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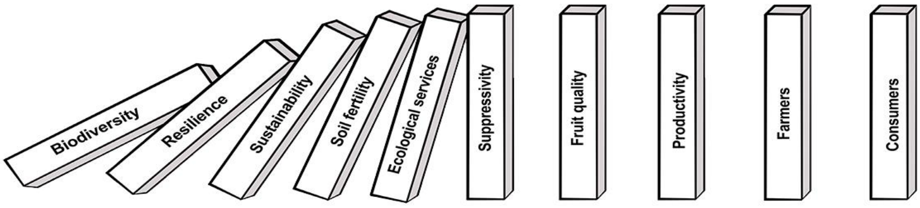


NEWSLETTER

N° 2 June 2019

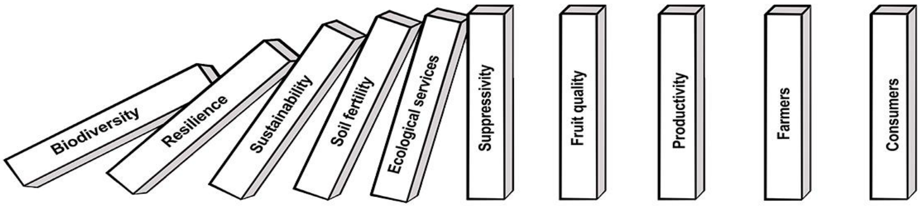
Release

It is already one year that the DOMINO project is running and we start to obtain some interesting data from the trials performed by the different partners which are confirming the concept at the base of the project: the introduction of a "vertical" production system, with the exploitation of different layers of the orchard, above and below ground, as a method to increase the agroecosystem resilience with a "domino" effect on biodiversity, fruit quality and overall sustainability of the cropping systems.

The article of Thomas Holtz and Markus Kelderer from the Experimental Station in Laimburg included in this issue is indeed presenting some outcomes from the trials with locally produced new organic fertilizers in comparison with those generally present on the market.

However, the project has been active in this first part of the growing season in setting several trials also with farmers dedicated to the innovative management of the row and of the inter-row. The proposed approach has met a high interest from the farmers, which have also underlined, during various meetings and events organized by the partners, the willingness to collaborate with the project. A detailed information about these meetings can be found on the project website, but we believe worthy to mention here those we consider the most important for the dissemination of the project concept and innovations:

- The presentation at the annual organic fruit growing conference ("Bio-Obstbautagung") organized by the partner FiBL in Lindau (CH), which was devoted to the organic fruit production of the future, underlining the need of a sustainable orchard management.

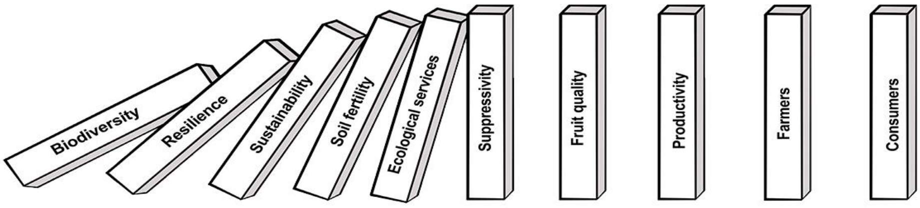


- The seminar at the International Agricultural Exhibition AGRA, the largest agricultural fair of Bulgaria, held in Plovdiv. It allowed to discuss environmental as well as political aspects of organic production in the country and the possibilities deriving from the innovations proposed by DOMINO.
- The workshop with the members of the Polish Association of Organic Fruit Growers in Biała Rawska (P), organized to define the method for the assessment and valorisation of the ecosystem services provided by the innovations proposed by the project.
- The workshop at the Competence Centre for Fruit Growing Bavendorf (D) organized with the Organic Fruit Growing Association (Fördergemeinschaft Ökologischer Obstbau) to present the first results of the trial using alternative fertilisers.
- The workshop organized at the University Alma Mater Studiorum of Bologna (IT) on strategies for sustainable organic orchard management, where the latest result on anti-hail net use and on live mulches application were presented along with the experience of a farmer involved in DOMINO's experimental activity.

