical environmental calculator that can calculate the impact of Swiss farms on the climate, biodiversity and sustainability.



► Agrometeo: An Indispensable Tool for Sustainable Production

Agrometeo is a platform providing decision-making tools and information for better plant protection in agriculture – for viticulture and fruit production in particular.

→ [Video \(German\)](#)



► The Secret of Emmentaler & Co.

Cheeses like Emmentaler, Emmenspitz and Leerdammer are characterised by large round holes and a nutty, slightly sweet flavour. A new publication gives an overview of these cheese varieties and how they are made.

► Efficient Life Cycle Analyses thanks to SALCAfuture



As of now SALCAfuture is being used by Agroscope, and it is also available for internal and external collaborations.

→ [Video](#)

► Plant-Protection Products in Vegetable Production



Handling resistance properly by bearing in mind groups of active substances: this is the aim of the recently updated publication 'Plant-Protection Products in Vegetable Production'.

► **How Digitalised Will Swiss Vegetable Farms Be in Future?**

Although digital technologies for vegetable production are available, they are seldom used at present. What factors prevent or promote their use? A survey of experts conducted by Agroscope provides answers.



► **Surveying and Identifying Wildflowers with Drones**

Wildflowers on meadows and pastures are important as a year-round food source for pollinating insects.

► **Typicity of Alpine Cheese: Surprising Observations**

The Experimental Station for Alpine and Mountain Farming studied 16 PDO Bernese Alpine Cheeses. Why do they vary so greatly in terms of taste and texture? A brief overview of an at-times surprising experiment.



► **Handling Persistent Pollutants in Livestock Production**

Although persistent organic pollutants (POPs) were banned in the 1980s, they can still accumulate in products of animal origin to this day.

→ [Presentation \(German\)](#)



► **Reducing the Damage Caused by Birds**

Agroscope is partnering with ornithologists to study the behaviour of corvids. The study aims to reduce the damage caused by these birds to sunflower and maize seedlings.

→ [Further information on these topics](#)

Thomas Gentil: Building Trust and Moving Forward Step-by-Step



Since 1 March 2022 Thomas Gentil has been Deputy Head of Agroscope, Head of the Resources Unit and a Member of the Executive Board. Among other things, he wants to optimise workflows for the benefit of all employees.

“For an impatient sort like myself” confesses native Jurassian Thomas Gentil with a chuckle, “it was painful to recognise that anyone who chooses the direct route usually ends up needing more time to reach their destination.” Being aware of this, the 38-year-old from Delémont is happy to work towards solutions in small steps – in keeping with Albert Einstein’s quote that “the most powerful force in the universe is compound interest.”

Public administration chosen over politics

Thomas Gentil lives in Corminboeuf, Canton of Fribourg, and studied Political Sciences and Public Administration (MPA) at the Universities of Lausanne and Bern. He came by his predilection for these subjects honestly, as his father was a career politician. Even so, after dipping his toe into local politics, Gentil decided not to follow in the footsteps of his father, but instead focused on Federal Administration. After developing the legal and scientific bases for the Federal Office of Public Health FOPH, he worked at the Federal Office of Police fedpol, where he was responsible for corporate development. As the new Head of the Resources Unit at Agroscope, he learned the ropes quickly. “I was given a very cordial welcome” Gentil acknowledges with a hat-tip to his fellow Executive Board members and his team. Around 130 people in the spheres of IT, infrastructure, finances, human resources, procurement management, quality and safety, and legal services work under him.

