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**DYNAMIC SOD MULCHING AND USE  
OF RECYCLED AMENDMENTS  
TO INCREASE BIODIVERSITY, RESILIENCE AND SUSTAINABILITY  
OF INTENSIVE ORGANIC FRUIT ORCHARDS AND VINEYARDS**

**YEARLY REPORT OF PLANT PHYSIOLOGICAL STATUS,  
CROPS' YIELD AND QUALITY DATA  
AS INFLUENCED BY OVERHEAD NETTING  
(2018-2019)**

# TEAM/CREDITS:



## **Università Politecnica delle Marche**

*P.zza Roma 22, 60121 Ancona, Italy*



ИНСТИТУТ ПО ОВОЩАРСТВО – ПЛОВДИВ  
Fruit Growing Institute – Plovdiv

## **Fruit Growing Institute**

*Ostromila 12 str. 4004, Plovdiv, Bulgaria*



## **Laimburg Research Centre**

*Laimburg 6 I-39051 Vadena (BZ), Italy*



## **Research Institute of Horticulture**

(Instytut Ogrodnictwa)

*Al. 3 Maja 2/3 96-100 Skierniewice, Poland*



## **CTIFL French technical Interprofessional Centre for Fruits and Vegetable**

*22 rue Bergère, 75009 Paris, France*



## **FiBL - Research Institute of Organic Agriculture**

*Ackerstrasse 113, 5070 Frick, Switzerland*



UNIVERSITY OF  
HOHENHEIM

## **University Hohenheim**

*Schloss Hohenheim 1, 70599 Stuttgart, Germany*



## Work package 5 - New plant protection systems

The partners involved in WP5 are the Research Center Laimburg (LAIM) and the Research Institute of Organic Agriculture (FiBL). During 2018, the two partners discussed and defined the field trials and the goals of this work package, while the real field activities started in 2019, before the beginning of the vegetative season. The nets system was mounted on one apple tree row alternating ca. 15 meters covered by Keep in Touch® plots and ca. 15 meters not covered plots and was open during the phenological stadium BBCH 65. Until the nets opening, all the organic treatments performed in the three theses were identical. After the opening (roof nets + side nets) no more PPT were used in the covered and control thesis, while they were carried out as usual in the organic thesis. In June all the three theses were manually thinned leaving ca. 100 apples per tree.

Main goals of WP 5:

- a) to understand if and how the Keep in touch system® (rain cover protective nets combined with sides anti-insect nets) is working in terms of fungal and pests damaging reduction,
- b) to understand if and how this system is influencing the harvest in terms of fruit production,
- c) to understand if the light quality/quantity changes due to the net presence affect the fruit quality.

### Activities carried out at LAIM

**Object I:** effectiveness of the system “Keep in Touch®” applied on apple trees against the damages caused by pests and fungal diseases

**Object II:** the effect of “Keep in Touch®” system on light availability, leaf photosynthesis and fruit quality on apple trees

**Position:** Block 26 Laimburg – Vadena (BZ), Italy

**Variety:** Gala/M9



### Experimental design:

- 1 (covered) thesis without PPT and with “Keep in Touch®” system
  - 2 (control) thesis without PPT and without “Keep in Touch®” system
  - 3 (organic) thesis with organic PPT and without “Keep in Touch®” system
- four repetitions per thesis, 11 - 15 trees per repetition

### Required plant protection treatments:

Covered: Only pre-flowering treatments, then NO PPT

Control: Only pre-flowering treatments, then NO PPT

Organic: Usual PPT required for organic apple farming

### Description:

#### Object I

The fungal diseases evaluation on leaves will be performed between June and July and before the harvest, while pest and fungal fruit damages will be evaluated after the harvest and after the winter storage. The fruit production of selected threes (Kg/tree) will be recorded, in order to evaluate possible side effects of the protective system on the harvest. Furthermore, visual inspection and evaluation of the trees will be regularly performed to record the presence/absence of possible pests.

