CORE organic Cofund

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NATURE & SCIENCE: HAND IN HAND

# DOMINO

## Innovative orchard management enhances soil fertility, biodiversity and economic sustainability

Thomas Holtz – Markus Kelderer

# Workplans

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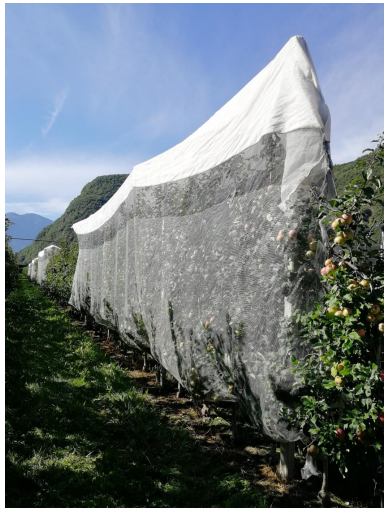
| WP 5<br>New plant protection systems | WP 3<br>Improving biodiversity | WP 4<br>Fertilization management |
|---|---|---|
| Physical barriers –<br>Keep in touch® system | Green manuring +<br>Live mulching | N-mineralization test |
| Apple, cherry, apricot – orchards and vineyard | Apple orchard and vineyard | Laboratory incubations |




# WP 5
# Keep in touch® “system” trials

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| | |
|---|---|
| Sides | 4 x 2.3 mm |
| | 1.3 x 1.3 mm |
| Top | 0.3 x 0,3 mm |

www.keepintouchsystem.eu

www.laimburg.it


AGAINST:
Hailstorms
Pests
WATER

# Keep in touch®

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Experimental questions

1. Does the system properly work against fungal infections?
2. Is it feasible to reduce the plant protection applications?
3. What are the advantages and disadvantages of this system?
4. How the microclimatic conditions are influenced by the net?

Evaluations

1. Pest damages
2. Fungal infections
3. Influence on the meteorological variables

Crops

1. Apple – different variety
2. Apricot – Orange red
3. Cherries – Kordia Regina
4. Vineyard – Merlot

| | Apple (Fuji) | Cherries | Apricot | Vineyard |
|---|---|---|---|---|
| Experimental plant: | VZ Laimburg 41 | VZ Laimburg 61 | VZ Laimburg 61 | |
| Variety/Rootstock: | Fuji / M9 | Kordia Regina / Gisela 5 | Orange Red / St. Julian A | Gewürztraminer |
| Plant distance: | 3,18 X 1,0 m | | | |
| Planting year: | 2003 | 2013 | 2015 | |
| Experimental design: | 4 randomized blocks, 12 trees + 2 border trees per trial unit | 3 randomized blocks | 3 randomized blocks | 3 randomized blocks |
| Application technique: | Keep in touch®: no fungicidal spraynys throughout | Keep in touch®: no fungicidal spraynys throughout | Keep in touch®: no fungicidal spraynys throughout | Keep in touch®: no fungicidal spraynys throughout |
| Evaluations: | June<br>Harvest<br>Post storage | June<br>Juli<br>Post storage | June<br>Post storage | September |

