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TILMAN-ORG Interim Meeting

Jan 21 and 22, 2013

Aston University, Birmingham

TILMAN-ORG
A European Network

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Ecological service providing crops (ESCs) in organic vegetable production systems

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Outcomes of the on-going activities
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Service providing crops

crops introduced in the agro-ecosystems:

- to enhance (ecological, spatial and temporal) diversification
- thus (re)generating and maintaining the biotic interactions
- and – in turn – providing ecological services

(Kremer and Miles, 2012)

Kremen, C., and A. Miles. 2012. Ecosystem services in biologically diversified versus conventional farming systems: benefits, externalities, and trade-offs *Ecology and Society* **17**(4): 40. http://dx.doi.org/10.5751/ES-05035-170440

Synthesis, part of a Special Feature on A Social-Ecological Analysis of Diversified Farming Systems: Benefits, Costs, Obstacles, and Enabling Policy Frameworks

Ecosystem Services in Biologically Diversified versus Conventional Farming Systems: Benefits, Externalities, and Trade-Offs

Claire Kremen[1] *and Albie Miles*[1]

ABSTRACT. We hypothesize that biological diversification across ecological, spatial, and temporal scales maintains and regenerates the ecosystem services that provide critical inputs—such as maintenance of soil quality, nitrogen fixation, pollination, and pest control—to agriculture. Agrobiodiversity is sustained by diversified farming practices and it also supplies multiple

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Ecological services providing crops (ESCs)

Ecosystem services (examples)

- nutrients supply and management (i.e. fertility building crop)
- water holding capacity
- weed control
- disease and pest control (different mechanisms);
- pollination services
- C sequestration
- resilience to (extreme and severe) weather conditions
- ……

ESCs contribute to reduce negative externalities of agriculture (i.e. environmental and/or social costs).

Not *directly* aimed at yield.

(Foley et al., 2011; Kremer and Miles, 2012; Thorup Kristensen et al., 2012;)

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Introduction of ESCs in vegetable cropping systems

1. As ecological infrastructures (not in the rotation)
2. Within the rotation (*complementary crops*)
   i. ESC is grown between subsequent yielding crops (*YCs*) of the rotation (*inter-rotated ESCs*)
      i. place in the rotation
      ii. management (termination)
   ii. ESC is grown intercropped within the yielding crop (*living mulch*)

Complementary (not alternative) strategies, contributing to temporal and spatial in-system diversification

(Masiunas, 1998)

Inter-rotated ESCs: place in the rotation

Continental areas:

- warm season reserved for the yielding crop(s)
- ESCs mainly grown in the cold season
- no (or limited) conflict between YCs and ESCs

Mediterranen areas:

- YCs grown all the year around
- ESCs often in conflict with YCs (direct cost + yield loss)
- ESCs are (preferably) introduced
  - in the (relatively) cold season in semi - Mediterranean areas
  - in summer, in the fully Mediterranean areas (protected organic vegetable production systems)

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Including ESCs in (diversified, vegetable) cropping systems

1. As ecological infrastructures (not in the rotation)
2. Within the rotation
   1. ESC is grown between subsequent yielding crops (*YCs*) of the rotation (*inter-rotated ESCs*)

INTERVEG is focused on **living mulch** in organic agro-ecosystems **for vegetable production**

   2. ESC is grown intercropped within the yielding crop: ***living mulch***)

Complementary (not alternative) strategies, contributing to temporal and spatial in-system diversification

(Masiunas, 1998)

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Differences between living mulch and intercropping (sensu stricto)

- Intercropping
  - two (or more) YCs are cultivated simultaneously at the same area
  - full complementarities in the resource utilisation patterns

- Living mulch
  - a YC is cultivated simultaneously at the same area with a ESC
  - the ESC occupies the ecological niche(s) left available from the YC
  - most of system resources should remain available for the YC, then,
  - system management should aim at
    1. reducing competition between the YC the ESC
    2. optimizing the ecological services provided by the ESC within the field/farm

(Theriault et al., 2009; Bath et al., 2008; Vanek, 2005; Cerruti et al., 2004; Swenson et al., 2004)

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InterVeg research hypothesis and aims

The main ***hypothesis of the research*** is that the introduction and the proper management of living mulch in vegetable production systems (in comparison to the sole cropping systems) would allow:

- comparable yields
- similar or higher produce quality
- lower environmental impact (i.e. reduction of potential risk of N leaching)
- higher profitability (i.e. reduction of costs due to off-farm inputs reduction)

