# Report on the Cross-Visit: Germany and Switzerland

**Work Package:** WP02 - Improving cultivar testing, seed multiplication & health for high quality seeds for the organic sector

**Dissemination level:** Public

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## About the report

This report has been produced in the framework of the Horizon 2020-funded project LIVESEED.[1] The main aim of LIVESEED is to boost the production and use of organic seeds and plant breeding for organic agriculture across Europe. It is co-ordinated by IFOAM EU, and its scientific coordinator is FIBL-CH. LIVESEED has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 727230 and by the Swiss State Secretariat for Education, Research and Innovation (SERI) under contract number 17.00090.

Work Package 02 of LIVESEED aims at improving cultivar testing, seed multiplication & health for high quality seeds for the organic sector, and partly, at boosting the organic seed production and multiplication in countries where the organic sector is less developed (PL, HU, RO, BG, EL, ES and PT) and/or has particular needs, by promoting smart practices and knowledge exchange. As part of this Work Package, LIVESEED is organising visits to France, Italy, Netherlands and Germany, with the aim to demonstrate and promote smart practices to increase productivity and quality in organic seed production of cereal, vegetable, potato and fruit crops. To foster organic seed multiplication, the cross visits aim to:

i) enable a mutual learning process amongst professionals engaged,
ii) reveal regional particularities as well as lessons to be generalized,
iii) inspire and stimulate regional partners to initiate changes in their system,
iv) forge relationships as a basis for a professional network that can sustain after the project period.

Due to the COVID-19 pandemic, the cross visit was cancelled in mid-April 2020. However, since the organisation was very advanced, we decided to compile a report with information from the places we would have visited. The report was compiled via in-depth interviews with the farmers/organisations, via webinars, via presentations and via desk-studies.

This report is recommended for stakeholders involved in the production and use of organic seed: farmers, certifiers, producers, retailers, seed authorities, and the general public.

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[1] http://liveseed.eu

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# 1. The German and Swiss Cross Visit

LIVESEED project partners FiBL-DE and FiBL-CH took the lead in the local organisation and hosting of the cross visit in the Germany and Switzerland, planned between 12-14th May 2020. The 3-day visit 14 experts were invited from Poland, Hungary, Romania, Bulgaria, Greece, Spain, Portugal and France. The participants were experts from seed companies, organic farmers, farmer advisors, researchers and agricultural trainers. Participants were selected based on their involvement in the organic sector, their knowledge on seed production, and their capacity to multiply the knowledge in their country as 'change agents'.

Due to the COVID-19 pandemic this visit could eventually not take place. Nevertheless, we decided to compile information we could gather via interviews, webinars, desk-studies and presentations we received from the experts we would have visited. The information presented below follows the original agenda (see Annex I).

The virtual program therefore covers the following topics:

A. Technical aspects and practices of organic apple/wine breeding/propagation
B. Variety Testing in Fruit/wine Breeding;
C. Plant Protection in Organic Fruit/wine propagation
D. Practices of preserving old fruit and vine varieties for organic
E. Selection of suitable organic fruit and vine varieties and rootstocks for organic farming
F. Organising and contents of farmers training for organic fruit and wine propagation
G. Processing practices of organic fruit/wine
H. Biology, phenology, fertility issues in organic

# 2. The places presented from Germany and Switzerland

## ORGANIC VINE BREEDING AND GRAPES

### VITIFIT PROJECT

VitiFIT, a project funded by the German Federal Ministry of Food and Agriculture on grape vine health (esp. Plasmopara viticola), breeding for fungus-resistant grape varieties (PIWI) and the VitiMeteo Rebenperonospora" forecasting system

Contact: Project Leader Professor Beate Berkelmann-Löhnertz, Hochschule Geisenheim University, Department of Crop Protection, Beate.Berkelmann-Loehnertz@hs-gm.de
https://vitifit.de/

### WEINGUT RUMMEL

Organic vine breeding, selection, propagation and production, winemaking, organic wine value chain.

Organic vinery Rummel Geißelgasse 36 76829 Landau – Nussdorf https://rummel-biowein.de/

Contact: Mr. Klaus Rummel: Info@rummel-Biowein.de and Mr. Valentin Blattner: valentin@domaineblattner.ch

### REBSCHULE FREYTAG

Selection, propagation and marketing of robust vine varieties.

LIVESEED is funded by the European Union's Horizon 2020 under grant agreement No 727230 and by the Swiss State Secretariat for Education, Research and Innovation (SERI) under contract number 17.00090.

Rebschule V & M Freytag Theodor-Heuss-Straße 78 67435 Neustadt/Wstr; https://www.rebschule-freytag.de/)
Contact: Mr. Volker Freytag: info@rebschule-freytag.de

## ORGANIC FRUIT

**ORCHARD MUSEUM**
An orchard with a focus on breeding and production of pears on plums.
Obstbaumuseum Glems Eberbergstr. 24 72555 Metzingen – Glems
Contact: Mr. Willy Müller info@glemser-holzwerkstatt.de Ms. Ute Ellwein: u.ellwein@gmx.de

**BIO-OBSTHOF GLOCKER (FÖKO) - DIE FÖRDERGEMEINSCHAFT ÖKOLOGISCHER OBSTBAU e.V**
Bio-Obsthof Glocker Tepfenhart 5 88263 Horgenzell https://www.foeko.de/die-foeko/der-vorstand/
Contact: Mr. Nikolaus Glocker: anbau@bioobsthof.de

**FiBL SWITZERLAND**
FiBL is one of the world's leading institutes in the field of organic agriculture. The program offered insights into FiBL-CH research on organic plant protection measures, cultivation technology on apple, cherry, apricot and berries.
Ackerstrasse 113, 5070 Frick, Switzerland https://www.fibl.org/en.html
Contact: Ms. Claudia Daniel: claudia.daniel@fibl.org; Mr. Niklaus Bolliger: bolliger-flury@bluewin.ch; Mr. Michael Friedli: michael.friedli@fibl.org

We would like to express our gratitude for the flexibility and willingness to cooperate for Beate Berkelmann-Löhnertz, Mr. Klaus Rummel, Valentin Blattner, Volker Freytag, Ute Ellwein, Niklaus Bolliger, Michael Friedli and Claudia Daniel.

We would also like to thank FiBL Germany and Switzerland for organising the visits!

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# Presentation of the local context - by Freya Schaefer FiBL–DE

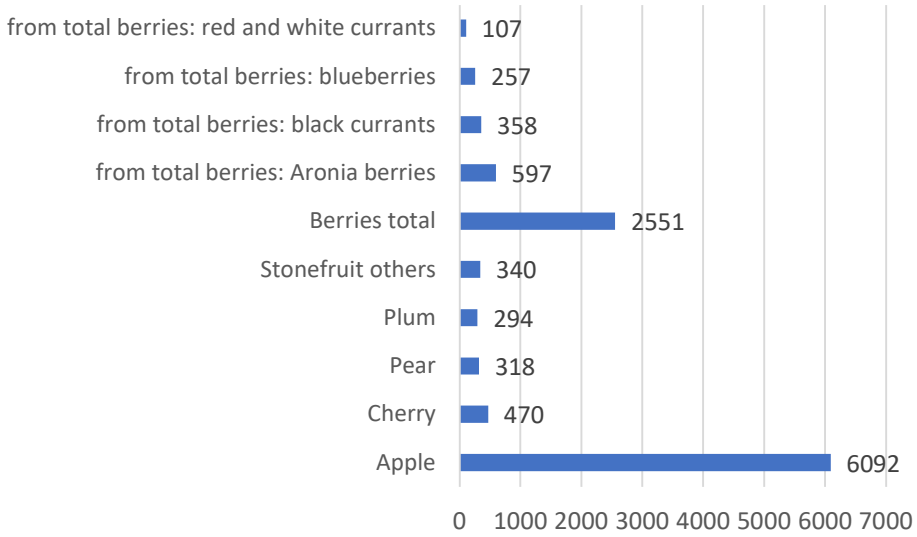
The Research Institute of Organic Agriculture (FiBL) is one of the world's leading institutes in the field of organic agriculture. Its locations are situated in Switzerland, Germany, Austria, France and a representation in Brussels (Belgium) through FiBL Europe. FiBL's strengths lie in its interdisciplinary research, innovations developed jointly with farmers and the food industry, solution-oriented development projects and rapid knowledge transfer from research into practice.

FiBL Germany is maintaining the organic seed database www.organicxseeds.com. OrganicXseeds is and interactive, real-time database tool which can be adapted to national conditions and is implemented as national seed database in: DE, CH, BE, LUX, UK, IRE, DK, SE. FiBL-DE is also the database manager of the national organic seed database in Germany. FiBL DE is member of the two national seed expert groups chaired by the ministry of agriculture. FiBL DE is member of the seed expert group of BÖLW, and a board member of ECO-PB (www.eco-pb.org). FiBL-De offers advisory service to organic breeders. FiBL-DE also provides an input List for Organic Production in Germany: Experts check whether inputs meet all requirements for organic farming in Germany. Positively assessed commercial products are published in the Input List[2].

The Organic Field Days are a new platform on which farmers can network and obtain comprehensive information about innovations in organic farming. The trade fair offers new products, machine demonstrations, and a lecture and cultural programme. In 2021 the third Öko-Feldtage will take place in Villmar, the teaching and testing facility of the University of Giessen[3].