# First results on cherry-trees

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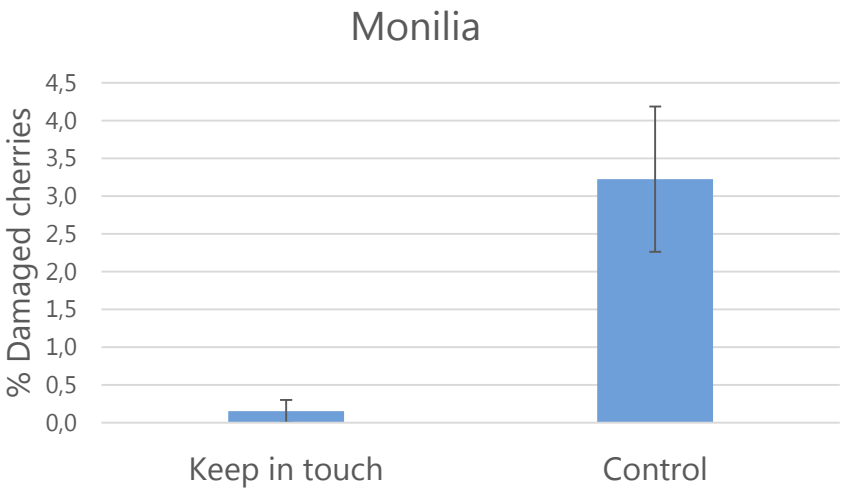
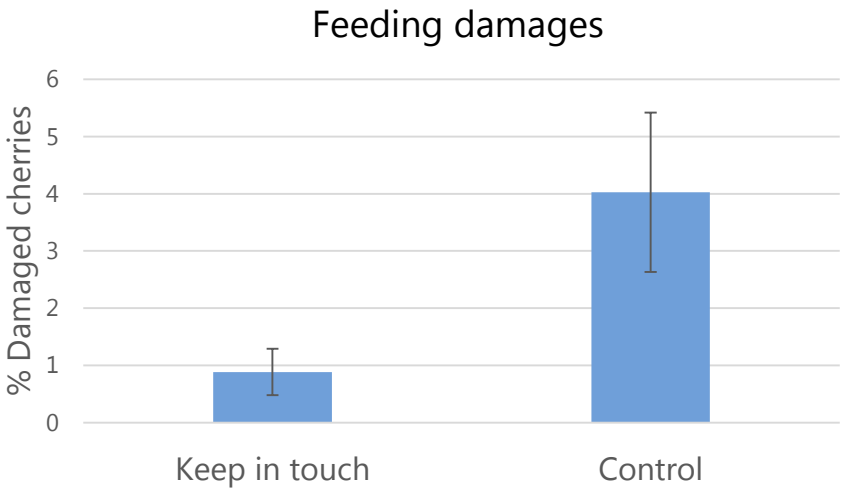
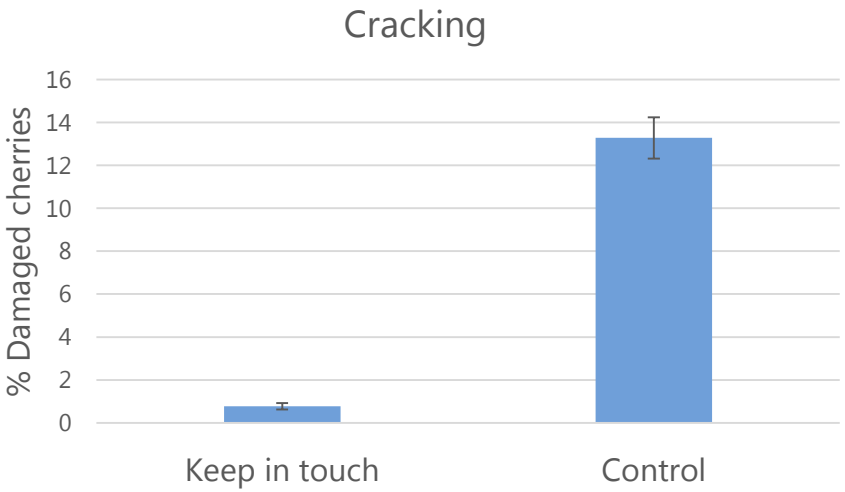
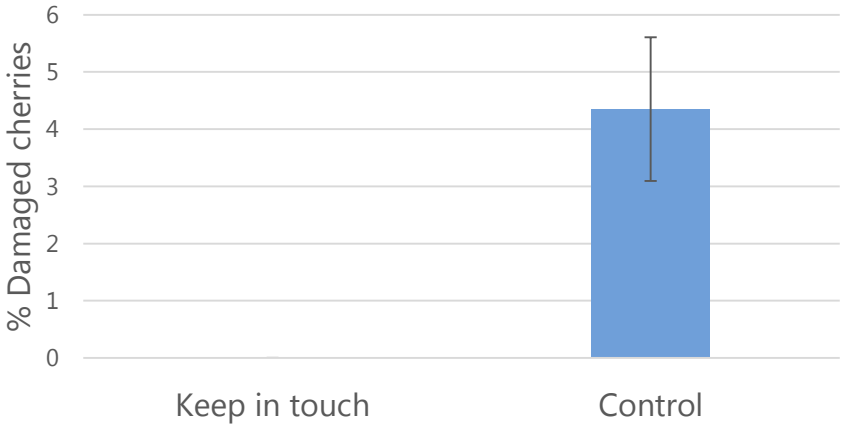
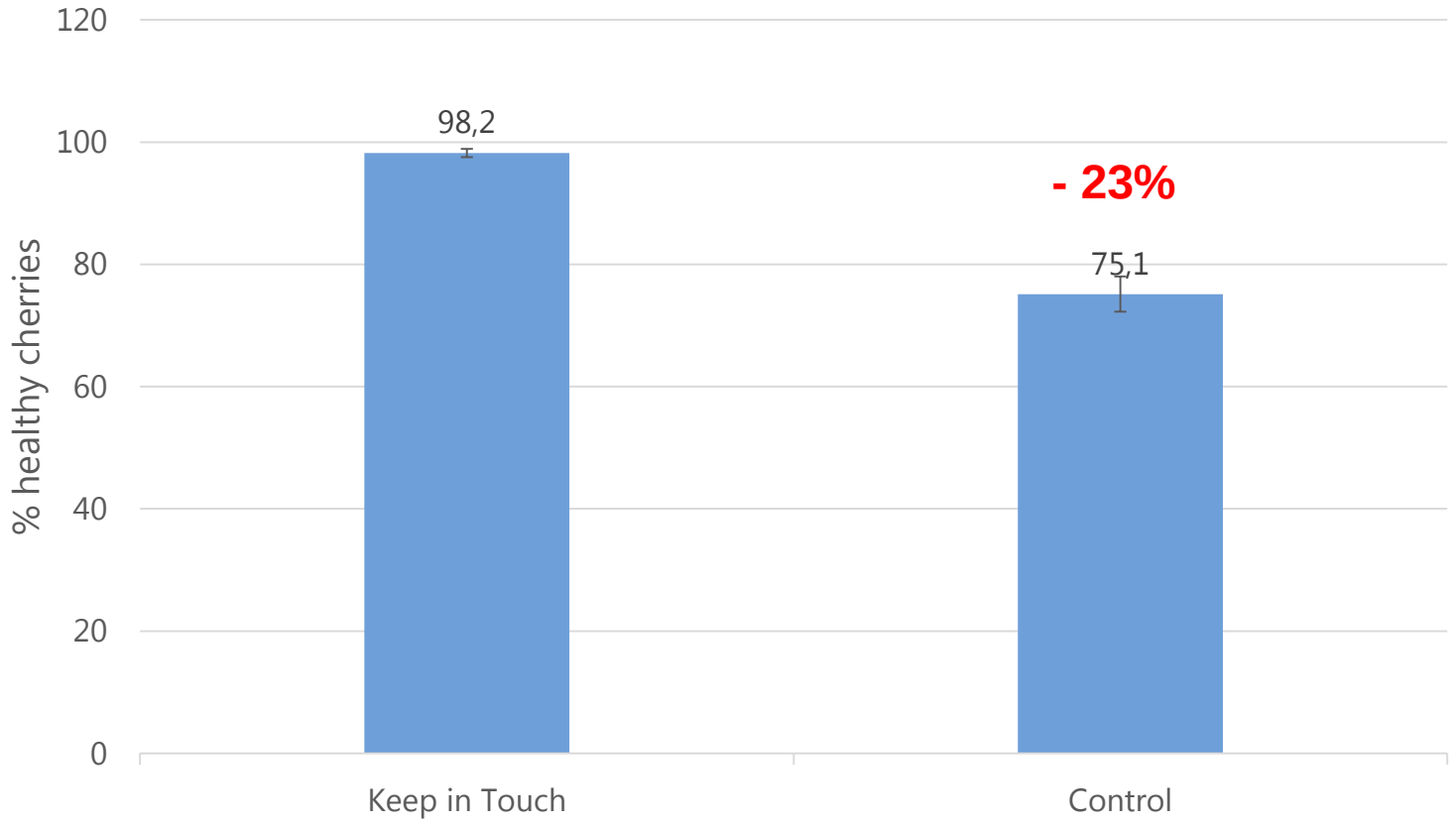