- The presentation in the framework of the workshop "Cropping for the future: networking for crop rotation and crop diversification" organized by the Agricultural European Innovation Partnership (EIP-AGRI) in Almere (NL), to illustrate the activities and solutions of DOMINO as an example of the different approaches demonstrated throughout the EU tackling the issues of crop diversification and biodiversity improvement.

We take the occasion to wish all the readers a fruitful summer season.

Eligio Malusá and Małgorzata Tartanus



Nitrogen rich biomasses used as fertilizers. Laboratory and open field trials at Laimburg Research Center

Thomas Holtz, Markus Kelderer

thomas.holtz@laimburg.it

Nitrogen rich biomasses derived from industrial plants, organic waste plant-treatments and biogas production are becoming always more interesting for the organic agriculture. The ground idea is to exploit the organic nitrogen trapped into the biomass to cover the nitrogen demand of orchards and vineyards. Furthermore, as the nature of the products is organic, they can supply other nutrients like potassium, phosphorus, magnesium, calcium and increase the organic carbon pool of the ground. Starting from this concept, twelve organic substances (Tab. 1) were tested as nitrogen fertilizers. To understand if these products can be used in agriculture, bacteria and heavy metals content were examined, and laboratory trials to understand
how much and how fast these substances are releasing mineral nitrogen into the soil were performed. Every sample was mixed with 250g of soil and incubated for two months in aerobic condition. The mineral nitrogen was periodically extracted and quantified, while at the beginning and at the end of the experiment a complete soil characterization was effectuated.

Nr.	Row material	ID code	N content (%)
1	Bone and horn meal	HR_MA	14.09
2	Sillage	VIN1	4.28
3	Clover pellets	CLV_PE	3.62
4	Dried peas	PEAS	3.88
5	Digestate	DGS1	0.62
6	Clover silage	CLV_SI	1.70
7	Biodigestate pellets	DGS_PE	1.82
8	Biochar + compost	BCH_COM	1.04
9	Compost	COM	1.16
10	Mushrooms substrate	MSR	0.74
11	Sillage Inhort	VIN2	3.35
12	Digestate Inhort	DGS2	0.53
13	Control	KNTR	0.00
14	Reference - Ammonium sulfate	REF	21.18

Tab. 1 List of the 12 substances plus one control (nr. 13) and one chemical reference (nr. 14) incubated in controlled conditions. All the substances are reported with the relative nitrogen content.