Optimising workflows

“The Resources Unit has recently been subject to lots of changes. The first thing I want to do is build trust and lend people moral support so that they can perform their daily work as efficiently and skilfully as possible. Being able to develop and deploy all their skills is paramount. Ultimately, this is in the interests of the whole of Agroscope.” To this end, he wants to further optimise the work environment and workflows. This means providing resources where necessary, setting up transparent processes, distributing competences and defining responsibilities. He is ideally equipped for this task, since previous projects at fedpol required the same thing – the steady, step-by-step optimisation of one’s own way of working. Thomas Gentil relaxes at home in the company of his wife and two school-age children and is already looking forward to his next trip abroad. He also enjoys sports – strength training at home and jogging – both on a regular basis and with small increases in effort, with a view to one day reaping the compound interest in this sphere as well. —



- 1 Agroscope supports the Swiss cheese sector with innovative technologies and develops basic knowledge to avoid quality issues.
- 2 Cheese production on the Praditschöl Alp, Val S-charl in the Engadine.
- 3 Useful facts and tips on forage production and grazing management were presented at 'Equiday Avenches', Agroscope Swiss National Stud's Practitioners Day.





Hay harvest in past.





1



2



3

1 Soil structural quality forms the basis for sustainable management. | 2 Molecular diagnostics is used to identify and genetically characterise both harmful and beneficial organisms. | 3 Every year, cherry and plum production and plant protection are discussed at the Breitenhof Conference, held at the Agroscope Stone Fruit Centre in Wintersingen, Canton of Basel-Landschaft.



4



5



6

4 Mechanical weed control in sugar beet. | 5 The sensor-controlled mini-greenhouse at the BEA Bern Expo public exhibition in Bern. | 6 Flower strips can encourage beneficial insects in crops grown under cover as well as outdoors. | 7 The parasitic wasp *Ganaspis* cf. *brasiliensis* acts as a natural antagonist of spotted-wing *Drosophila*.



7

Determining Soil Carbon Storage Potential

Protecting the climate whilst reaping a good harvest is possible if greater amounts of carbon are sequestered in the soil. Agroscope calculated the amount of additional carbon that the soil is capable of storing.

Thomas Guillaume, David Makowski, Zamir Libohova, Saïd Elfouki, Mario Fontana, Jens Leifeld, Luca Bragazza, Sokrat Sinaj

Storing more carbon in the soil reduces the amount of greenhouse gases in the atmosphere and promotes soil fertility and good harvests. With appropriate management, optimal values can be achieved, which protects the

environment and pays off in economic terms. In this context, Agroscope conducted a study to estimate the additional amount of carbon that can be stored in arable soils.

Type of crop rotation is key

The study showed that average carbon saturation in farmland is 62% in the top 20cm of the soil. This means a high carbon-storage potential. The longer arable land is covered with grass and clover, the higher the carbon saturation will be. This is why temporary grasslands in the crop rotation have a major influence on the amount of carbon stored in the soil.

Conclusions

- ▶ Improving the carbon content of arable soils makes it possible to protect the climate whilst reaping good harvests.
- ▶ The longer farmland is covered with temporary grasslands during the crop rotation, the more carbon can be stored.
- ▶ The Agroscope calculation model explains 80% of the variation in the carbon-storage capacity of arable soils with five variables, and 59% of the variation with two variables (carbon and soil texture).





Carbon stored in the soil reduces the amount of greenhouse gases in the atmosphere and promotes soil fertility.

Ratio of organic carbon to clay constituents

Most arable soils have a carbon-to-clay-content ratio below 1:10 in the top 20cm – a threshold value below which soil structural quality no longer permits sufficient resistance to mechanical stress or water stress. Low soil organic-matter content requires a higher application of

fertiliser, especially nitrogen fertiliser. Consequently, increasing the carbon content of arable soils not only benefits the climate, but also improves soil fertility. —

[Scientific article in Geoderma, Elsevier, 422: 115937, 2022, 1–9.](#)

Using Sensors to Better Adapt Nitrogen Fertilisation to Plants and Soils

To ensure a good harvest while protecting the environment, a nitrogen surplus must be avoided. Agroscope is investigating how the application of nitrogen fertiliser can be better adapted to soil replenishment and the needs of the plants.

Francesco Argento, Frank Liebisch, Michael Simmler, Cecil Ringger, Matthias Hatt, Achim Walter, Thomas Anken



Sensor systems like tractor-, drone- and satellite-based applications are already used in agriculture.