## Status-quo of organic fruit, berry and vine production in Germany

The area of organic fruit and berry production in Germany for the year 2017 (in hectare)[4] can be summarized in the Figure 1 below:




[2] Input list for organic agriculture: https://www.betriebsmittelliste.de/en/home.html

[3] For more information, please visit www.oeko-feldtage.de.

[4] https://de.statista.com/statistik/daten/studie/378226/umfrage/anbauflaeche-von-obst-im-oekologischen-landbau-in-deutschland-nach-art/

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### Organic stone fruit production in Germany[5]

Organic stone fruit trees require investment, which is usually made over a period of at least 15 years. Appropriate care should therefore be taken when planning. The following points should be noted:

- Choice of the variety-rootstock combination
- Determination of the planting distance
- Ordering the tree material: Only an early order in an organic tree nursery guarantees the purchase of well-branched, strong young trees.
- Location selection: The limited possibilities to intervene regulation through plant protection and fertilization give this point a greater importance than in the other fruit growing.
- Soil preparation: A good growth of the trees can only be guaranteed in soil with a good structure. Careful soil preparation with deep loosening and subsequent sowing of green manure, as well as the application of well-rotted composts, make sense depending on the location.
- Choice of support structure: There are now various systems (concrete, galvanized steel, wood with and without impregnation).
- Considerations about the possibilities of promoting beneficial organisms and ecological compensation elements (hedges, flower strips).

### Organic apple production in Germany

- Of all types of fruit, the apple has the greatest importance in terms of area and economy in organic farming. It is mainly marketed through wholesalers, to a lesser extent directly from the farm. Food retailing is becoming increasingly important for marketing, although it requires special structures (cooperatives, producer groups) to ensure continuous delivery.
- Growing on weakly growing substrates (M9) is standard when producing table apples. Various soil cultivation devices are available for the effective weed regulation in the tree strip.
- For **fertilization** more organic commercial fertilizers are available. In addition to the supply of nutrients, the supply of soil with organic matter plays a very important role. For example, composts from organic manure and green waste are used here.
- One of the most important preventive plant protection measures is the selection of resistant varieties. It is also important to create favorable living conditions for beneficial organisms through flower strips, hedges, nesting aids etc.
- The scab is one of the economically most important **diseases**. Significant damage can also be caused by the fire blight and in rainy areas the bedside diseases and cause the rain spot disease. Depending on the variety and location, preventive treatments using approved plant treatment products (e.g. copper, network sulfur, lime sulfur, mycosine) are necessary.

### Availability of organic planting material of apples in the national seed database (spring 2020):

- 21 different offers (directly available)
- 19 offers for advance ordering,
- 382 conservation varieties and small quantities
- 8 rootstocks

[5] The website OKOLANDBAU provides important information on further fruit crops: https://www.oekolandbau.de/landwirtschaft/pflanze/spezieller-pflanzenbau/obstbau/

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Suche nach Art: Apfel

| Apfel | *Malus domestica* | 430 |
|---|---|---|

| Angebotsgruppen | Anzahl | Einstufung |
|---|---|---|
| Apfelbäume für Erwerbsobstbau | 21 | Material untersteht nicht Art 48 der VO 889/2008/EG |
| Apfelbäume für Erwerbsobstbau für Vorbestellung (Pflanzung im Folgejahr) | 19 | Material untersteht nicht Art 48 der VO 889/2008/EG |
| Erhaltungssorten, Kleinstmengen (< 20 Bäume), Sorten gemischter Qualitäten, Halbstämme, Hochstämme | 382 | Material untersteht nicht Art 48 der VO 889/2008/EG |
| Unterlage - Pflanzgut | 8 | Material untersteht nicht Art 48 der VO 889/2008/EG |
| Unterlage - Saatgut | 0 | Einzelgenehmigung |

Zeige auch nicht verfügbare Angebote

*Figure 2. Apple varieties in the German national seed database*

### Organic strawberry production in Germany

- Due to the relatively large **production risk** and the heavy workload, the production costs for organic strawberries are comparatively high. Organic strawberries can also be sold at correspondingly high prices.
- Because of the extraordinary peak **work** at harvest time, it is important to plan new plantings carefully. The areas should not be too large to begin with. Direct marketing, also with self-picking systems, plays an important role in strawberries. For delivery to wholesalers, early contact with potential customers is crucial.
- Green plants (fresh seedlings) and frigo plants are particularly widespread in organic farming. The latter are young strawberry plants that are not cleared in August, but only in November or December and then stored in a warehouse at minus 1.5 degrees until the planting date. One advantage of frigo plants is that the time of planting can be handled relatively flexibly. Green plants are expensive compared to frigo plants, but less susceptible to harmful organisms.
- Strawberries need well drained **soils**. Plots with compaction (e.g. plowsoles) or waterlogging are unsuitable for strawberry cultivation.
- Regions in cold valeys should be avoided, however, because late frosts during flowering can lead to major failures. The **nutritional needs** of strawberries are low compared to field crops. Compared to other types of berries, strawberries have a higher potassium requirement.
- In organic strawberry cultivation is both the annual and the two-year culture spread.

### Organic shrub berry production

- Organic shrub berries are in demand on the market. Common shrub **berries** are **raspberries**, **gooseberries** and **currants**, and increasingly **cultivated blueberries**. The production risk for shrub berries is high, but so is the potential added value.
- Raspberries and blackberries in particular cannot be stored for long. Sluggish sales quickly spoil the goods, which affects the profitability of the crops.
- Setting up a shrub berry plant is labor intensive and involves high costs. Good planning is therefore necessary.
- Newcomers should ask themselves three questions:

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**1. Do shrub berries fit the farm?**

- Berry cultivation requires a lot of specialist knowledge. The company must have suitable locations for the profitable production of quality berries. Can the peaks be mastered?

**2. Is there a demand for shrub berries?**

- Before planting, there should be clarity about marketing opportunities. Is direct marketing or cultivation possible for wholesale?

**3. Which degree of intensity should be aimed for?**

- The internal and external quality of table berries are subject to ever increasing demands. This is why professional berry cultivation is becoming more and more expensive, and the pressure to regularly achieve high yields is increasing. Extensively produced berries can also be used for direct marketing or processing.

#### Organic wine production

- In organic cultivation, the quality of the wine is paramount. By deliberately foregoing maximum yields, the winemaker promotes a self-regulating ecosystem that does not require chemical pesticides and easily soluble nitrogen fertilizers. Compared to conventional viticulture, this involves an increased amount of work, which is reflected in higher product prices.
- After long years of growth, organic wine-growing areas remained at a stable 8,000 hectares in 2016. Organic farming thus accounts for eight percent of the total area under vines.
- The organic area has almost doubled since 2008. According to the organic wine experts Randolf Kauer and Beate Fader, the rapid increase in the organic wine-growing area can essentially be attributed to two factors. On the other hand, there is an increasing demand from the food trade and even the discounters.
- The German organic winegrowers mostly market their wines directly from the winery. There is also a collaboration with specialist retailers and the catering trade. Cooperatives have also entered the organic wine market since the 1990s, and marketing initiatives have also been established. Because the increasing demand of the food retail trade can often not be served by individuals.
- The organic winegrower selects the grape variety primarily based on marketing options, quality aspects and microclimate. There are now also varieties that are very resistant to major fungal diseases. The soil also influences the choice of variety and shapes the wine in a special way.
- Ecovin.de is the organic viticulture association in Germany

# 05. The Places Presented

## VISIT 01: VitiFit PROJECT[6]

VITIFIT JOINT PROJECT: HEALTHY VINES (VITIS VINIFERA) IN ORGANIC VITICULTURE THROUGH RESEARCH, INNOVATION AND KNOWLEDGE TRANSFER

[6] The new website of the VITIFIT project can be found here: https://vitifit.de/

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VitiFit is the biggest practical research project for organic viticulture. The objective of the project is to reduce and replace copper-based fungicides, and thus, improve sustainability of organic viticulture. The project runs from June 2019 to May 2024 and is funded with 6.3 million € by the Federal Ministry of Food and Agriculture (BMEL) based on a decision by the German Bundestag in the framework of the Federal Organic Farming Programme (BÖLN).

In Germany, about 10% of the vineyard area is managed organically. The federal government aims to increase this share to 20%. Downy mildew, caused by *Plasmopara viticola*, is one of the major challenges in organic viticulture and represents a bottleneck for conversion to organic production. Currently, the use of copper-based plant protection products is still widespread but will be banned imminently. Therefore, VitiFit focuses on 4 main subject areas:

- Development and optimisation of plant protection strategies against downy mildew in organic viticulture for established and new grapevine varieties:
  - Various plant extracts and improved formulations will be tested for their effectiveness
  - The reduction of copper input by the process of microencapsulation, so-called CuCaps
  - Viticultural measures such as targeted defoliation and the use of soil covers, the application of new active substances and UV-C radiation
  - Application of organic plant protection products is being examined to determine whether it has negative effects on the ecosystem of the vines' leaves and leaf sheaths.
- Breeding, wine processing, market acceptance and economic feasibility study of new fungus-resistant grapevine varieties
- Adaption of forecasting model "VitiMeteo Rebenperonospora" to new grapevine varieties and organic viticulture (the model is a valuable decision-making aid for winegrowers when scheduling a plant protection measure. By processing relevant weather parameters, the system indicates periods of time during which infections and spore formation are possible)
- Knowledge transfer, networking and communication between research and practice

An interdisciplinary team of 8 research institutes for viticulture, 4 organic associations, 3 practice partners, and 5 organic demonstration farms (incl. Weingut Rummel) is involved in the project. A digital platform facilitates knowledge exchange and networking among actors in practice, advisory and research.