#### Object II

Through the use of two weather stations and a ceptometer, environmental variables such as rainfall, air temperature, air humidity, solar irradiance, state of the leaves (dry / wet) and light intensity will be recorded in two different conditions: under the Keep in Touch® protective nets (covered thesis) and in the control thesis. The data will be collected throughout the season (from May till the harvest) and compared to assess the influence of the protective nets on the main micro-climatic variables of the tree canopy. Quality and quantity of light (direct/diffuse, PAR) will be measured at canopy level (s) as well as the leaf assimilation on both sides of the tree row. The measurements of photosynthetic activity (PA) will be carried out with clear sky, the measurements of light intensity will be carried out in the same point of



the previous record (PA), always positioning the ceptometer horizontally (north-south). The PA measures will be performed on two leaves per trees, and on three trees per repetition, for a total amount of 24 leaves per thesis. The choice of the leaves should not be random, it is necessary to select healthy leaves, easily accessible by the operator and not shaded by other trees/leaves. Furthermore, they should be fully developed and in basal position along the shoot, which must start from a mixed bud and will be manually thinned to carry only one fruit. Following these indications, 6 leaves per repetition (3 east and 3 west) will be marked to be easily recognizable. The measurements will be repeated over time every two week, starting from the first week of May.

Furthermore, fruit quality parameters such: sugar content, firmness, acidity, redness, fruit size, macro-elements content will be measured after the harvest and related to the light quantity, quality and leaves PA.

## Project timing

### Initial phase

- 1) Installation of Keep in Touch® system (mid-March)
- 2) Installation of weather stations (late-March)
- 3) Pre-opening treatments on all theses (till the ca. 15th April)
- 4) Opening of the nets (BBCH 65, ca. mid-April)
- 5) First measures with the ceptometer, leaves labelling, establishment of the measurement protocols (correct position of the instrument, of the operator etc.)

### During the two years

#### Maintenance

- 1) Weekly cleaning of weather stations

#### Treatments

- 1) On “Organic” all the required treatments

#### Leaves Pn and light

- 1) Light and photosynthetic measurements and assessments of the light quality and quantity at biweekly intervals



2) Pn, Gs and E will be measured with ADC and/or with a Ciras instrument twice a day (morning and early afternoon). The amount of PAR on the measured leaf will be recorded as well

3) Just before such a measurement, a survey of quality of light will be carried out with A) a ceptometer B) with sensors of diffuse and direct light (right at the spot where Pn, Gs and E are measured).

Fruit quality and quantity produced

1) Parameters such: sugar, firmness, acidity, redness, fruit size, macro-elements content will be measured after the harvest

2) Comparison of the harvest between the different theses

Fruit and leaves damages evaluation

1) Scab on leaves and fruits (mid-June)

2) Pest and fungal damages on leaves and fruits (harvest)

3) Evaluation of fungal infections on stored fruits (February)

### Activities carried out at FiBL

**Object I:** effectiveness of the system “Keep in Touch®” applied on apple trees against the damages caused by pests and fungal diseases

**Object II:** the effect of “Keep in Touch®” system on the microclimatic conditions around the trees and on the fruit quality on apple trees

**Position:** apple orchard at FiBL in Frick, Switzerland

**Varieties:** Ariwa and Topaz

### Experimental design:

1 (covered) thesis without PPT and with “Keep in Touch®” system

2 (control) thesis without PPT and without “Keep in Touch®” system

3 (organic) thesis with organic PPT and without “Keep in Touch®” system



three repetitions per thesis, 5-11 trees per repetition

**Required plant protection treatments:**

Covered: Only pre-flowering treatments, then NO PPT

Control: Only pre-flowering treatments, then NO PPT

Organic: Usual PPT required for organic apple farming

**Description:**

**Object I**

The fungal diseases evaluation on leaves will be performed between June and July and before the harvest, while pest and fungal fruit damages will be evaluated after the harvest and after the winter storage. The fruit production of selected threes (kg/tree) will be recorded, in order to evaluate possible side effects of the protective system on the harvest. Furthermore, visual inspection and evaluation of the trees will be regularly performed to record the presence/absence of possible pests.

**Object II**

Micro-climatic conditions under the Keep in Touch® nets and in the control will be measured to assess the influence of the protective nets on the main micro-climatic variables of the tree canopy.

Furthermore, fruit quality parameters such as sugar content, firmness, acidity, redness, fruit size will be measured after the harvest.

**Project timing**

**Initial phase**

- 1) Installation of Keep in Touch® system (mid-March)
- 2) Pre-opening treatments on all theses (till the 23th April)
- 3) Opening of the nets (BBCH 65, 25th-April)



### During the two years

#### Treatments

- 1) On “Organic” all the required treatments

#### Fruit quality and quantity produced

- 1) Parameters such as sugar, firmness, acidity, redness, fruit size will be measured after the harvest
- 2) Comparison of the harvest between the different theses

#### Fruit and leaves damages evaluation

- 1) Scab, powdery mildew, Marssonina, Alternaria on leaves (begin-July)
- 2) Pest and fungal damages on leaves and fruits (harvest)
- 3) Evaluation of fungal infections on stored fruits (winter)