Commercial sensor systems such as tractor-, drone- and satellite-based applications are already available at present for targeted nitrogen fertilisation. In order for these systems to be used effectively and efficiently in agriculture, however, further development under practical conditions is essential. In future, satellite-based applications could be used for site-adapted fertilisation, supported by drones and/or tractor-based systems according to need.

Adapting fertiliser application – protecting the soil, water and air

With nitrogen fertilisation, it is important to get the dosage right. This means adjusting the amount of fertiliser both temporally and spatially to the needs of the plants whilst bearing in mind the soil nitrogen supply. Doing this can prevent excess nitrogen from finding its way into the environment, where it can pollute the groundwater as a nitrate or exacerbate the greenhouse effect as nitrous oxide.

To obtain an indicator for the quantity of plant-available nitrogen, the soil-water nitrate content was measured in a winter wheat study. For this, Agroscope experts used suction cups and sensors embedded in arable soil at a depth of between 15 and 45 cm. Because this indicator is not sufficient on its own to determine plant nitrogen uptake, however, the researchers also concurrently analysed multispectral images from a camera drone as well as plant samples in order to measure plant nitrogen content. All these data were linked together to determine the connection between the dynamic processes of soil nitrogen replenishment and N uptake in the plants.

Measuring plant nitrogen uptake with drones

During the growing season, the plants largely absorb the available nitrate in the soil water, but the supply is also replenished in the soil. Weather conditions, for example if water becomes scarce, play a major role here.

The results showed that it is possible to measure plant nitrogen uptake with calibrated multispectral images. Using these in combination with calculation models that determine the nitrogen replenishment in the soil, nitrogen fertilisers can be dosed more precisely, thereby reducing surpluses. —

Conclusions

- ▶ With nitrogen fertilisation it is important to get the dosage right, since excess nitrogen can pollute the groundwater or form greenhouse gases.
- ▶ Calibrated multispectral images from drones or satellites enable us to measure plant nitrogen uptake during the growing season.
- ▶ Weekly nitrate measurements in the soil are not suitable as a sole indicator to determine the dynamic processes of nitrogen replenishment in the soil. Consequently, soil nitrogen measurement is still in need of further research and development.
- ▶ In combination with results from other studies, it was shown that nitrogen surpluses can be reduced by around 30% without any yield losses.
- ▶ The acquired knowledge will be refined at the 'Smart Technologies' experimental station in the Cantons of Thurgau and Schaffhausen on commercial farms and implemented in practice.

[Video: Digitalisation Enables Targeted Fertilising](#)

[Scientific article in European Journal of Agronomy 134, 126462, 2022.](#)

Divico Wines in Blends with Pinot Noir: High Quality, Intense Colour

Divico, Agroscope's new disease-resistant grape variety, is noted for the quality of its wines. Blending trials with the Pinot Noir variety have shown that Divico is also highly suitable for correcting colour intensity in the latter.