# Healthy cherries June



# After one month in the storage room

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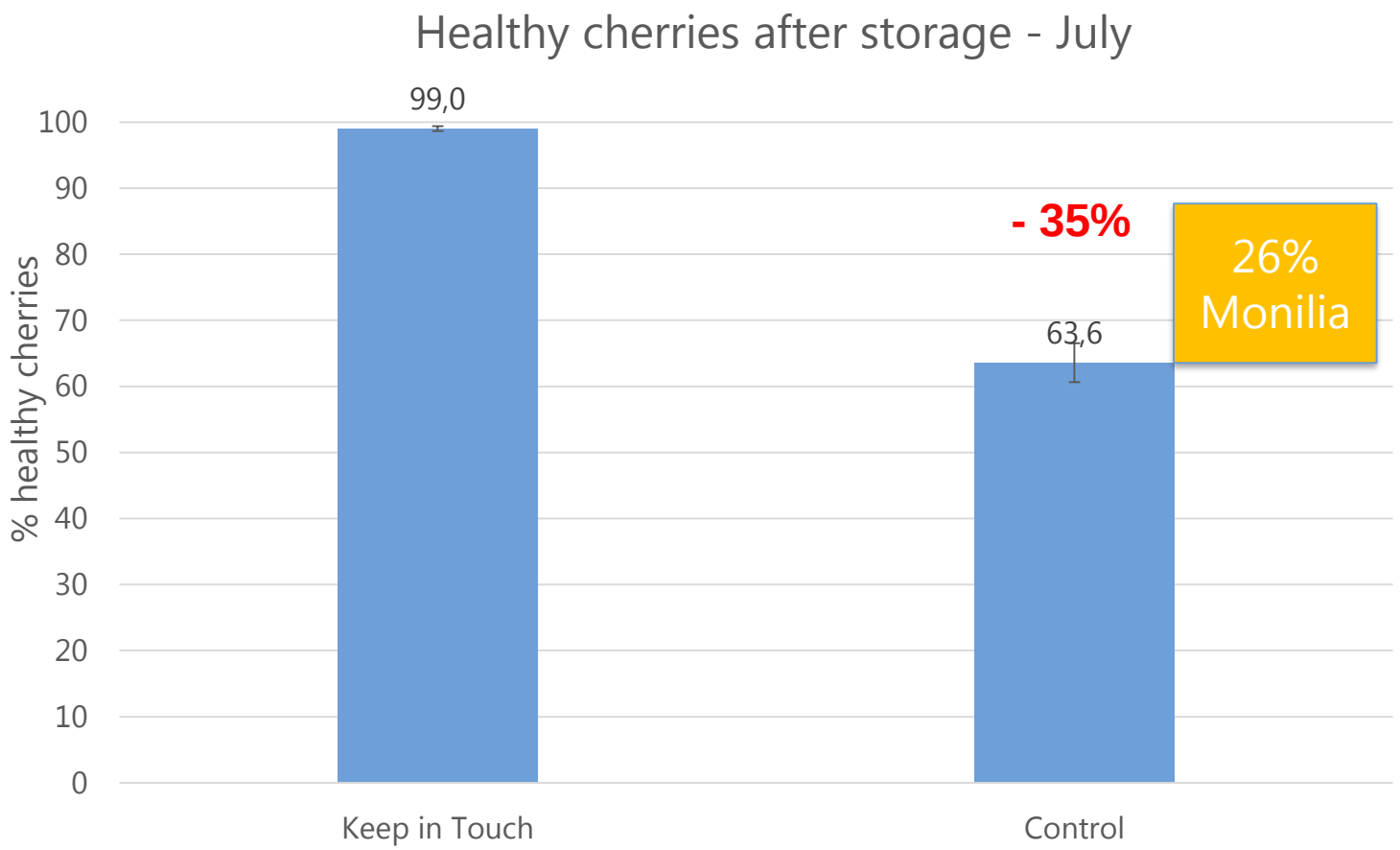

# First results on Apricot-trees

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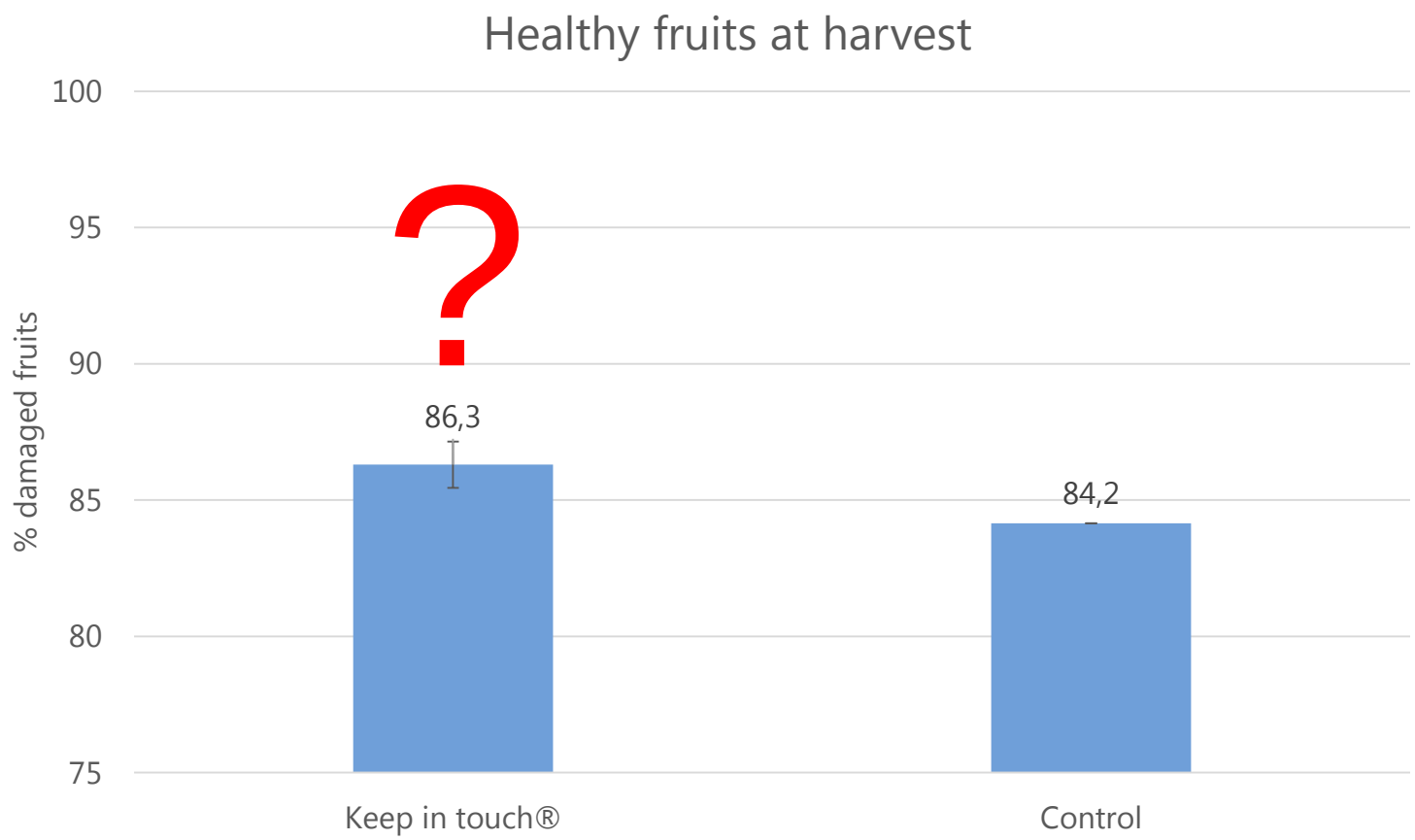


The net was opened too late
Cladosporium, Corineum and Monilia already started the infection process

# Which are the advantages of using the net-system?

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| Pro | Con |
|---|---|
| Protection against hail, fungi and insect damages | Costs |
| Reduction of chemical treatments | Carboon footprint* |
| Soil compaction reduction | Landscape |
| Protection from direct sunlight (sunburn) | Disposal or recycling?<br>0,30 €/Kg |
| Long lifespan of the plastic nets (?) | |
| Reduced water consumption | |
| Cracking reduction | |