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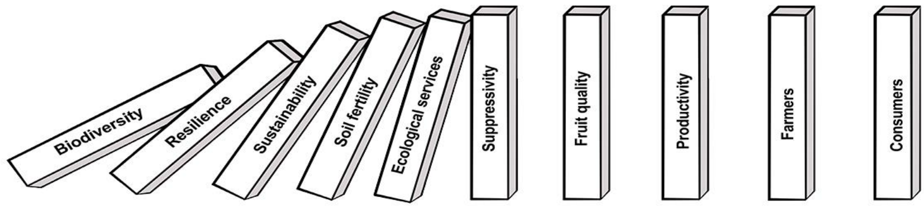
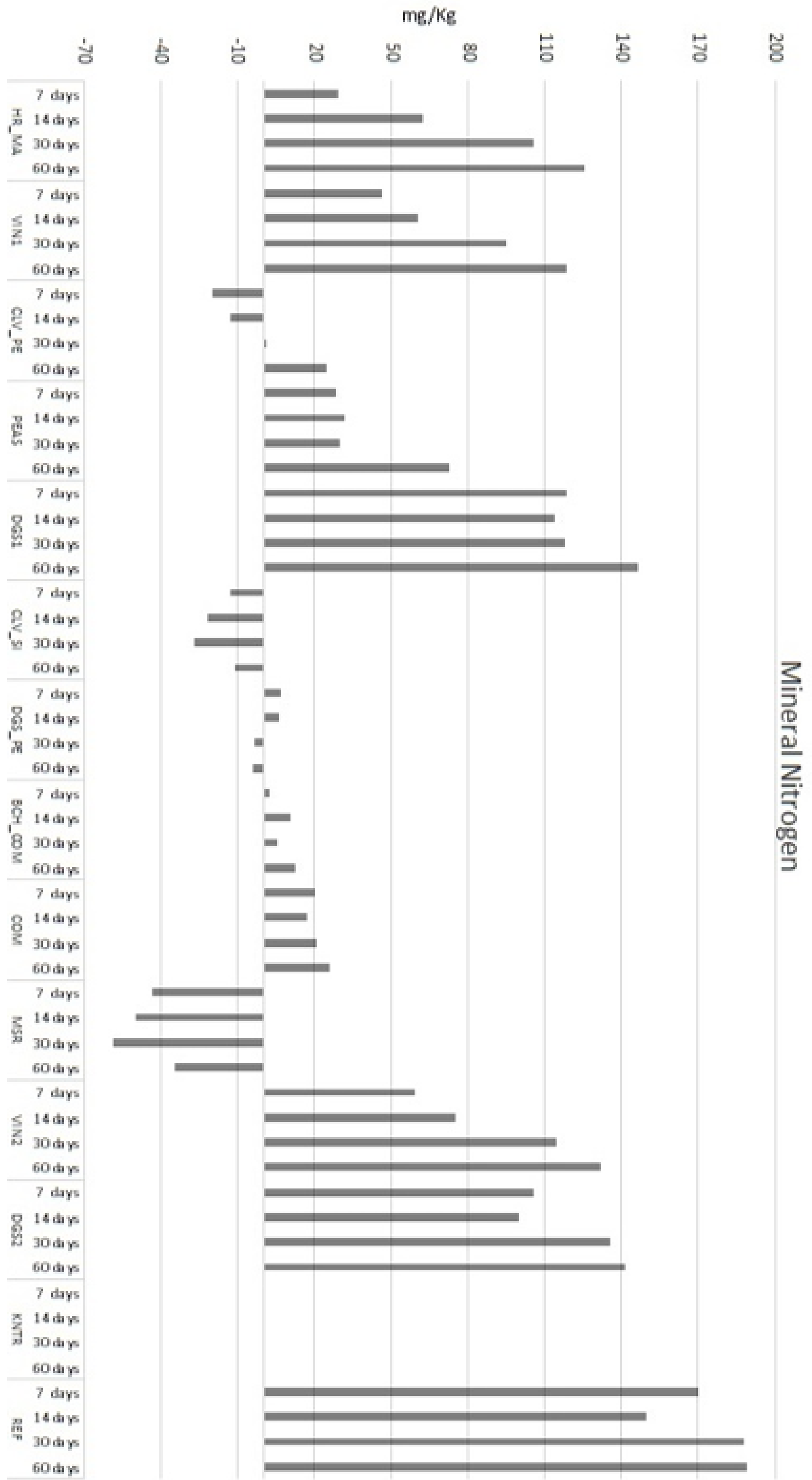
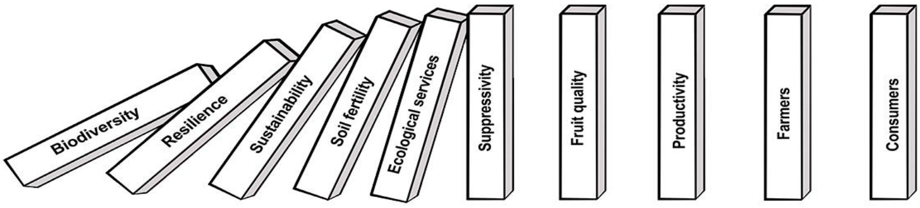
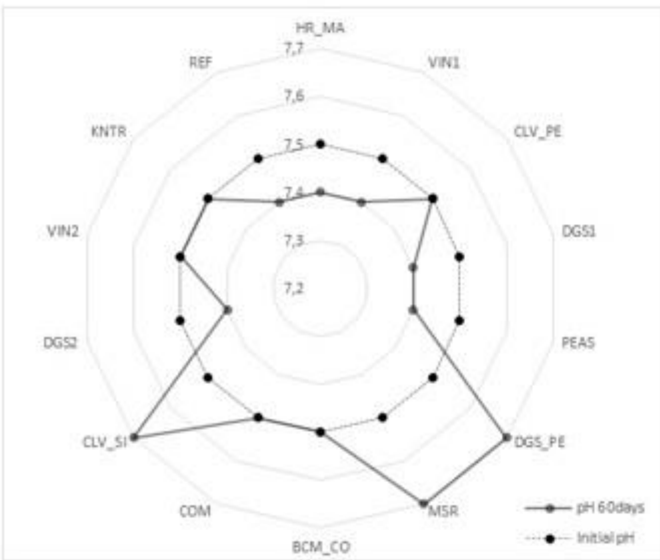