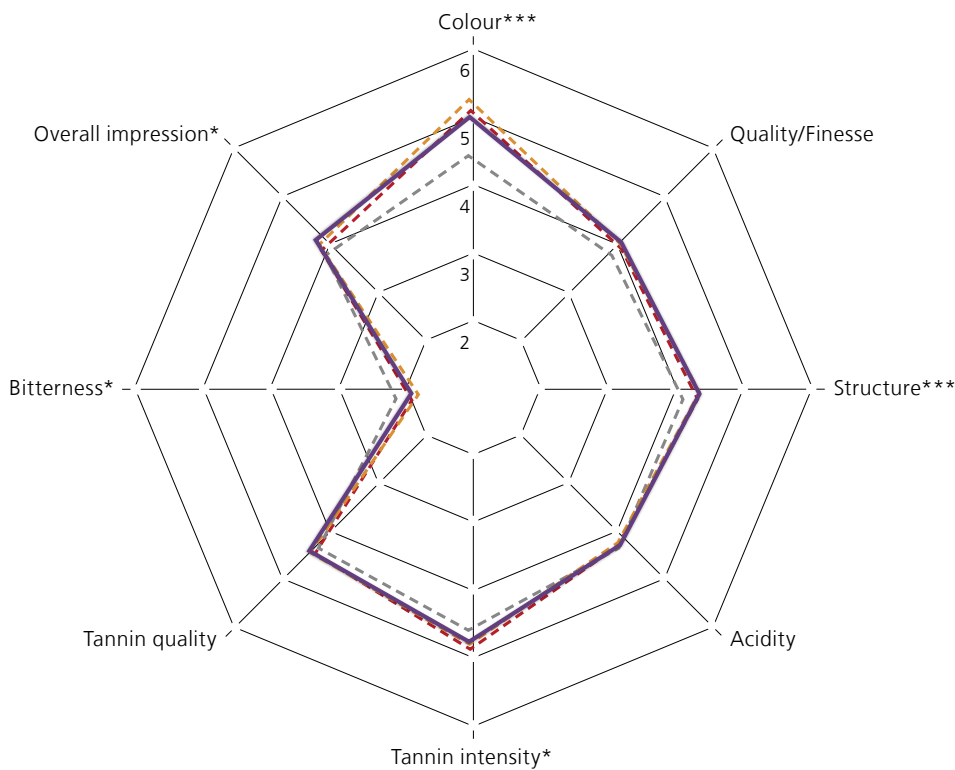
Jean-Laurent Spring, Vivian Zufferey, Thibaut Verdenal, Jean-Sébastien Reynard, Fabrice Lorenzini, Gilles Bourdin, Christophe Carlen

Grown on a surface area of nearly 3900 ha in 2020, Pinot Noir is the most cultivated grape variety in Switzerland, widespread throughout all wine regions north of the Alps. Its reputation is founded on the delicacy and typicality of its bouquet, dominated by fruity notes and a good structure associated with a very soft, velvety tannin profile. Visually, it is sometimes marred by a colour often rated as slightly weak in intensity. In Switzerland, certain teinturier ('dyer') grape varieties such as Dakapo and Dunkelfelder are grown whose wines, when used in low percentages in blends, can improve the colour of Pinot Noir. In 2013, moreover, Agroscope authorised a first red grape variety resistant to downy and powdery mildew as well as botrytis blight – Divico – the characteristics of whose wines are likely to make it a promising candidate for this use.

In a trial conducted on the Agroscope experimental farms in Changins and Pully, a 10% blend of Divico with Pinot Noir was compared to blends with the Dakapo and Dunkelfelder grape varieties to determine the ability of each to improve Pinot Noir colour.

Left, Pinot noir; right, Divico; centre, a blend of Pinot noir and 10% Divico.





Sensory profile of the blended wines
 Averages for 2009–2012.
 Marks of 1 (=low, poor) to 7 (=high, excellent).
 The criteria indicated by
 *** exhibit very highly significant differences ($p = 0.001$),
 ** highly significant differences ($p = 0.01$),
 * significant differences ($p = 0.05$).

— Pinot noir
 — 10 % Dakapo
 — 10 % Dunkelfelder
 — 10 % Divico

Promising results for Divico in Pinot Noir colour intensity improvement study

The study concludes that, in terms of colour improvement when blended with Pinot Noir, Divico is on a par with the Dakapo and Dunkelfelder grape varieties commonly used for this purpose. Furthermore, the highly favourable agronomic characteristics of Divico, particularly its resistance to diseases of the vine, make it a highly promising candidate which could soon become the gold standard for this purpose. —

[Scientific article on agrarforschungschweiz.ch](https://www.agrarforschungschweiz.ch)

Conclusions

- ▶ Agroscope studied the improvement of wine colour intensity in blends made with Pinot Noir, Dakapo, Divico and Dunkelfelder grape varieties.
- ▶ The blending trials with the three grape varieties produced wines with interesting qualities and a similar phenolic composition.
- ▶ The sensory analysis of the three blending trials showed a distinct improvement in colour intensity, structure and tannin intensity, as well as a general impression of a less-pronounced bitterness and a higher hedonic note than for Pinot Noir on its own.
- ▶ Owing to its highly favourable agronomic characteristics and in particular to its resistance to downy and powdery mildew as well as botrytis blight, the grape variety Divico is suitable for blends for correcting the colour intensity of Pinot Noir wines.