## VISIT 02: INTERVIEW WITH WEINGUT RUMMEL

### Introduction

LIVESEED is funded by the European Union's Horizon 2020 under grant agreement No 727230 and by the Swiss State Secretariat for Education, Research and Innovation (SERI) under contract number 17.00090.

Since 1986, family Rummel produces organic wines on a 15 ha-vineyard in Landau, Pfalz, Germany. The vineyard reflects Rummel's philosophy: a diverse and lively environment contributes to a healthy agroecosystem and is the foundation of high-quality wines.

**Weingut Rummel - Facts in numbers**

| | |
|---|---|
| **Area** | 15 ha (60% white wine, 40% red wine varieties) |
| **Employees** | 5 (of which 3 are family members) |
| **Working hours** | 850 h per ha |
| **Varieties** | 30 different grape varieties (15 PiWis on 70% of the area) |
| **Turnover** | 650.000€ per year |

One of the biggest challenges in organic viticulture is the use of copper as a fungicide against downy mildew. Copper is a heavy metal that contaminates the soil, and thus, imposes a threat to the ecosystem and its organisms. Furthermore, for spraying, the use of tractors is necessary which in turn requires fuel, damages the soil, destroys flower strips and the habitat of many beneficials. The use of copper and the lack of alternatives represents one barrier for farmers to convert to organic. Rummel's vineyards are the living proof that a significant reduction in copper use is possible. As part of an internal biodiversity and sustainability strategy, Rummel primarily uses pheromones, extracts from orange peels, backing powder and fungus resistant grapevine varieties (PiWis) to reduce pest pressure.

## Why organic?

"In winegrowing, we aim to increase the share of organic agriculture to 20%. This would be a positive development. If we can reduce the use of pesticides, we achieved a lot for the environment."

**Klaus Rummel**

### PiWis – fungus resistant grapevine varieties

Rummel's vineyard requires a minimal amount of spraying due to the use of so-called PiWis. These are varieties stemming from a collaborative breeding programme established in 1988 between Weingut Rummel, the Swiss wine grower Valentin Blattner and Rebschule Freytag.

In this collaboration, Valentin Blattner is responsible for developing new breeding lines, Volker Freytag propagates the candidate varieties and produces grafted seedlings, while Klaus Rummel receives about 20 of these seedlings to produce an experimental wine (see Figure ).

If Rummel is satisfied with the outcome, he cultivates about 700 seedlings in a larger field trial. If wine production and market introduction is successful, the new breeding line can be sent to variety registration. Special in this collaboration is that the assessment of candidate varieties takes place on-farm and is not marker-based in laboratories.

One challenge in the early stage was to overcome regulative restrictions and bureaucracies. Large-scale cultivation, even under trial conditions, required an official variety registration. Rummel explains that it was an enormous effort to communicate to authorities the inconsistencies of this legislation. Eventually a compromise could be found that allows Rummel to cultivate unregistered cultivars in field trials and to sell the wine through direct marketing channels.

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Within the last 30 years, 20 different PiWis were tested in this collaboration and two received an official variety registration: Cabernet blanc and Cabernet Sauvignon. From first trials to variety registration more than 10 years can pass. For instance, Sauvignon was firstly cultivated as Cal-6-04 in 2005, until it received its denomination in 2019. The denomination of a variety is beneficial for its marketing. Marketing and consumer education are the biggest bottlenecks in the production of PiWis. In contrast to Riesling or Weißburgunder varieties, PiWis remain rather unknown. Rummel had to put a lot of effort into teaching consumers to be open to new taste experiences instead of relying on the name of the grapevine variety. The major advantage of PiWis is their yield stability as opposed to more popular varieties that depend on high application rates of copper. German-speaking countries are pioneers in the production of wines from PiWis, but further research, knowledge dissemination and public relation activities are necessary. Currently, Rummel grows 15 different PiWis on 70% of his vineyard, but Rummel aims to increase this share to 100%.

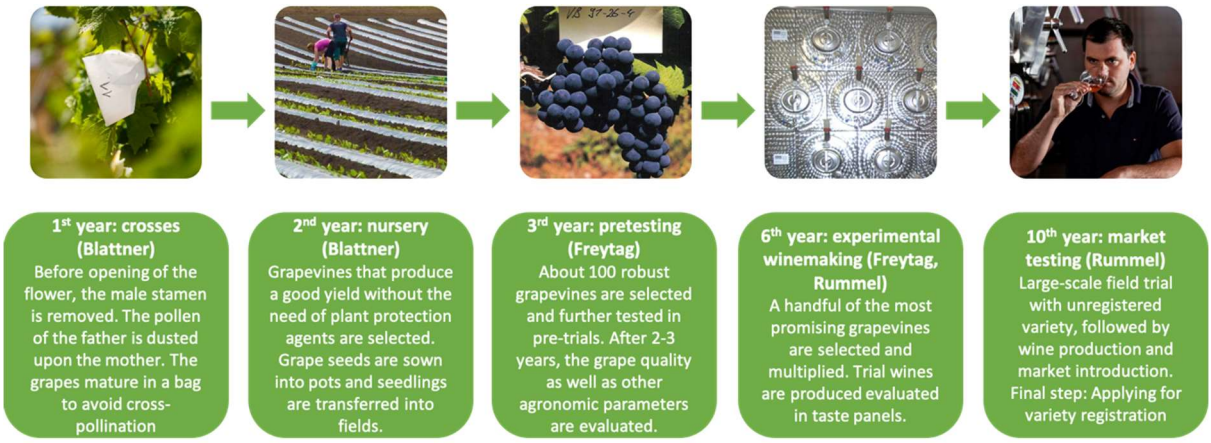


*Figure 3: Grapevine breeding – The path to new PiWis (https://rummel-biowein.de/the-piwi-way/).*

## Financing and other businesses

It can take more than 20 years from the first crossings to arrive to a new variety. Financing of the PiWi-breeding programme is done primarily through private investments by the actors, with the addition of 2,000-3,000€ per year through project funding (e.g., VitiFit project).

Furthermore, Rummel is involved in research-related activities and hosts different PhD theses. In 2002, he joined the network of demonstration farms for organic farming and intensified their public relations work. In 2005, they received, as the first winery, the advancement award for organic farming.

Since 1993, Rummel is a member in the ECOVIN-network, the largest network of organic wineries. Products carrying the ECOVIN logo guarantee compliance with high quality standards and ecological production. For instance, ECOVIN-members commit to limit copper application to 3 kg per ha and year. The ECOVIN-network provides seminars to help with conversion and is involved in knowledge dissemination and public relations work. Furthermore, ECOVIN organises nationwide tastings in which Rummel's wines reach among the highest scores.

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## VISIT 02b: INTERVIEW WITH VALENTIN BLATTNER

### Introduction

Valentin Blattner's vineyard extends on 8 ha in Soyhières, Switzerland. The vineyard is imbedded in an intact ecosystem in which the natural vegetation serves as an intercrop to keep a natural balance between pests and beneficials.

**Valentin Blattner's vineyard - Facts in numbers**

| | |
|---|---|
| **Area** | 8 ha |
| **Employees** | 0 |
| **Varieties** | 100% PiWis |
| **Turnover** | 100.000€ per year |

### PiWis – fungus resistant grapevine varieties

Apart from the vineyard, Blattner manages the Research Institute for Ecology and Grape Breeding (Forschungsinstitut für Ökologie und Rebenzucht) in Reinach, Switzerland. Research focuses on breeding fungus resistant grapevine varieties with trials in several countries including Spain, France, Germany, New Zealand and Canada.

### Why organic?

"I can live outside in nature, in an intact environment, with butterflies and crickets. I continue my work. Even if the world ends tomorrow, I will plant a fruit tree today, whereas others buy a Mercedes."

**Valentin Blattner**

35 years ago, Blattner started with PiWi breeding for his own vineyard. At that time, grapevine varieties were primarily bred by state institute. Blattner observed that resistance breeding was not recognised as a strategy to reduce spraying in organic viticulture.

In breeding, it is necessary to constantly recombine resistance genes, to avoid that the fungi overcome resistances. For instance, for 500 years there were no breeding activities with Pinot Noir, i.e. no new genetic information was introduced, which resulted in an adaptation of the pests and a highly susceptible variety. To breed new PiWis, Blattner conducts crossings between resistant varieties and high-quality wine variety. The progeny should not only display a good resistance against several diseases, but also a good growth behaviour, a good yield performance, and should be suitable for high-quality wine production.

To identify suitable cultivars, Blattner says it just requires only a chair to sit in the vineyards and to observe within the natural environment which plants and why they survive. The ones that survive are multiplied and planted in his vineyards. According to Blattner, this interrelation is more important than the use of marker selection and genetic analysis in laboratories.

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In the early stages, Blattner was confronted with legal hurdles. To be successful, he states that it is necessary to have a critical look at legislative texts, to identify contradictions, and present these to authorities.