- Carbon footprint of innovative plastic covers used as insect and pest control system in organic apple orchards.
M. Boschiero, M. Kelderer, C. Casera, 2016

# WP 4
# N-mineralization trials

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## Organic substances

| Nr. | Substance | ID | N content (%) |
|---|---|---|---|
| 1 | Hornmanure | HR_MA | 14,09 |
| 2 | Vinasse | VIN | 4,28 |
| 3 | Cloverpellets | CLV_PE | 3,62 |
| 4 | Peas | PEAS | 3,88 |
| 5 | Digestate | DGS | 0,62 |
| 6 | Clover silage | CLV_SI | 1,70 |
| 7 | Bio-pellets Sterzing | STE_PE | 1,82 |
| 8 | Biochar + compost | BCH_COM | 1,04 |
| 9 | Compost | COM | 1,16 |
| 10 | Mushrooms substrate | MSR | 0,74 |
| 11 | Vinasse Inhort | VIN_INH | 3,35 |
| 12 | Digestate Inhort | DGS_INH | 0,53 |
| 13 | Control (only soil) | KNTR | 0,00 |
| 14 | Reference – ammonium sulfate | REF | 21,18 |

# WP 4
# N-mineralization trials

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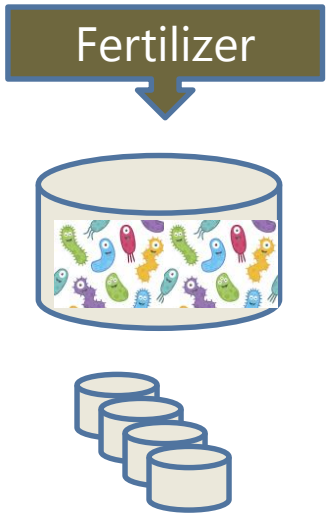


12 different organic fertilizers
+ 2 controls

Incubation at 10° C for 60 days

4 repetition per sample
4 different extraction periods (7 – 14 – 30 – 60 day)

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224 samples for the N-min analysis
+
108 samples for microbial biomass analysis
+
14 Soil analysis after 60 days

# WP 4
# N-mineralization trials

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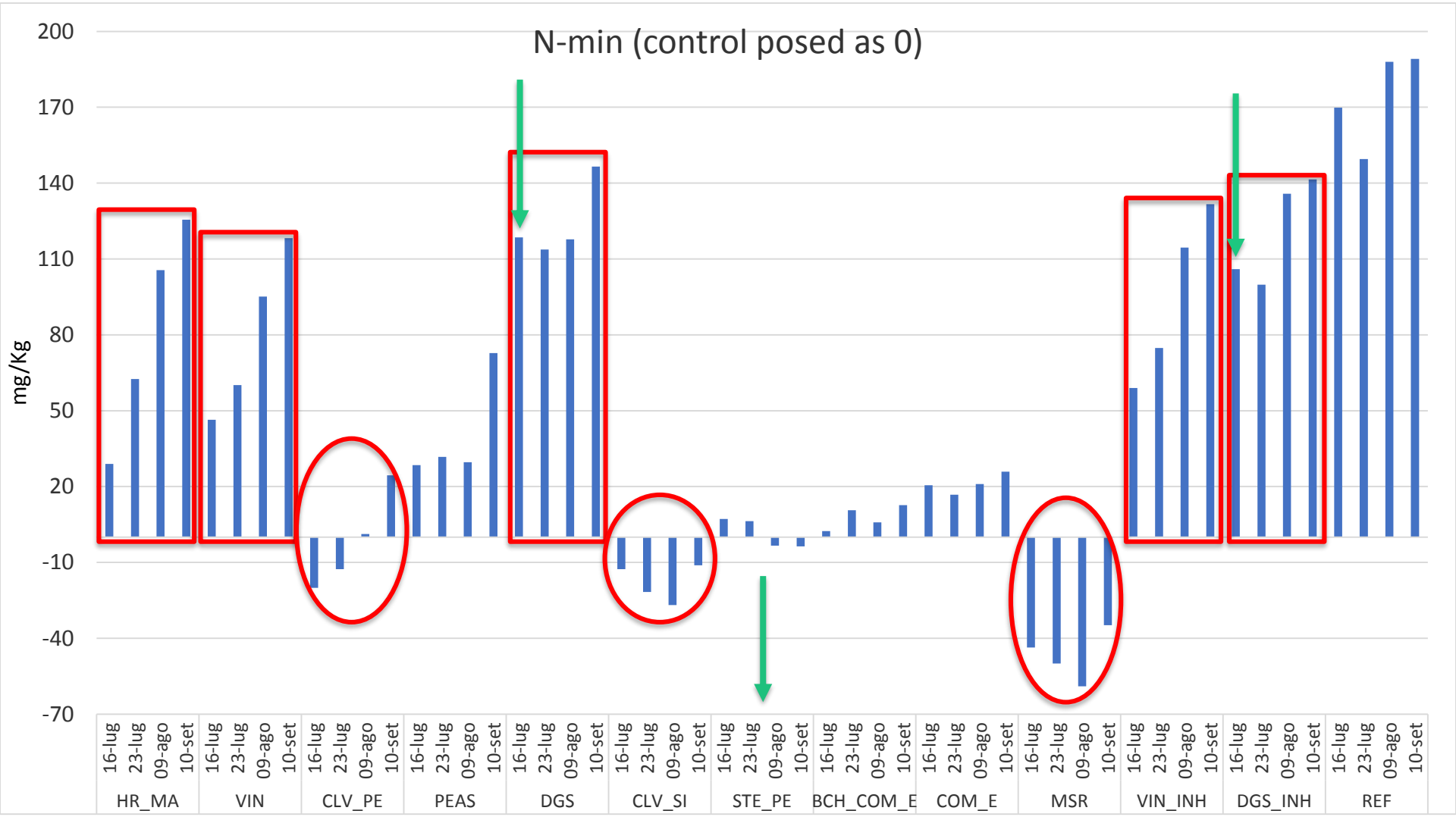