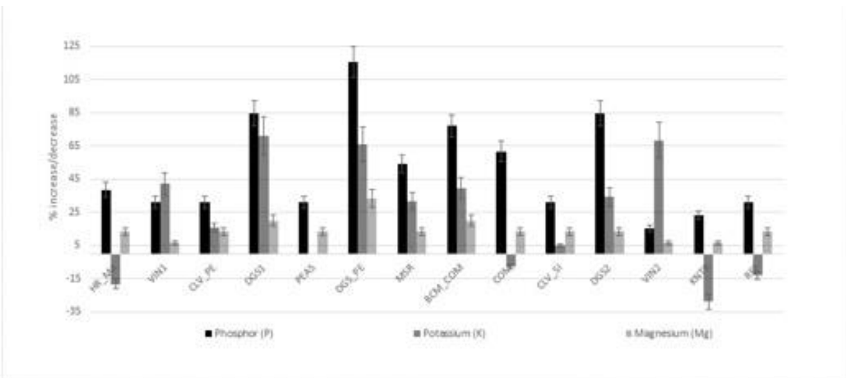
Graph 1. Mineral nitrogen extractions performed after 7, 14, 30 and 60 days of laboratory incubation. The mean values obtained from the control pots were subtracted from all the other samples.



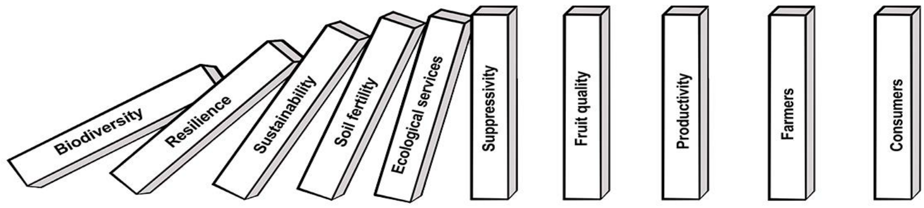
Graph 1 clearly shows how digestates (DGS1, DGS2) are the fastest nitrogen releaser, and how they are releasing the larger quantity of mineral nitrogen.
The two stillages (VIN1 and VIN2) are working well too, but both required more time than the digestates to reach high mineralization levels. From the solid products horn manure (HR_MA) is fast mineralized and bring constantly "new" mineral nitrogen to the soil, acting as slow releaser nitrogen fertilizer. Unfortunately, not all the tested products worked as expected. Using clover pellets (CLV_PE), during the first month, the mineral nitrogen was immobilized and only after 30 days it becomes available, but it stayed always low (<30 mg/Kg). Digestate pellets (DIG_PE) showed minimal influence on the soil mineral nitrogen, that remains extremely stable and close to the control value. For what concern clover silage (CLV_SI) and mushrooms substrate (MSR) the results are extremely negative, as in all the four extractions performed the values were lower than in the control pots. Finally, the compost (COM) brings slowly and only low quantity of mineral nitrogen, that was even lower when compost and biochar (BCH_COM) where mixed together (8:1 v/v).
To better understand what happened to the soil after the two months of incubation the main soil parameters were measured. As shown in graph 2, a few substances (CLV_SI, DIG_PE and MSR) are slightly basifying the soil, while others (DGS1, DGS2, PEAS, VIN1, HR_MA) are acidifying it, but the values remain quite close to the initial one (pH 7.5 ± 0.2). The Humus content increased in all the trials, while it remains quite constant (+5%) in the control. As expected, also the organic carbon pool increased, as all the tested substances contain mainly organic matter. For what concern macro-elements (graph 3), phosphor and magnesium increased in all the trials, particularly with the application of digestate pellets



Graph 2. Soil pH measured after 60 days of incubation.



Graph 3. Percentage of increase/decrease of soil macro-nutrients measured after 60 days of incubation.