## VISIT 03: INTERVIEW WITH REBSCHULE FREYTAG

### Introduction

Rebschule Freytag is a wine nursery, responsible for multiplication of seedlings and grafting of rootstock. On 20 ha, the most suitable grapevine varieties are selected during the vegetation period and further propagated. The rootstock predominantly originates from Freytag's own pruning gardens. Next to the genetic stability of the grapevine varieties, soil health, balanced fertilisation and plant care are the priorities in the management of his vineyards.

**Rebschule Freytag - Facts in numbers**

| | |
|---|---|
| **Area** | 20 ha |
| **Employees** | 4 |
| **Portfolio** | 24 white grape varieties,<br>19 red grape varieties,<br>21 new varieties (incl. PiWis),<br>4 table grape varieties |

Rebschule Freytag's portfolio (see Figure 4) lists white and red grape varieties, as well as new varieties and table grape varieties. Each variety is described in its agronomic properties, disease resistance and winemaking properties. Furthermore, recommendations for cultivation are provided. The aim is to provide grapevine varieties that are adapted to regional pedo-climatic conditions and suitable for individual winemaking techniques.

### PiWis – fungus resistant grapevine varieties

Since the 1990s, Volker Freytag supports Valentin Blattner in the PiWi-breeding-programme. Selection is based on inoculated screening trials in which spore suspension are applied on the underside of the leaves. The number of spores indicates the level of resistance. PiWis do not have a full resistance but a tolerance to mildew. This means, in rainy seasons with a high pest pressure, application of plant protection agents is still necessary. For this purpose, Rebschule Freytag conducts research to minimise fungicide application and to identify the best time for application. For instance, in a rainy season, the best time for application is at scale BBCH 15 and during flowering.

The PiWi-breeding-programme pursues 4 aims:

- **Ecological:** minimising fungicide application, minimising the use of machinery in vineyards to protect soils and reduce energy input
- **Agronomic:** robust and vital varieties, insusceptible grape skin, long maturity period, loose grapevines for better microclimate
- **Oenological:** above-average and market-oriented wine quality, easy processing, high storability (acidity, tannins)
- **Economic:** minimising labour needs, improving soil health for long-time productivity

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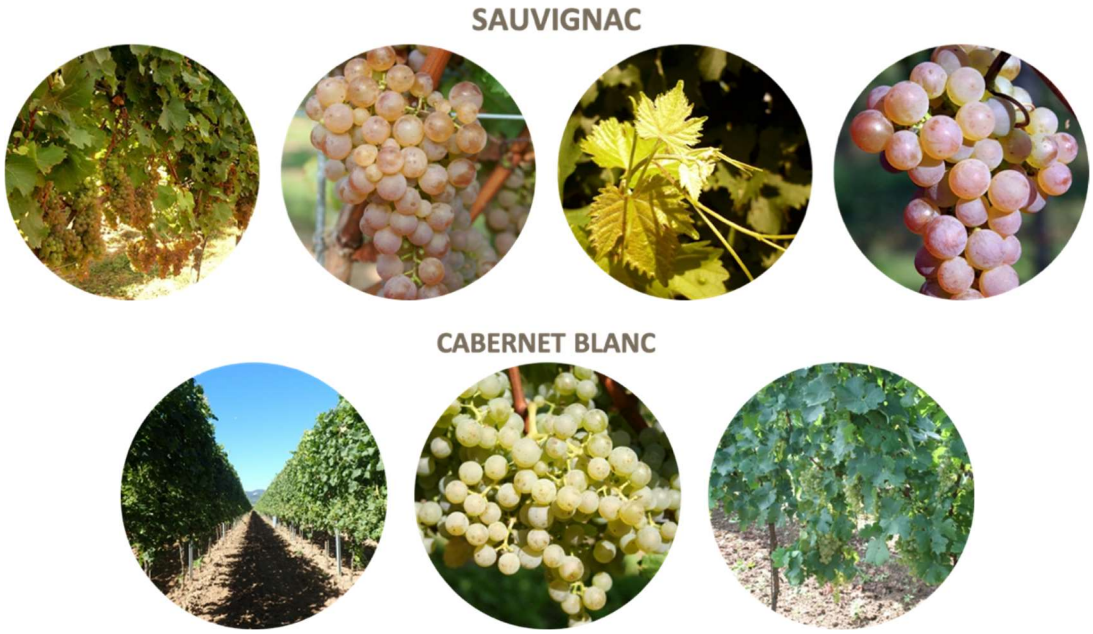


*Figure 4: PiWi varieties in Rebschule Freytag's portfolio - Sauvignac and Cabernet Blanc*[7]

## VISIT 04: ORCHARD MUSEUM GLEMS – WEBINAR WITH Ms UTE ELLWEIN

### The tradition and future of orcharding

In a LIVESEED webinar, Ute Ellwein presented the diversity of apple, pear and cherry varieties, and the tradition and future of orcharding. Ms. Ellwein is a fruit adviser at the district administration in Karlsruhe (Landratsamt Karlsruhe), former trial engineer at the Agricultural Technology Centre in Augustenberg (Landwirtschaftliches Technologiezentrum Augustenberg, LTZ), and chairwoman at the association for advisors for orcharding, gardening and landscape of Baden-Wuerttemberg (Beratungskräfte Obstbau, Garten und Landschaft Baden-Württemberg e.V., BOGL).

The orchard extends on 116,000 ha (48% apples, 23% cherries, 14% plums, 11% pears, 4% walnuts) in Reutlingen, Weinsberg, Karlsruhe and near lake Constance. The orchard is part of the biggest fruit production region in central and western Europe and due to its unique landscape and traditional farming management was designated as UNESCO biosphere reserve Swabian Alb.

The orchards serve to preserve traditional varieties, to breed for new varieties and as experimental stations. The orchards are characterised by a mixture of different fruit trees, a combination of big and small trees, and different distances between trees. The difference between the traditional orchards and the more intensive orchards can be easily spotted from a bird's eye perspective (see Figure 5).

[7] https://www.rebschule-freytag.de/rebsortiment.en.html

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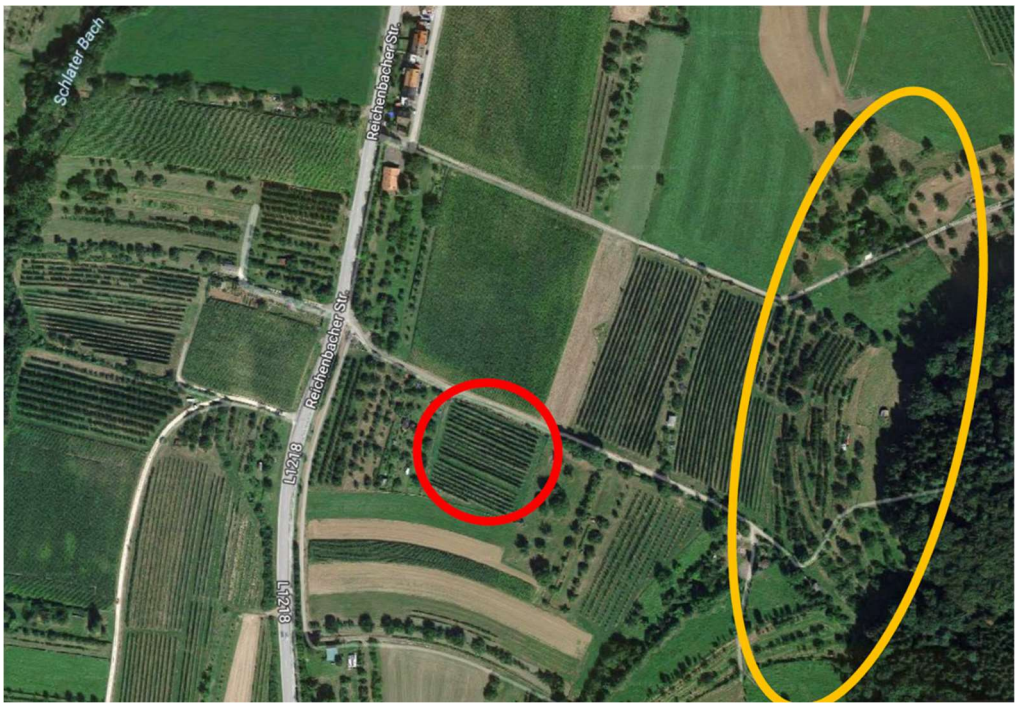


*Figure 5: Bird's eye perspective – UNESCO biosphere reserve Swabian Alb with traditional orchards (yellow) and more intensive orchards (red) (presentation by Ute Ellwein).*

There are different ways to preserve the traditional varieties:

- **Production:** For instance, the Ermstäler Knorpelkirsche, a local cherry variety, is used to produce and sell a special liquor, juice, and fruit gummi bears.
- **Education:** Trees in the orchard are marked with signs to educate on the variety's name, properties and end use possibilities. Exhibitions and tastings serve to display the diversity of fruit trees. The Orchard Museum Glems (see chapter below) educates on traditional varieties as well as traditional cultivation and processing techniques.
- **Fruit tree sponsorship:** 32 districts in Baden-Wuerttemberg each took over the sponsorship of three fruit tree varieties. The respective varieties were selected based on the following aspects: bred or discovered in the district, importance for the district, adapted to the district.
- **Identification and mapping:** With an online questionnaire or a mobile app, the district Reutlingen tries to identify and map fruit tree varieties that are hidden in private gardens. More than 5000 trees and 460 varieties were registered. If a rare variety is identified, they are included in propagation programmes[8].
- **Gene bank:** The German gene bank for fruits (Deutsche Genbank Obst, DGO[9]) was founded in 2007. The aim is to secure the long-term use and availability of plant genetic resources (traditional and wild varieties). The genebank consists of a network of different partners (federal state offices, districts, communes, associations) that are involved in the in-situ and ex-situ preservation of the different fruit species. The coordination office is situated at the Julius-Kühn Institute, the Federal Research Centre for Cultivated Plants, and is responsible for regulating the cooperation among all partners. For fruit trees, it is not possible to store the seeds as it entails the genetic information of father and mother. In order to preserve the pure variety, propagation takes place vegetatively. Apart from the in-situ preservation in orchards, ex-situ preservation takes place using cryopreservation. The meristem is isolated and stored in liquid nitrogen. After cryopreservation, new sprouts can form out of the meristem.