Hardy Grazing Livestock: Protectors of the Mountain Landscape

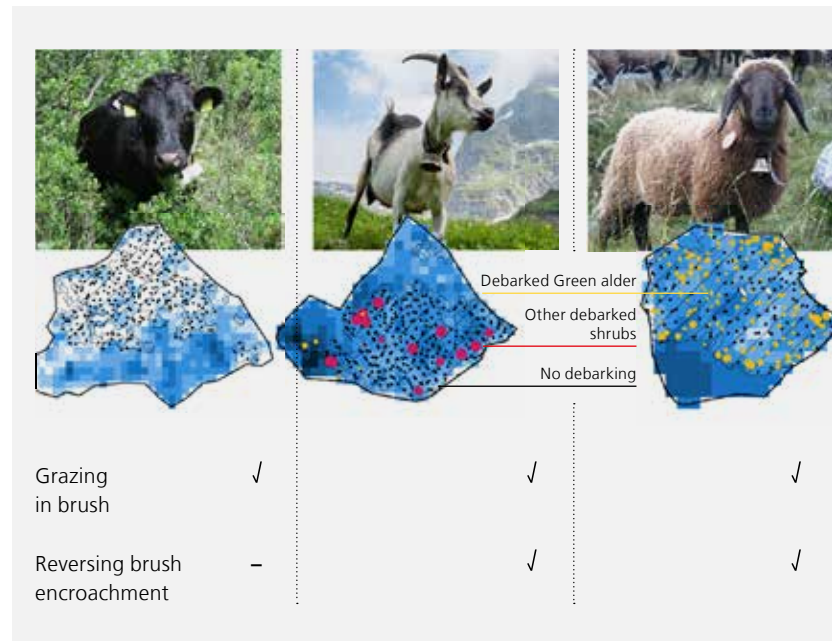
Biodiverse mountain pastures are being overgrown by green alder shrubs. A study conducted by Agroscope and ETHZ shows that hardy sheep and goats can stop shrub encroachment. In particular, the traditional Engadine sheep has a taste for green alder. By debarking the shrub it damages it, thus preventing its spread and protecting valuable alpine pastures.

Caren M. Pauler

Mountain pastures are increasingly being encroached by green alder. Over the past 30 years, shrub encroachment has swallowed up around 7% of the Swiss alpine area. Species-rich habitats and valuable grazing land are being lost. For many centuries, goats were the main grazing livestock in the Alps. Because they debark green alder, they effectively prevent shrub encroachment. However, goat-keeping is hardly profitable in modern farming, and has been all but replaced by cattle and sheep husbandry.

An experiment 2000 metres above sea level

Researchers from Agroscope and ETH Zurich wanted to find out if there are grazing animals which could replace the goats in preventing shrub encroachment. On a mountain pasture in the Engadine valley they observed hardy cattle, sheep and goats that cope well with steep terrain and harsh weather conditions. The animals were kitted out with GPS neckbands to reveal whether they spend time in the brush or on open pasture. The degree to which the animals damaged the shrubs was also measured.



The experiment showed that cattle damage green alder shrubs only slightly. Although they feed on green alder leaves and trample young shrubs, they cannot debark the plants. That, however, is what is needed for the shrubs to die off and for encroachment to be stopped in the long term.



Robust sheep breeds like the traditional Engadine sheep can stop green-alder encroachment on alpine pastures.

A somewhat surprising diet

Contrast this with the remarkable behaviour of the Engadine sheep – a hardy breed originating in the Engadine valley. Normally sheep are assumed to do minimal damage to shrubs. But the Engadine sheep showed an exceptional predilection for the bark of green alders, and actually damaged the shrubs to a far greater extent than the goats did. Furthermore, the scientists were able to show that goats and Engadine sheep penetrate deep into the green-alder brush, whilst cattle merely visit the edge of the brush and prefer open pasture. Hence, the recommendation of the hardy sheep and goats as caretakers of the landscape on brush-encroached mountain pastures. —

Conclusions

- ▶ The studies show how important site-adapted livestock are. Hardy, traditional breeds are capable of reversing shrub encroachment on terrain where machines can no longer be used.
- ▶ In this way, hardy sheep and goats preserve the beauty and biodiversity of mountain pastures. It is therefore important to make increasing use of these ancient breeds once more, despite their lower productivity.
- ▶ The traditional Engadine sheep is ideally suited to controlling green-alder encroachment.