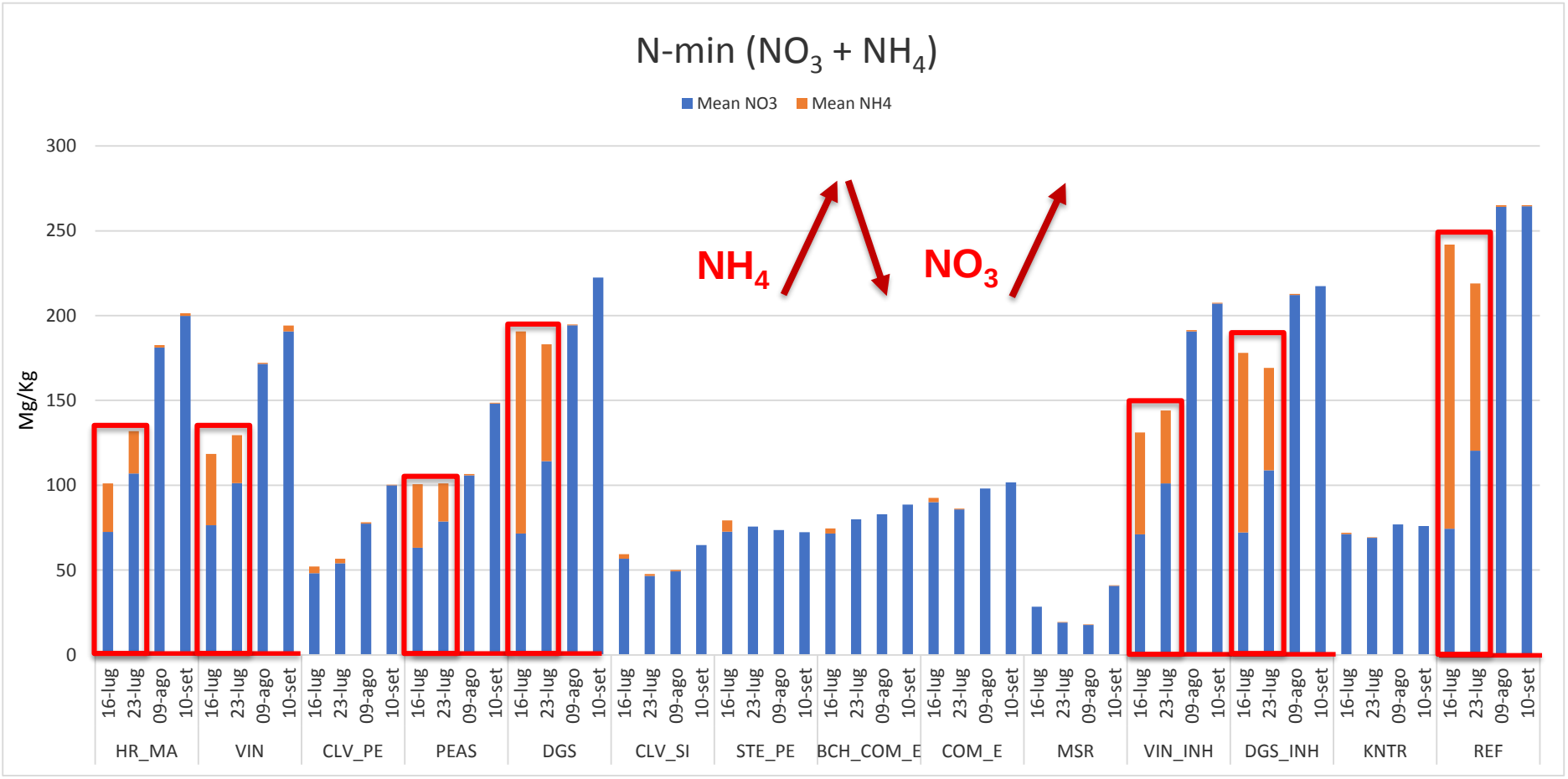
N-min ($NO_3$ + $NH_4$)
Mean NO3
Mean NH4
Mg/Kg
300
250
200
150
100
50
0
$NH_4$
$NO_3$
16-lug
23-lug
09-ago
10-set
HR_MA
VIN
CLV_PE
PEAS
DGS
CLV_SI
STE_PE
BCH_COM_E
COM_E
MSR
VIN_INH
DGS_INH
KNTR
REF

# Influence of the organic matter on the soil parameters

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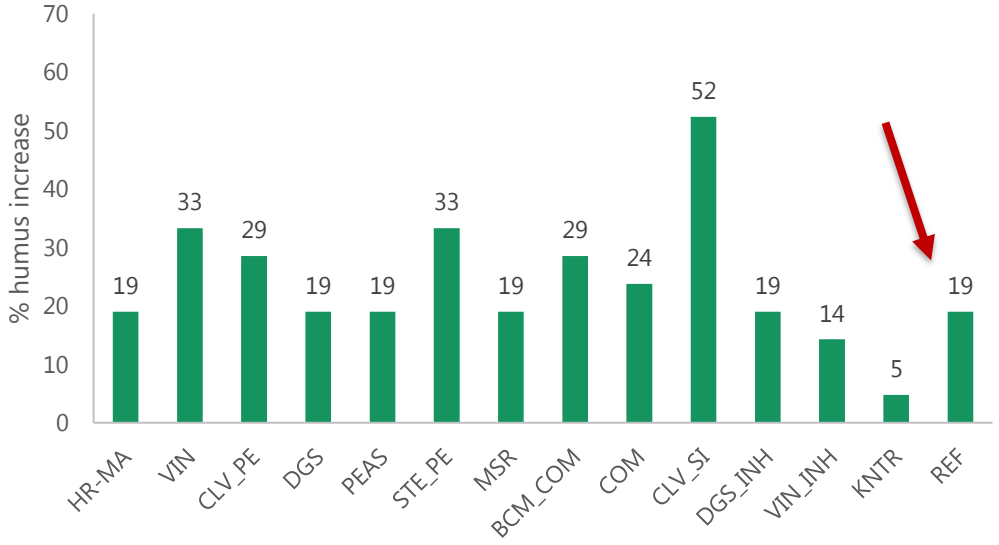
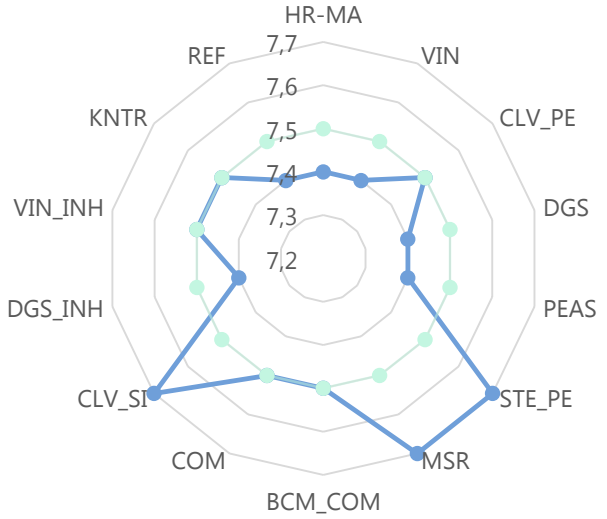
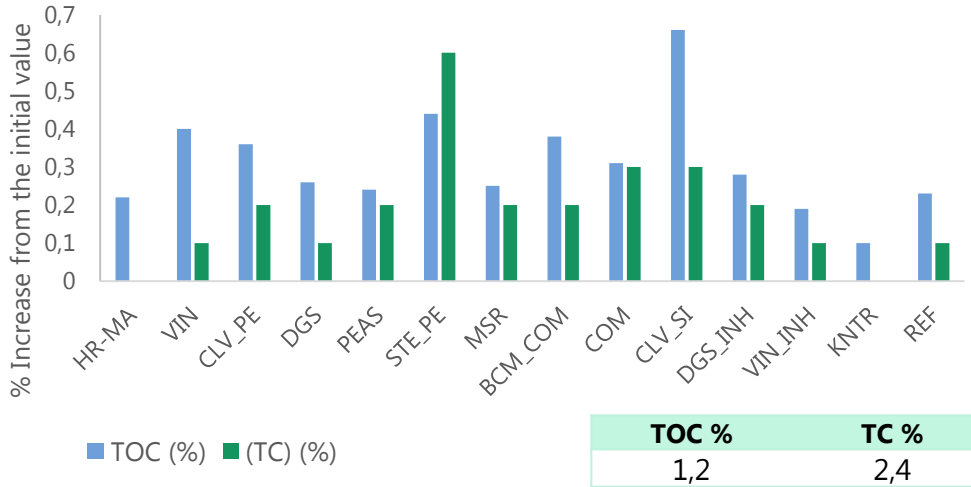
## Humus increase in 60 days (%)