[8] For more information, see: www.sortenerhalt.de
[9] https://www.deutsche-genbank-obst.de

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## Breeding

Franz Rueß is responsible for fruit tree breeding at the Governmental Research Station for fruit and wine growing in Weinsberg (Staatliche Lehr- und Versuchsanstalt für Wein und Obstbau, LVWO). Breeding activities focus on developing resistant varieties against diseases such as mildew and scab in order to reduce spraying in orchards.

In resistance breeding, varieties with polygenetic resistances are used to avoid that the pathogen adapts to the monogenetic resistance. Sources for resistance can be wild and traditional varieties. Identification of scab resistant apple varieties takes place in vivo. The leaf of a susceptible variety shows scab lesions; whereas, the leaf of a resistant variety shows needle marks (see Figure 6).

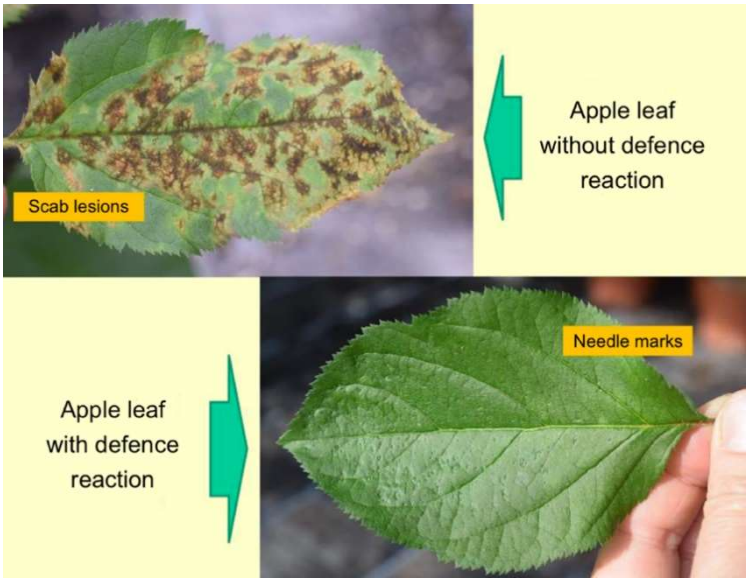


*Figure 6: Apple leaf with and without defence reaction against scab (presentation by Franz Rueß[10]*

Another aspect of consideration in breeding are columnar apple trees (see Figure 77). Only in apples, the columnar growth can be genetically determined. For other fruit tree species, the columnar growth is obtained by pruning. Columnar apple trees have short internodes and apples grow directly at the stem. As a result, pruning can be minimised, and the planting distance can be reduced. Furthermore, columnar apple trees have a high fertility and robustness against winter frost. However, they need a stronger root stock than normal trees. Further breeding goals include high storability, late blooming, and suitability for distillation.

[10] https://docplayer.org/48134766-Moeglichst-wenig-pflanzenschutz-resistente-und-robuste-sorten-fuer-den-extensiven-obstbau-37-vorarlberger-obstbautag.html.

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*Figure 7: Columnar apple trees (presentation by Franz Rueß,*[11]

## Variety testing

The variety station encompasses 15 ha and 700 varieties of different fruit species. Trials look at different varieties, rootstocks, cultivation systems and plant protection. In trials with different cultivation systems, growth habits such as spindles, ufo (upright fruiting offshoots) shapes are evaluated. The aim is to achieve a narrow, hedge-like fruit wall that allows to decrease the row distance, to save time and to ease mechanical applications (thinning, harvesting, pruning), and to reduce spraying.

## The role of the Orchard Museum Glems

The Orchard Museum Glems is situated close to Reutlingen at the foot of the Swabian Alb. The museum is an example of how an association can contribute to biodiversity, preserve ancient fruit varieties as well as the knowledge on old cultivation and processing methods.

The production of cider in Glems goes back to the 17$^{th}$ century and increasingly replaced wine production during the 18$^{th}$ century. The former fruit-press building was turned into an Orchard Museum which opened its doors in 2004. The museum is run by an association consisting of about 100 members. Active members of the association manage the exhibition, the maintenance of the fruit-press building, including kitchen and wine cellar as well as a pear walking path. One member of the association is responsible for the cider production. Regular public events (e.g., tastings), guided tours and seminars fill the Orchard Museum with life. Furthermore, the association is in close contact with partners within the biosphere region Swabian Alb and colleagues in fruit-press and cider production.

The exhibition educates on special features of orcharding and gives an overview of all steps from planting to processing, including cidermaking, distilling, bottling, drying and boiling down of jam. For example, the museum displays the differences between the stems of the fruit trees, the practice of grafting, traditional phytosanitary machineries, traditional harvesting bags, and traditional cidermaking equipment (see Figure 8.).

[11] https://docplayer.org/48134766-Moeglichst-wenig-pflanzenschutz-resistente-und-robuste-sorten-fuer-den-extensiven-obstbau-37-vorarlberger-obstbautag.html

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*Figure 8: Impressions of the exhibitions at the Orchard Museum Glems[12].*

The pear walking path (see Figure 9) guides visitors through an orchard characterised by tall fruit trees that can yield up to 120 Simri (1 Simri = 22,15 l, according to a travel report from 1797). The pear trees can grow up to 200 years old, thereby surpassing other fruit crops.

*Figure 9: Impressions of the pear walking path near Orchard Museum Glems*

[12] https://www.obstbaumuseum-glems.de/museum/

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## Discussions/reflections during the webinar:

- **Do you observe susceptibilities to pests and diseases (e.g., Drosophila suzukii in cherry trees)? Is this information available to growers?**

Scoring of diseases takes place. Apart from the variety's susceptibility, the disease incidence depends on the region of cultivation. If resistant varieties are identified, they are used to make crosses. However, among the 16 cherry varieties, no resistance against Drosophila suzukii could be identified. There are no public disseminations, but results can be given out on request by contacting Ute Ellwein.

- **Is the assessment done under organic conditions?**

At the experimental station in Karlsruhe, assessment takes place in an integrated production. Trials simultaneously serve to test plant protection products. There are other on-stations or on-farm trials under organic management conditions.

- **Do you collaborate with universities?**

Collaborations with the University Weihenstephan, Hohenheim and Geisenheim exist. Furthermore, within a working group, trials in 10 different locations throughout Germany take place.

## Why organic?

"The diversity of fruit tree varieties is a living cultural good. It is important to keep these genes alive in order to potentially use them in the future."

**Ute Ellwein (Orchard Musem)**

## VISIT 05: FÖKO

The Fördergemeinschaft Ökologischer Obstbau e.V. (FÖKO) is a supra-association of around 200 organic fruit farmers in Germany. The association was founded in 1993. With support by the Federal Organic Farming Programme (BÖLN) and the federal state Baden-Wuerttemberg, 5 regional groups promote organic fruit growing through educational offers, research and public relations work. FÖKO connects practice, advisory and research, and thereby creates an active network that can react quickly to current issues in organic fruit growing with well-founded solutions, particularly in the areas of crop protection and tree nurseries.

FÖKO is involved in a wide range of activities:

- **Congresses, conferences, seminars:** Organic fruit growing conference, organic berry growing conference, Ecofruit-congress, excursions, introductory courses on organic fruit growing.
- **Network:** Once per year the FÖKO network invites to facilitate professional exchange among actors. The network discusses about current research results and developments in organic fruit growing and identifies further research priorities. Results from working groups (e.g., varieties and breeding, insect control, soil) are presented and recommendations are disseminated.
- **Journal "Öko-Obstbau":** For 10 years, with the support of FÖKO advisors, the journal on organic fruit growing informs on latest technical developments.

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- **Exchange between authorities and decision-makers:** FÖKO is in contact with authorities, publishes position papers and proposals (e.g., authorisation of important plant protection products).
- **Cooperation with associations and organisations:** Cooperation with Organic Food Production Alliance (BÖLW), Member of International Federation of Organic Agriculture Movements (IFOAM) and exchange with farming associations.
- **Research:** FÖKO initiates and supports research projects on current issues of organic fruit growing (e.g., project on disease prevention in organic apple production, nationwide project on ecological diversity in orchards, EIP breeding project on robust apple varieties for organic orcharding).

FÖKO informs about advisory services for organic fruit growing and training possibilities in organic fruit growing. The next introductory course will take place at LVWO Weinsberg from 18 November to 20 November 2020[13] (). Furthermore, FÖKO provides lists for organic plant protection agents and lists with recommended organic fruit tree varieties as well as providing nurseries. Lists are available on www.organicXseeds.de.