[Scientific article in Journal of Applied Ecology 59, 5, 2022, 1394–1405.](#)

[Video in German: Grünerlen-Regulierung mit Ziegen](#)



Green alders overgrow an alpine pasture.

	2020 CHF	2021 CHF	Divergence CHF	Divergence in per cent
Functional Earnings				
Financially impacting	28,493,268	21,621,191	-6,872,077	-24.1%
Non-financially impacting	-7,062,412	2,478,091	9,540,503	135.1%
Total revenues	21,430,856	24,099,282	2,668,426	12.5%
Functional Expenditure				
Financially impacting	140,210,888	143,898,173	3,687,285	2.6%
Non-financially impacting	5,495,979	5,268,108	-227,871	-4.1%
Service accounting between offices	44,605,375	43,700,532	-904,843	-2.0%
Total functional expenditure	190,312,241	192,866,813	2,554,572	1.3%
Statement of Investments				
Investment income	-36,250	-13,025	23,225	64.1%
Investment expenditure	4,373,588	4,336,217	-37,371	-0.9%
Reserves				
Creation of earmarked reserves	4,063,000	3,426,638	-636,362	-15.7%
Use of earmarked reserves	1,140,026	2,241,505	1,101,479	96.6%
Third-Party Funds				
Acquisition of third-party research funding	23,061,709	15,399,930	-7,661,779	-33.2%

1213
lectures and posters

1873
lessons (universities, technical colleges, vocational schools and courses)

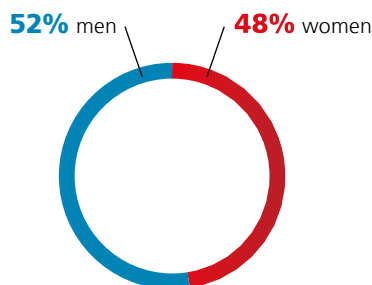
85
supervised dissertations

78
supervised semester, bachelor and master theses

1391
publications, including 799 practice-oriented publications;
592 scientific publications

922 full-time positions (FTE) with
1077 employees

65 doctorates
37 trainees
28 internships
41 postdoc



Contact and Copyright Information

Published by

Agroscope
Schwarzenburgstrasse 161
3003 Bern
agroscope.ch

Editorial Office & Information

Communication Agroscope
info@agroscope.admin.ch

Concept & Layout

Agroscope, Magma Branding

Photos

Agroscope (D. Altenbach, G. Brändle, J. Brunner,
M. Fuchs, C. Gazzarin, J. Marmy, C. Parodi, M. Schneider,
J. Studer, S. Willi); K. Beltrando, CABI; 123rf.com

Publication

Published several times a year as a print magazine
and in electronic form in German, French and English

Copyright

© Agroscope 2022

Printed on 100 %-recycled FSC-certified
Genesis paper with PRe inks (pollutant-free).

printed in
switzerland

ISSN

2673-6055 (print)
2673-6063 (online)

Subscribing to the print magazine

[‘agroscope’ Magazine is published several times a year. It is available free of charge in three languages \(German, French and English\) both in print and as a PDF and E-paper on the Agroscope website. Each issue contains highlights from Agroscope research. The State Account and Key Figures are published in one issue per year.](#)



[Our free newsletters keep you informed about Agroscope’s research activities, publications and events.](#)

Follow us



“Digitalisation in the agricultural sector is in full swing, and is already a defining feature of everyday life. New Smart Farming technologies not only permit continual process optimisation, but can also guarantee high product quality.”

Nadja El Benni

Head of the ‘Sustainability Assessment and Agricultural Management’ Research Division

► Editorial, page 1