## Soil pH after 60 days

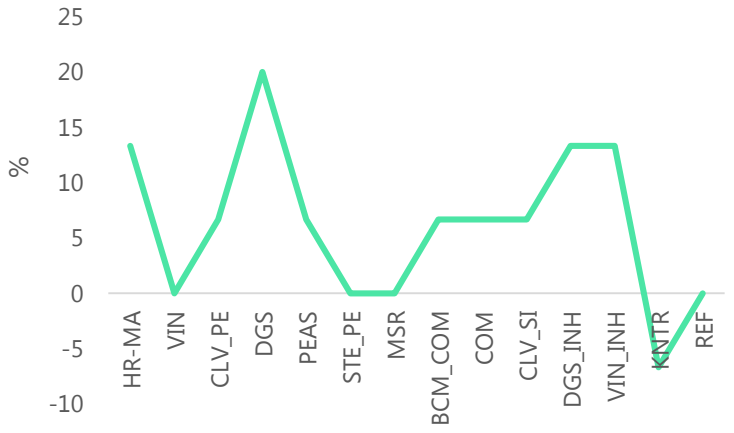


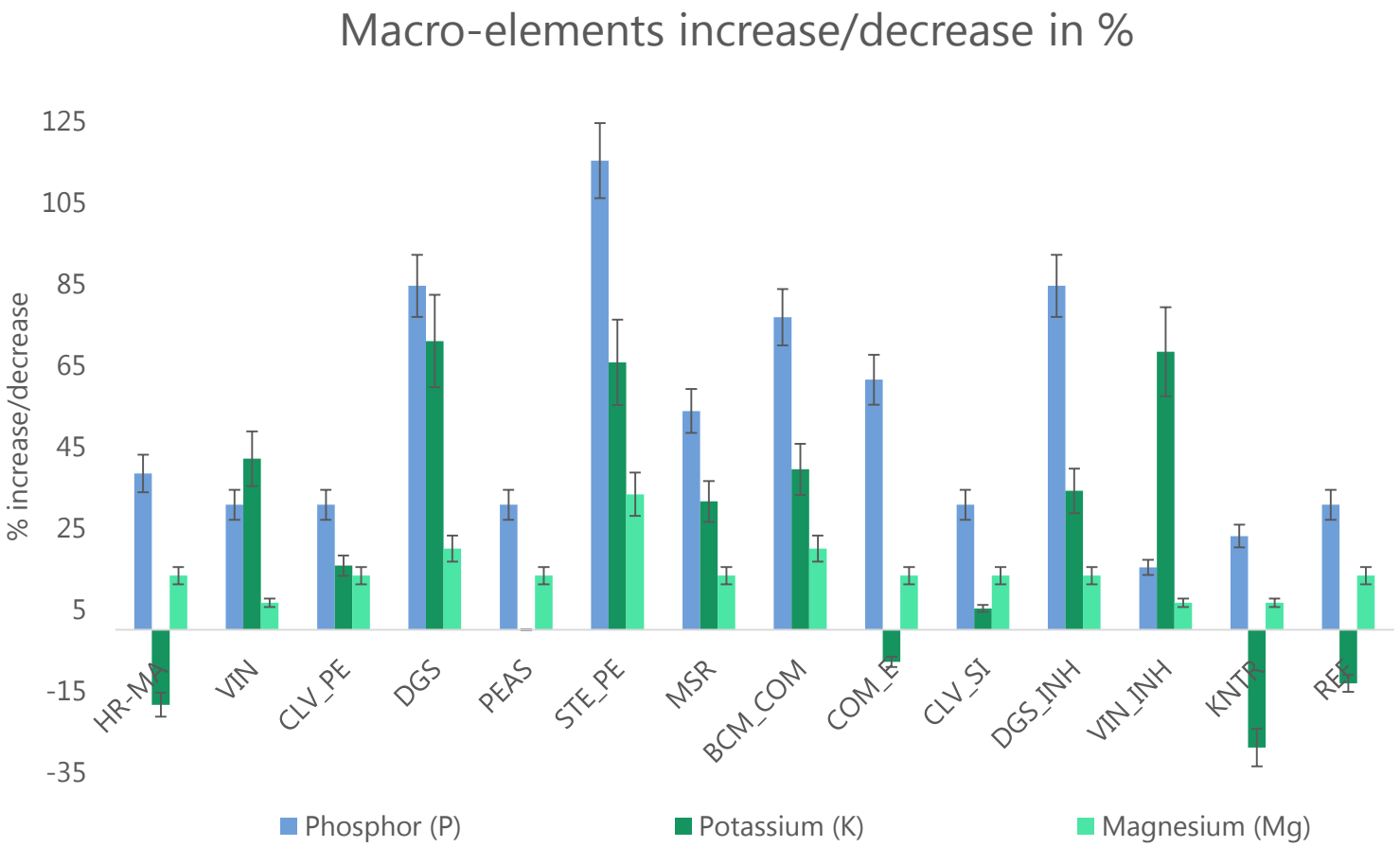

## TC and TOC increase in 60 days




| TOC % | TC % |
|---|---|
| 1,2 | 2,4 |

## t-N (%)




Macro-elements increase/decrease in %
% increase/decrease
125
105
85
65
45
25
5
-15
-35
HR-MA
VIN
CLV_PE
DGS
PEAS
STE_PE
MSR
BCM_COM
COM_E
CLV_SI
DGS_INH
VIN_INH
KNTR
RES
Phosphor (P)
Potassium (K)
Magnesium (Mg)

# How different organic substances influence the microbial biomass



# Considerations

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- The two liquid fertilizers are the faster N releaser.
- Digestates, vinasses and horn manure are reaching the higher levels of mineralization
- Some of the tested substances are not mineralizing at all, they are immobilizing the N
- The commercial organic fertilizer did not bring any mineral nitrogen to the soil but it bring a lot of macro-elements

# Food for thought

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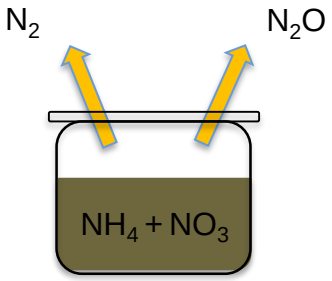
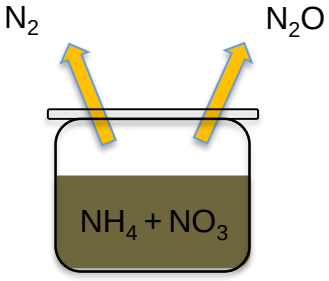
The current system do not allow to discriminate between the N-min of the different weeks. Maybe the system could be optimized..