## VISIT 06: APPLE BREEDER NIKLAUS BOLLIGER (SWITZERLAND)

### Biohof Rigi

In a LIVESEED webinar, Niklaus Bolliger presented the process of on-farm organic apple breeding[14]. Since 1985, Niklaus and Regula Bolliger-Flury manage the biodynamic farm Rigi, located in Hessigkofen, Switzerland.

Next to a diversity of vegetable and arable crops, an apple orchard extends on 1,5 ha. 0,5 ha of the orchard are reserved for apple production of new breeding lines as well as standard varieties used in organic farming. On 1 ha, Bolliger conducts breeding of new and robust apple varieties.

**Biohof Rigi - Facts in numbers**

| | |
|---|---|
| **Area** | 15 ha (1,5 ha orchard of which 1 ha for apple breeding) |
| **Livestock** | Mother cows, sheep, chicken |
| **Crops** | Vegetables for direct marketing, arable crops for forage production, apple orchard |
| **Turnover** | 400.000€ per year |

### Poma Culta

In 2004, Bolliger founded Poma Culta, a non-profit association for the promotion of research into biodynamic fruit growing. The research station extends on 3 ha (including compensation area with standard trees, hedges and rough pastures) in Hessigkofen, Switzerland.

Poma Culta cooperates closely with the biodynamic farm Rigi and other organic farms in Europe. Innovative is that breeding is conducted under on-farm conditions. The philosophy of Poma Culta is to select under conditions as comparable as possible to the situation in which the new varieties have to prove themselves later. In line with this, 7 candidate varieties are being tested on 6 farms

[13] https://www.foeko.de/veranstaltungen/einfuehrungskurs-oekologischer-obstbau/
[14] https://www.liveseed.eu/wp-content/uploads/2020/07/PP_PomaCulta.pdf

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throughout Europe. Additionally, 9 candidate varieties are currently being evaluated in official variety testing.
Through member-fees and fundraising, Poma Culta enables financial continuity for biodynamic fruit breeding as opposed to project-funding. Poma Culta has about 250 members that pay annually 40 Swiss francs (ca. 38€). Furthermore, Poma Culta receives donations that amount to 30,000 Swiss francs per year (ca. 28,500€).

## Apple breeding

Bolliger's motivation to start apple breeding was to develop robust and vital varieties that require less plant protection products and are adapted to the regional pedo-climatic conditions. His selection decisions are based on a holistic evaluation. According to Bolliger, the breeder requires a broad knowledge on tree nursery, orcharding, soil management, etc.; whereas, today's breeding often focuses on genetics only.

Another aspect of consideration is the heterozygosity of apples. Bolliger's theory is that inbreeding can increase the characteristics of ancestors and brings hidden characteristics of the genome to appearance. It might help to anchor these characteristics more firmly in the genome.

New candidate varieties have to pass 3 selection steps and 5 years of pre-registration testing until application for variety registration:

- **1st selection step:** Young seedlings are produced from targeted crosses. Pollination takes place either by hand or by triggering natural pollination. For the latter, after netting the parent trees, bumble bees are introduced into the net, while other insects are excluded to avoid uncontrolled pollination. Fruits are harvested in autumn and about 3,000-5,000 seeds are sown in winter. For 2-3 months, seedlings grow under tunnel production and then transplanted into the open field. No plant protection products are used in this selection step to identify disease susceptibilities. About 2-20% (in average 5%) reach the next selection step.
- **2nd selection step:** About 150-250 candidate varieties (2 trees each) are grafted upon M9 and planted in rows. In the next season, not well-performing trees are removed from the row. In this selection step, fruits during vegetation and under storage are evaluated. The same plant protection products are used as under on-farm conditions. Bolliger neither uses copper nor sulphur or lime sulphur; only bicarbonate is used to allow the identification of robust candidates. Furthermore, Bolliger uses Neem against aphids and pheromones against the codling moth. Scoring of scab, mildew, Marssonina leaf blotch and soot marks takes place. The candidate varieties do not need a full resistance, but high levels of robustness. After 2 years of outdoor cultivation, 5% reach the 3rd selection step.
- **3rd selection step:** 5-10 candidate varieties (10 trees each) are propagated on M9 as spindle trees. Agronomic traits (e.g., yield, growth behaviour), storage properties and market potential are evaluated on-farm over a longer period (5-7 years).
- **Pre-registration testing:** Since 2017, 6 candidate varieties are being tested on 5 locations in Europe (North of Germany, North of France) and Switzerland (South Tyrol). Within the next 2 years, Bolliger hopes to identify one candidate variety which can be send to official variety registration.

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*Figure 10: Examples for common apple diseases*

## Discussions/reflections centred around:

- **What are the conditions that trials can take place on-farm? Which kind of agreement exists between you and farmers?**

The agreement is partly based on contract, private agreements and trust.

- **How are you working together with other institutions such as FiBL CH?**

Bolliger has a long-term collaboration with FiBL CH and Agroscope, the Swiss centre for agriculture research. FiBL CH scientifically accompanies Bolliger's apple breeding activities. For instance, FiBL CH offers support in questions regarding phytopathology. Furthermore, FiBL CH develops a test to be used in early stages of breeding to help with mass selection of scab robust seedlings.
Bolliger stresses the importance to collaborate, to learn from each other and to share knowledge.

- **How do you organise market entry for new varieties? What is your target market?**

Market introduction of new varieties is challenged by commerce and logistics. Bolliger criticises that commerce is not innovative and demands standard varieties as opposed to varieties that require less plant protection products. In the organic market, however, there are more opportunities to introduce new varieties. Additionally, direct marketing and short-value chains facilitate communication with the consumer about the added benefits of new varieties.
A further barrier to market entry is the fees for variety registration. In Switzerland, variety registration costs 10,000€. It is possible to already establish the tree nursery during testing. Nevertheless, the application fee represents a financial risk in case the new variety is not successful on the market. In Germany, there is the possibility to get a low-level registration which is less expensive. However, seed production and marketing are geographically limited and once registered on this level, it is not possible to upgrade to the full registration. Therefore, Bolliger expressed the wish to allow a provisional variety registration with lower fees to test market introduction before the full price for variety registration has to be paid.

- **What is the purpose of the organic breeding label Bioverita?**

According to Bolliger, it is essential to have an organic breeding label that indicates that the process – form breeding to the end product – took place under organic conditions. Bioverita certifies that breeding took place using methods and techniques that are compatible with the principles of organic farming and respect the integrity of the plant. The label increases the awareness of organic farming and organically bred varieties.

- **Which fertilisers do you use?**

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The cooperating farmers use their common practices. Bolliger uses sheep wool and compost as fertilisers. In general, Bolliger prefers to breed under rather low nutrient levels to identify the seedlings that can mobilise the nutrients. Like this, Bolliger can identify varieties with a good nutrient use efficiency.

### Why organic?

"For me, it was always without question to produce organically. I was unhappy about standard varieties, like Jonagold, that require high amounts of plant protection products. I said to myself, that it cannot be organic to use these high levels of inputs to produce table fruits. Even organic pesticides contaminate the environment. That is why in organic we need different varieties."

**Niklaus Bolliger**

## VISIT 07: Research activities in fruit and berry cultivation techniques at FiBL SWITZERLAND – MICHAEL FRIEDLI

In a LIVESEED webinar, Michael Friedli presented research results by FiBL CH covering pip fruits, stone fruits and berries. Friedli is responsible for coordinating the group of fruit and berry cultivation technique[15].

**Pip fruits:**
Research at FiBL CH focuses on

- Variety testing (25 apple varieties, 13 pear varieties);
- Plant protection (scab, sooty blotch, Marssonina);
- Optimisation of cultivation technique (flower thinning); and
- Increase pip fruit cultivation for juice production.

**FiBL CH - Facts in numbers**

| | |
|---|---|
| **Founded** | 1973 |
| **Employees** | 200 employees<br>80 interns, students, apprentices |
| **Area** | 200 Swiss organic farms |
| **Activities in fruit and berry cultivation technique** | Pip fruits (apples, pears), Stone fruits (cherries, apricots, plums), Berries (strawberries, raspberries) |

Variety testing at FiBL CH is embedded in a network including breeders, variety testers, nurseries, producers, researchers, consultants, retailers and consumers. The process of pip fruit variety testing at FiBL CH is displayed in Figure 11. The organic variety team strengthens and expands the organic pip fruit market with a coordinated, qualitative and ecological improvement of the range of varieties across the entire chain from breeders to retailers.