(DIG_PE), the two bio-digestates (DGS1, DGS2) and the two composts (COM, BCH_COM). Only potassium, within horn manure (HR_MA), compost (COM) and control (KNTR) pot-trials decreased to lower values if compared to the potassium level at the beginning of the experiment.

From the laboratory incubations performed in 2018, six of the previous substances (Table 2) were selected for the second step, the open-field trial. Except for horn manure, already well known as nitrogen fertilizer, all the other substances did not show a proper mineral nitrogen supply to the soil, thus they are not interesting as nitrogen fertilizer. The goal of the open field trials of 2019 is to verify if the substances posed in open field conditions mineralize as well as in the laboratory incubation, where soil and air temperature and moisture were constant. In the field trials each pot was fertilized with 8g N and for the two digestates, the silages and the clover pellets, the pot fertilization was split in three biweekly distribution, to avoid possible root damages due to the nitrogen excess. The first distribution was performed three weeks after a one-year knip Gala Schniga Schnico Red / M9 was planted. A single application was performed only in the case of the dried peas, and after two weeks the germinated seeds were cut and incorporated to the soil. To understand how much organic nitrogen mineralize, five extractions will be performed II, IV, VIII, XII and XVI weeks after the second fertilizer application (see Table 3). The trial will last two years and as in the previous experiment, the soil will be fully characterized before and after the end of the experiment.

Nr.	Row material	ID code	N content (%)
1	Control	KNRT	0
2	Sillage	VIN1	4.22
3	Sillage Inhort	VIN2	2.96
4	Digestate	DGS1	0.52
5	Digestate Inhort	DGS2	0.50
6	Clover pellets	CLV_PE	3.60
7	Dried peas	PEAS	3.48

Tab. 2 List of the 6 substances plus control (nr. 7) posed in open field conditions. All with the relative nitrogen content.

	May					June				July					August/September		
Weeks	0	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	XIII	...	XVII	XXI
Tree transplanting	■																
Fertilizer applications				■		■		■									
N-min analyses								■		■				■		■	■

Tab. 3 Time table of the fertilizer applications and mineral nitrogen analysis planned from week 0, when the apple trees were transplanted in pots.

Laimburg, 25.05.2019

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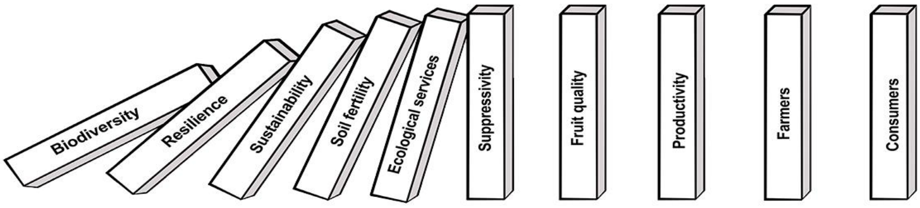

Read more at the CORE Organic website: *http://www.coreorganic.org/*
find publications from the project at: *http://www.domino-coreorganic.eu/*

The DOMINO consortium

Coordinator:

Davide Neri

Department of Agricultural, Food and Environmental Sciences

Università Politecnica delle Marche

Italy

e-mail: d.neri@univpm.it

Partners:

Hristina Kutinkova, Fruit Growing Institute, Bulgaria

Markus Kelderer, Laimburg Research Centre, Italy

Eligio Malusa, Research Institute of Horticulture, Poland

Marie Lisa Brachet, Centre Technique Interprofessionnel Fruits Légumes, France

Michael Friedli, Research Institute of Organic Agriculture – FiBL, Switzerland

Sabine Zikeli, Hohenheim University, Germany

Stakeholders involved:

Werner Castiglione – BioSudtirol, Italy

Christian Gamper - Vi.P Bio Vinschgau, Italy

Reinhard Verdorfer - Bioland Südtirol,Italy

Ulrich Kiem SBR organic, Italy

Vincenzo Vizioli – AIAB Associazione Italiana Agricoltura Biologica. Italy

Christoph Höfflin - Fördergemeinschaft Ökologischer Obstbau e.V., Germany

Stowarzyszenie Polski EkoOwoc - Poland