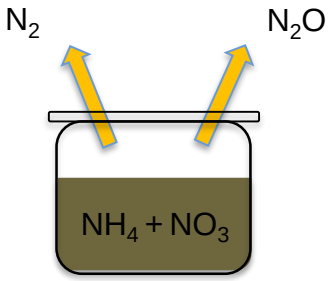
1° extraction



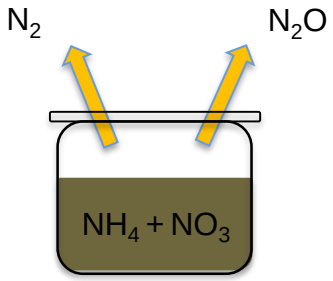

2° extraction

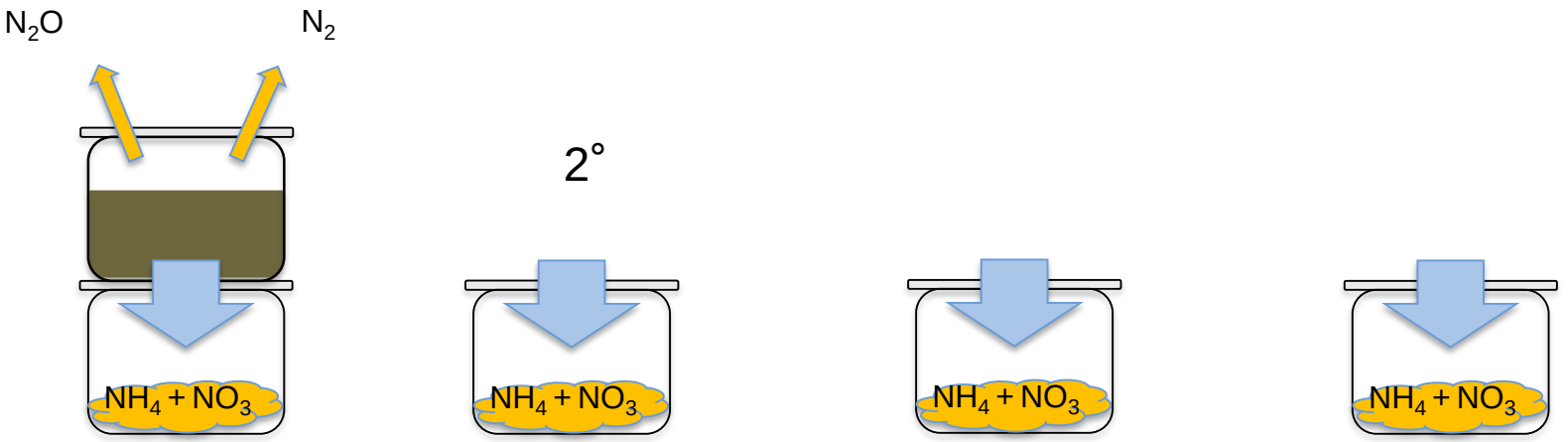



3° extraction




4° extraction



# WP 3
# Green manuring and Live mulching

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## Apple orchard

**Tree rows**

| Nr. | Latin name | Common name |
|---|---|---|
| 1 | *Portulaca oleracea* | Purslane |
| 2 | *Tropaeolum majus* | Garden nasturtium |
| 3 | *Potentilla reptans* | Creeping cinquefoil |
| 4 | *Galium mollugo* | Hedge bedstraw |
| 5 | *Fragaria* | Wild strawberry |
| 6 | *Trifolium resupinatum var. resupinatum* | Persian clover |
| 7 | *Portulaca oleracea + Achillea millefolium* | Purslane + Yarrow |
| 8 | *Achillea millefolium + Galium mollugo + Trifolium repens* | Yarrow + Hedge bedstraw + White clover |
| KB | Control + soil tillage | |
| K | Control | |

**Intra-rows**

| | | |
|---|---|---|
| 9 | *Trifolium incarnatum - Canapa sativa - Cucurbita pepo* | Italian clover - Cannabis - Zucchini |
| 10 | *Pisum sativum - Canapa sativa - Cucumis sativus* | Pea - Cannabis - Cucumber |
| 11 | *Secale cereale + Trifolium incarnatum* | Rye + Italian clover |
| 12 | *Canapa sativa + Glycine max* | Cannabis + Soya |
| 13 | *Raphanus sativus var. Oleiformis +P. sativum* | Radish + Pea |
| K | Control | |