[15]The presentation used in the webinar: https://www.liveseed.eu/wp-content/uploads/2020/07/Friedli_Liveseed_cross_visit_20200610_final.pdf

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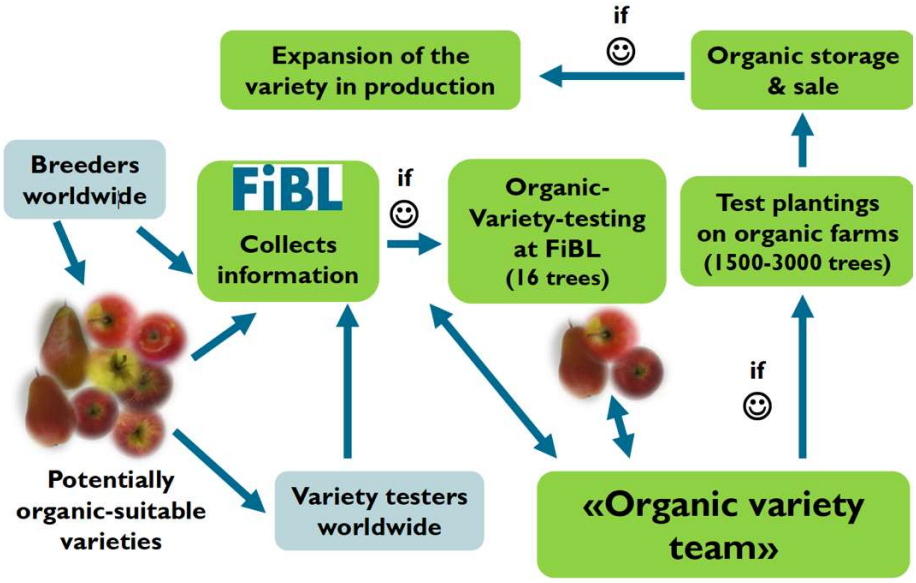


*Figure 11: Process of pip fruit variety testing at FiBL CH (presentation by Michael Friedli).*

Apple variety testing is conducted using two management systems: In order to identify the agronomic potential, standard organic plant protection and cultivation measures are used. In order to identify the genetic potential regarding diseases, pests and biennial bearing, reduced plant protection and minimal cultivation measures are used.

To bring new apple varieties to the market, FiBL CH uses a flavour group concept which was developed in cooperation with retailers. Apple varieties can be characterised according to 3 taste groups: mild to sweet; spicy, slightly acidic; and predominantly acidic. Normally, retailers ask for a high number of varieties. By grouping varieties in the taste groups, a smaller number of varieties can be brought to the market.

Every year, FiBL CH publishes a list of recommended pip fruit varieties for organic cultivation[16].

**Stone fruits:**
FiBL CH tests more than 30 varieties in collaboration with farmers and other research institutes. In organic cherry production the main problems are black cherry aphids. FiBL CH investigates different plant protection strategies: direct plant protection, release of selected beneficial insect species, and flower strips. To avoid a strong aphid population build-up, the control of stem mothers is essential. Based on their trials, FiBL CH identified 1-2 treatments with paraffin oil at sprouting as the most important treatment. This can be combined with pyrethrum + soap and Neem preparations after flowering as well as indirect regulation of aphids. The application technique is crucial for the success of the treatment. Other pests such as the cherry fruit fly and spotted wing drosophila can be controlled with full netting.

Key problem in organic apricot production are Monilia and Pseudomonas. Within the project "Development of a yield-safe production of organic apricots in Switzerland", FiBL CH tries to identify robust varieties, rootstocks and cultivation systems to increase yield reliability and economic efficiency. Varieties are tested in 3 different environments: tunnel production, with temporary weather protection, and without weather protection, each in combination with different grafting and

[16] www.fibl.org/shop

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plant protection techniques. In general, weather protection is positive for yield, fruit size, and storability.

**Berries:**
Research at FiBL CH with raspberries focuses on

- Variety testing;
- Cultivation systems (with/without weather protection, long canes cultivation, different substrates);
- Plant protection (raspberry leaf and bud mite);
- Improving production of organic young plants in collaboration with nurseries; and
- Profitability.

In general, weather protection could increase fruit quality, reduce botrytis infection and improve shelf-life. Equally, strawberry cultivation is shifting more and more from the classical field cultivation with fresh plants to weather protected cultivation.

## Discussions/reflections:

- **What is the purpose of using long canes in raspberries?**

Long canes are produced in nurseries. After the vegetation period, the cultivation is terminated by freezing the canes over winter. In spring, these canes are planted to produce new raspberry plants. The long canes produce a good harvest shortly after planting.
The purpose of long canes is to guarantee harvest as the production of raspberries as a permanent crop leads to harvest failures after a few years. This practice is often used in conventional production and increasingly in organic production. However, the production of long canes is expensive.

- **How many years are varieties tested before they can be included on the recommendation list? Does the recommendation list include organic nurseries where the variety can be obtained?**

The trial period depends on the fruit type. For instance, apples are tested for at least 3-4 years of fruit production throughout Switzerland. The recommendation lists entail results from trials by FiBL CH as well as from other institutes and breeders. Recommendation lists include information on nurseries where the variety can be ordered.

- **Do you expect a partial resistance of cherries against black aphids?**

FiBL CH tested around 30 varieties and observed a certain variability in resistance. However, it cannot be concluded yet, whether this variability stems from a partial genetic resistance.

# VISIT 07: Plant protection in organic – CLAUDIA DANIEL

Claudia Daniel is responsible for the development of new biocontrol strategies to solve plant protection and weed problems in organic agriculture at FiBL-CH.

FiBL CH's approach is to create robust cultivation systems in which indirect, preventive strategies are favoured over direct strategies to control pests and diseases. In organic agriculture, the aim is not a total eradication of the pests but rather a healthy balance between pests and beneficials[17]. This approach is illustrated by the plant protection pyramid (see Figure 1) and following examples:

17

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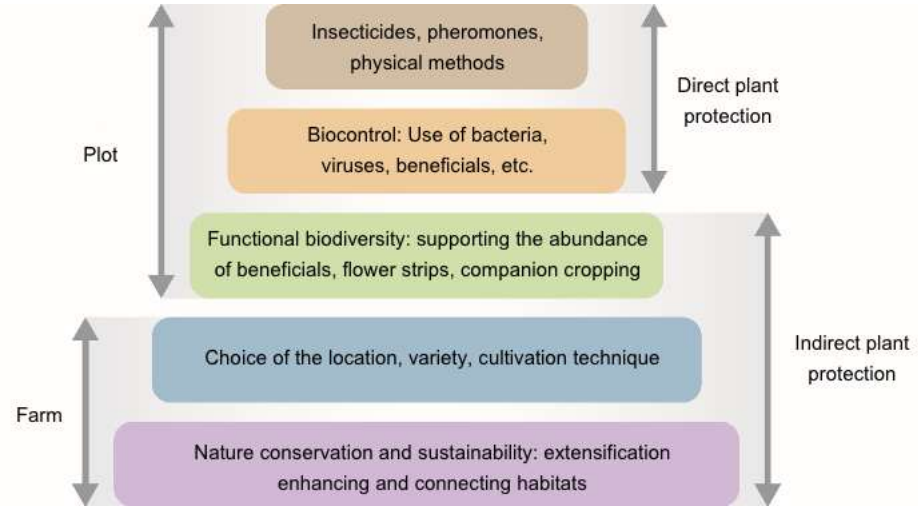


*Figure 1: Alternatives to pesticide use plant protection pyramid (Claudia Daniel)*

- **Cultivation technique**: An example for an efficient cultivation technique to reduce aphid populations is centrifugal pruning. Additionally, centrifugal pruning improves the sunlight penetration during the fruit-bud initiation period, which in turn, increases yield and fruit quality.
- **Variety choice:** An indirect plant protection strategy includes not only resistant varieties, but also varieties with a protective growth habit. For instance, apple varieties with trichomes on their leaves are unattractive for predatory mites.
- **Functional biodiversity:** FiBL CH investigated the possibility of a pesticide-free apple production by combining centrifugal pruning with functional biodiversity (flower strips, hedges, nesting boxes and stone heaps). This system lead to a good regulation of aphis and winter moth, but problems with sooty blotch occurred. Additionally, in the 6$^{th}$ year of testing, the scab resistance broke down. As a result, sulphur and potassium bicarbonate had to be applied. However, spraying led to the reduction of the spider population which are important for the control of aphids.
- **Biocontrol:** In general, biocontrol is favoured over the use of plant protection products. For instance, the codling moth can be regulated by the insecticide Spinosad. However, Spinosad has side effects on parasitoids. The reduction of parasitoids leads to an increase of woolly apple aphids for which no organic plant protection products exist. Instead of Spinosad, it would be useful to use the granulosis virus as a biocontrol strategy. The virus is very selective and efficient in controlling the codling moth.

Further readings on plant protection, biological control and insecticide in organic are provided by the articles and book chapters written by Ms. Daniel.[18]

[18] https://www.liveseed.eu/wp-content/uploads/2020/07/2018_PestManagementOrganic_Buch.pdf; https://www.liveseed.eu/wp-content/uploads/2020/07/Article-on-Plant-Protection-by-Claudia-Daniel.pdf

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## Annex I: Agenda of the visit

# Agenda – LIVESEED Cross-Visit
# Germany and Switzerland
# 12-14 May 2020
# Frankfurt – Frick

| Day 1 – 12 May 2020<br>Tuesday | | |
|---|---|---|
| **Time** | **Program** | |
| **09.00 – 10.30** | Introduction to the Cross-Visit: Getting acquainted:<br>• Presentation on LIVESEED project – IFOAM EU 10'<br>• Introduction exercise for the participants – IFOAM EU 10'<br>• Introduction of the local context: Germany and Switzerland and the organic propagation material production - fruits (by FiBL-DE) 20'<br>• Presentation by the host: Orientation – Program (where will we go) by Katherina Meyer (FiBL-DE) 10'<br>• Presentation of methodology - Organised – IFOAM EU 5'<br>• Expectations from Participants: Being change agents – IFOAM EU 5'<br>• Presentation by VitiFIT Project Leader Ms. Prof. Dr. Beate Berkelmann-Löhnertz about VitiFIT on grape vine health (esp. Plasmopara viticola), breeding for fungus-resistant grape varieties (PIWI) and the VitiMeteo Rebenperonospora" forecasting system 30' | Best Western<br>Breslauer Straße 8<br>64521 Groß-Gerau |
| **10.30 - 12.15** | *Travel to Weingut Rummel (https://rummel-biowein.de/) - introduction games in the bus for the participants* | Organic vinery Rummel<br>Geißelgasse 36<br>76829 Landau – Nussdorf |
| **12.15- 13.15** | *Lunch at Weingut Rummel* | |
| **13.15 - 15.30** | Introduction and Welcome by Mr. Klaus Rummel and Mr. Valentin Blattner Information on Organic vine breeding, selection, propagation and production, winemaking, organic wine value chain (with field visit) | |
| **15.30 - 16.00** | *Travel to Rebschule Freytag (https://www.rebschule-freytag.de/)* | Rebschule V & M Freytag<br>Theodor-Heuss-Straße 78<br>67435 Neustadt/Wstr. |
| **16.00 - 17.30** | Information from Mr. Volker Freytag on marketing. Visit of the propagation facilities. | |
| **17.30 - 20.00** | *Dinner with wine tasting* | |
| **20.00-20.30** | *Check-in at accommodation Kurpfalzhotel Landau (https://www.kurpfalzhotel-landau.de/kontakt/) (60-75€)* | Kurpfalzhotel Landau<br>Horstschanze 8+10.<br>76829 Landau/Pfalz |

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| Day 2 – 13 May 2020<br>Wednesday | | |
|---|---|---|
| Breakfast and check-out time, arranging invoices at the hotel by 08.30 | | |
| **08.30 – 10.30** | *Travel to Orchard Museum*<br>*Reflection on the First Day: Handouts for the bus time S/T/W* | |
| **10.30 – 13:00** | Program at the Orchard Museum:<br>• Welcoming by Mr. Willy Müller with field and museum visit. Explanation of the unique orchard landscape, the cultivated varieties and old processing methods.<br>• Presentation by Mr. Ute Ellwein speaking (LTZ) technical information on breeding and production of pears, excursion on plums. | Obstbaumuseum Glems<br>Eberbergstr. 24<br>72555 Metzingen – Glems |
| **13.00 – 14.00** | *Lunch at the Orchard Museum* | |
| **14.00 – 16.00** | *Travel to Bio-Obsthof Glocker (FÖKO) https://www.foeko.de/die-foeko/der-vorstand/*<br>*Reflection on the Orchard Museum - Exercise in 3-4 Groups in the bus* | |
| **16.00 – 18.00** | • Presentation by Mr. Nikolaus Glocker at FÖKO on how to organise courses for farmers in conversion for organic fruits<br>• Presentation on breeding and production of berries and cherries<br>• Field visit<br>• Reflections: presentation of exercise group results 30’ | Bio-Obsthof Glocker<br>Tepfenhart 5<br>88263 Horgenzell |
| **18.00 – 19.00** | *Dinner* | |
| **19.00 – 20.30** | *Travel to accommodation Hotel Sonnenhof & Sonnhalde (72 €)*<br>*Hohlgasse 3, 79777 Ühlingen-Birkendorf* | |

| Day 3 – 14 May 2020<br>Thursday | | |
|---|---|---|
| Breakfast and check-out time, arranging invoices at the hotel by 8.30 | | |
| **08.30 – 09.30** | *Travel time to FiBL-CH (Frick)* | |
| **09.30 – 12.15** | Program at FiBL-CH:<br>• Welcome by Dr. Monika Messmer 15’<br>• Presentation by Claudia Daniel about pest management in organic fruit production 105’<br>• Presentation by Niklaus Bolliger on organic apple breeding technologies 45’ | Ackerstrasse 113, 5070 Frick, Switzerland |
| **12.30 – 13.30** | *Lunch at FiBL- CH* | |
| **13.30 – 15.00** | • Presentation by Michael Friedli on fruit and berry cultivation technology and variety testing (apple, pear, cherry, apricot, strawberries) and field visit | Ackerstrasse 113, 5070 Frick, Switzerland |
| **15.00 - 15.45** | Closing reflections - Group Discussions (facilitated session):<br>• Learning outcomes of the visit<br>• Knowledge exchange between participants | |

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| | | |
|---|---|---|
| | • Selection of best practices and tools<br>• Evaluation | |
| **15.45 - 21. 00** | *Options:*<br>*Travel of participants by train to Switzerland airports (Basel, Zürich) 1 h30'*<br>*or*<br>*Travel of participants by bus back to Frankfurt am Mein/Airport 5h – estimated arrival at 21.00* | |

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# Annex II: List of participants of the planned physical meeting

| No | Name | Sending Organisation | Country | Email | Short Profile / Expertise |
|---|---|---|---|---|---|
| 1 | Desislava Stefanova | BIOSELENA | Bulgaria | stefanovadesislava3@gmail.com | Researcher at Fruit Growing Institute Plovdiv, Bulgaria, Department of plant protection. |
| 2 | Stefanos Liouzas | Aegilops | Greece | biofru@gmail.com | A pioneer organic fruit grower of 4 ha **apple and pears**. His organic certified family farm BioFRU (http://www.biofru.gr/) is located in Vasiliada, Kastoria (West Macedonia, Greece) . He established his organic fruit farm in 1993 and he joined AEGILOPS' Network in 2004 as a Focal Point coordinator. In 2014 he established AEGILOPS' heritage **fruit and vine** nursery with the purpose to preserve and select suitable fruit and vine varieties and rootstocks for organic farming and also to develop further an organic professionally fruit nursery. |
| 3 | Vasilis Ioannidis | Aegilops | Greece | basiliskilkis@yahoo.gr | Agronomist with experience in **vine**, arable crops and animal husbandry. From 2007 he is working for Kilkis Prefecture, responsible for conventional and organic wine production and food processing sector. He consults vine growers and vine chain stakeholders. Founder of Flora Kristonia plant diversity website (http://florakristonia.blogspot.com/). In 2016 he published for KIlkis Prefecture a study on KIlkis region vineyard with varietal description characteristics and quality traits. |
| 4 | Magdolna Toth | ÖMKi | Hungary | dr.toth.magdolna@t-online.hu | An **apple breeder** (breeding for 40+ years resistant apples. President of the Horticultural and Food Science Committee of the Hungarian Academy of Sciences 2011. Her research concerns apple breeding for multiple resistance and high or special fruit quality, germplasm resources – genebank researches, selection of new breeding resources, plant-pathogen interactions, marker analysis of the resistance background, methodological researches, studies of flowering phenology and fertility biology. |
| 5 | Zsolt Szani | MTA ATK | Hungary | szanizs@nebih.gov.hu | Fruit variety examination for 19 years, with focus on resistant **apples** from cross breeding among others, fruit DUS test for registration and plant variety protection, preparing Descriptive List, national List of fruit varieties, managing of fruit open days in the demonstrative orchards for fruit growers and breeders, publications about biotic and abiotic resistance of fruit species and varieties, CPVO expert. |
| 6 | Pedro Mendes-Moreira | ESAC | Portugal | pmm@esac.pt | Teaching genetic resources management strategies, participatory plant breeding and quantitative genetics, coordinating organic seed production projects in Portugal |
| 7 | Rosa Guilherme | IPC/ESAC | Portugal | rguilherme@esac.pt | Technical expert of ESAC and teacher of organic seed production of vegetables and propagation of fruits |
| 8 | Barbara Sazońska | IUNG | Poland | b.sazonska@cdr.gov.pl | (MSc in Horticulture) – an experienced agricultural advisor specialized in agri-environmental programmes and **organic horticulture**, currently working in the The Agricultural Advisory Centre in Brwinów, Branch Office in Radom. She has been working as an organic adviser for more than 20 years. |
| 9 | Lucian POPA | NARDI/RASA | Romania | office.biofarm@pald.ro | Farmer, agronomist, manager of the S.C. PALD Biofarm SRL |
| 10 | Évelyne Alcázar Marín | Ecovalia | Spain | ecovalia.international@ecovalia.org | Ecovalia provides advising and training to organic farmers. |
| 11 | Francois Warlop | ITAB-GRAB | France | francois.warlop@grab.fr | The most experienced organic apple breeder in France. |
| 12 | Margot Archambeau | ITAB | France | m.archambeau47@bionouvelleaquitaine.com | Apple breeder from France. |
| 13 | Katherina Meyer | FiBL-DE | Germany | katharina.meyer@fibl.org | Organiser of Cross-visit in Germany |
| 14 | Freya Shaefer | FiBL-DE | Germany | micha.groenewegen@sementesvivas.bio | Organiser of Cross-visit in Germany |
| 15 | Kaja Gutzen | IFOAM EU | Belgium | Kaja.gutzen@ifoam-eu.org | Organiser of Cross-visit in Germany |
| 16 | Agnes Bruszik | IFOAM EU | Belgium | agnes.bruszik@ifoam-eu.org | Coordinator LIVESEED |

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## Annex III: List of participants of the online webinars

28 May 2020 – Fruit Orchards

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02 June 2020 – Niklaus Bolliger Apple Breeding

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10 June 2020 – Michael Friedli on berry cultivation and research

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