# Apple orchard

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**Block 71**

Sorte Gala
Pflanzabstand: 3x0,8m
Pflanzjahr: 2016

N

| Physio | 1 | | 1 | 1 | | 1 | 1 | 1 | | 1 | 1 | 1 | 1 | Julia |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 8 | | 8 | 8 | | 8 | 8 | 8 | | 8 | 9 | 9 | 9 | 9 |
| | 10 | | 10 | 10 | | 10 | 10 | 10 | | 10 | 5 | 4 | 10 | 10 |
| | 10 | | 10 | 10 | | 10 | 10 | 10 | | 10 | 3 | KB | 10 | 10 |
| | 10 | | 10 | 10 | | 10 | 10 | 10 | | 10 | 4 | 5 | 10 | 10 |
| | 10 | | 10 | 10 | | 15 | 10 | 10 | 11 (3*) | 10 | 1 | 3 | 10 | 10 |
| | 10 | | 10 | 10 | | K | 10 | 10 | 12 (3*) | 10 | 2 | K | 10 | 10 |
| | 10 | | 10 | 10 | | K | 10 | 10 | 12 (3*) | 10 | K | 2 | 10 | 10 |
| | 10 | | 10 | 10 | | 13 | 10 | 10 | | 10 | 8 | 7 | 10 | 10 |
| | 10 | | 10 | 10 | | 13 | 10 | 10 | 14 | 10 | KB | 1 | 10 | 10 |
| | 10 | 13 | 10 | 10 | | 15 | 10 | 10 | K | 10 | 6 | 8 | 10 | 10 |
| | 10 | 13 | 10 | 10 | | 15 | 10 | 10 | K | 10 | 7 | 6 | 10 | 10 |
| | 10 | | 10 | 10 | | K | 10 | 10 | | 10 | | | 10 | 10 |
| | 10 | 12 (3*) | 10 | 10 | | K | 10 | 10 | 11 (3*) | 10 | 3 | KB | 10 | 10 |
| | 10 | | 10 | 10 | | 14 | 10 | 10 | | 10 | 8 | 6 | 10 | 10 |
| | 10 | 15 | 10 | 10 | | 14 | 10 | 10 | 15 | 10 | 4 | 8 | 10 | 10 |
| | 10 | | 10 | 10 | | 11 (3*) | 10 | 10 | | 10 | 1 | 5 | 10 | 10 |
| | 10 | 14 | 10 | 10 | | 11 (3*) | 10 | 10 | 12 (3*) | 10 | 2 | 1 | 10 | 10 |
| | 10 | | 10 | 10 | | 13 | 10 | 10 | | 10 | 6 | 7 | 10 | 10 |
| | 10 | K | 10 | 10 | | 13 | 10 | 10 | 14 | 10 | 5 | 3 | 10 | 10 |
| | 10 | | 10 | 10 | | 12 (3*) | 10 | 10 | | 10 | 7 | 4 | 10 | 10 |
| | 10 | 11 (3*) | 10 | 10 | | 12 (3*) | 10 | 10 | 13 | 10 | KB | K | 10 | 10 |
| | 6 | | 8 | 10 | | | 10 | 10 | | 10 | K | 2 | 10 | 10 |
| | 1 | | 1 | 1 | | | 2 | 4 | | 6 | 8 | 10 | 12 | 10 |
| | | | | | | | 1 | 1 | | 1 | 1 | 1 | 1 | 2 |
| | | | | | | | | | | | | | | 1 |

HERBICIDE
CONTROL
INTER-ROW SEEDLING

ROW SEEDLING
FALL SEEDLING
OLD SCREENING

# WP 3
# Green manuring and Live mulching

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## Vineyard

**Tree rows**

| Nr. | Latin name | Common name |
|---|---|---|
| 1 | *Portulaca oleracea* | purslane |
| 2 | *Galium mollugo* | hedge bedstraw |
| 3 | *Euphorbia helioscopia* | sun spurge |
| 4 | *Sanguisorba minor* | salad burnet |
| 5 | *Potentilla reptans* | creeping cinquefoil |
| 6 | *Glechoma hederacea* | ground-ivy |
| 7 | *Fragaria …* | wild strawberry |
| 8 | *Salvia pratensis + Achillea millefolium* | meadow clary + yarrow |
| KB | Control + soil tillage | |
| K | Control | |

**Intra-rows**

| | | |
|---|---|---|
| 9 | *Cannabis sativa + Pisum sativum* | cannabis + pea |
| K | Control | |


6

# Vineyard

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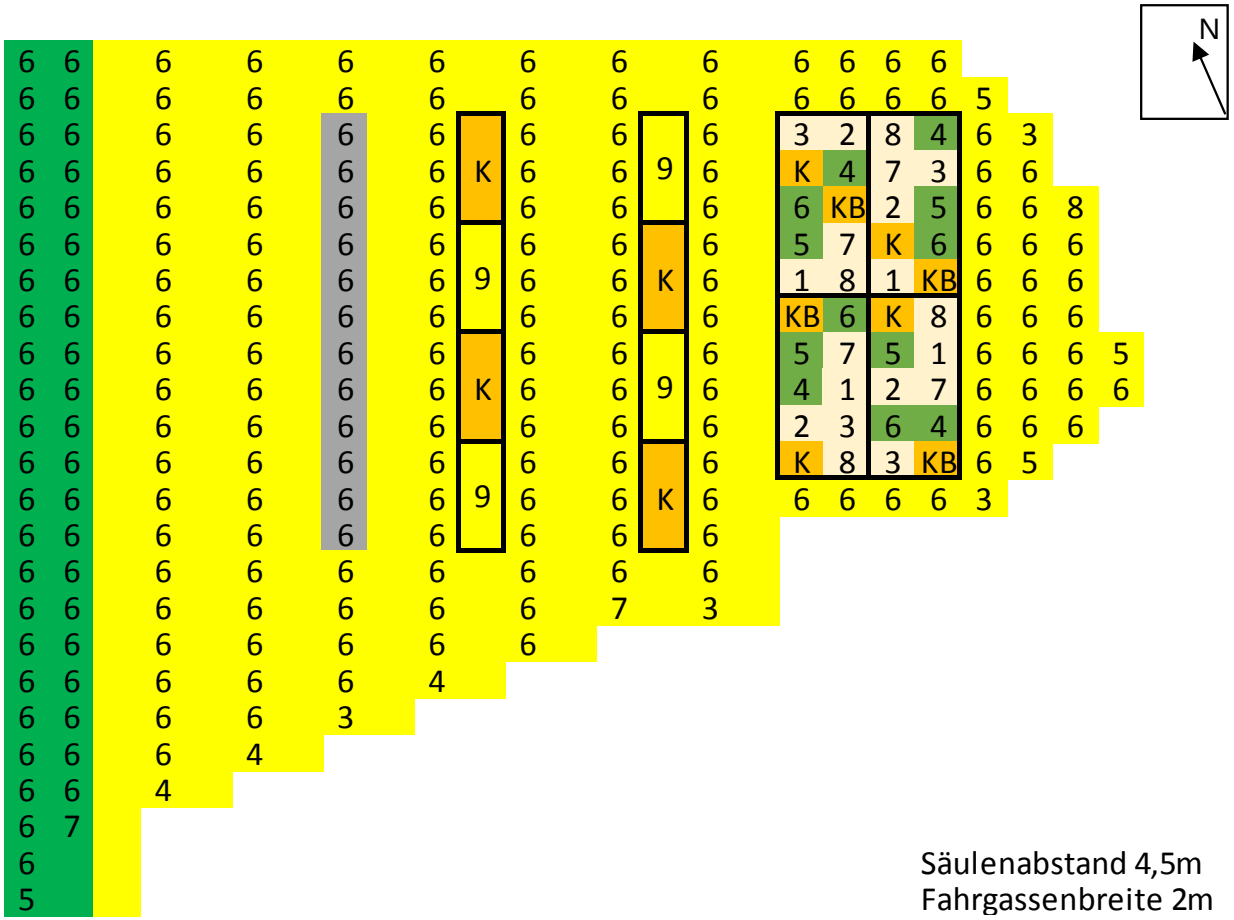


Säulenabstand 4,5m
Fahrgassenbreite 2m
Pflanzstandraum 2m x 0,7
3999 Reben a 1,5m²
Nettofläche 5999m²
T =Telefonmasten
X =Schieber

# Danke für Ihre Aufmerksamkeit.
# Grazie per la Sua attenzione.
# Thank you for your attention.

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