The project is aimed to evaluate the effect (advantages and disadvantages) of introduction of living mulch in terms of:

- yield and produce quality
- weed management
- nutrient management (N, P and K, specifically) and their effect on crop growth
- pest/beneficial insect interactions
- not-renewable energy consumption
- production costs

InterVeg Consortium

Partners from 4 CORE countries

Institutions	People
Consiglio per la ricerca e la sperimentazione in agricoltura (2 Research Centers: RPS and ORA) - IT	Stefano Canali Fabio Tittarelli Gabriele Campanelli Corrado Ciaccia
Associazione Italiana Agricoltura Biologica (AIAB) - IT	Livia Ortolani Cristina Micheloni
Università di Bologna - IT	Giovanni Burgio
University of Kassel - DE	Peter von Fragstein und Niemsdorff
Aarhus University - DK	Hanne L. Kristensen
University of Maribor - SLO	Franci Bavec

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InterVeg Activities

6 WPs

WP	Title	Leader
1	Coordination	Stefano Canali
2	Experimental sites establishment, management and harvest quality evaluation	Hanne L. Kristensen
3	Reduction of off-farm inputs for fertility management	Fabio Tittarelli
4	Functional biodiversity and beneficial insect population management	Giovanni Burgio
5	Weed management and energy saving	Stefano Canali
6	Stakeholders involvement and dissemination	Livia Ortolani

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InterVeg Kick off

CRA-ORA, Monsampolo del Tronto (IT)

14 Sept 2011

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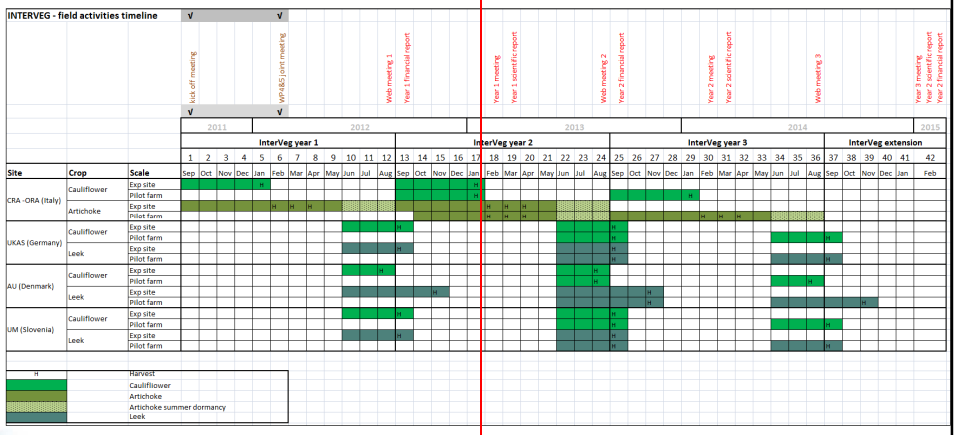
INTERVEG - field activities timeline



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InterVeg, so far

1. Activities officially started on the 5th of September 2011
2. The kick off meeting held Sept. 2011 in Monsamplo (IT)
3. Year 1 IT experimental sites activities (cauliflower and artichoke) concluded
4. Year 1 DE, DK and SLO experimental sites activities (cauliflower and leek) almost done
5. Dissemination activities (press release etc.) in all 4 countries
6. WP4 – WP5 joint workshop held Feb. 2012 in Maribor (SLO)
7. Joint meeting Feb. 2013 planned in Witzenhausen (GE)

(von Fragstein, 2011)

(Kristensen, 2009)

(Canali, 2009)

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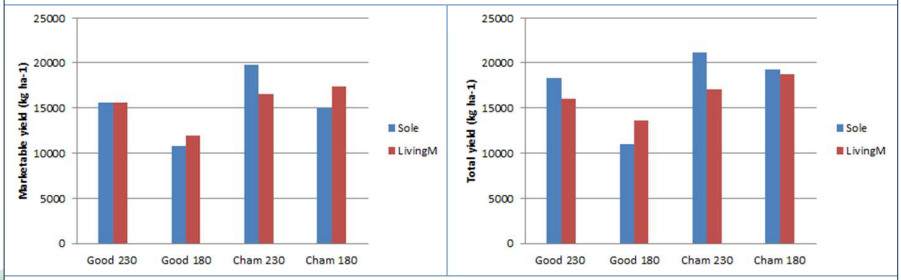
Hanne Lakkenborg Kristensen
FOOD AU-Aarslev

13. November 2012

Cauliflower 2012 - cultivars and fertiliser

preliminary



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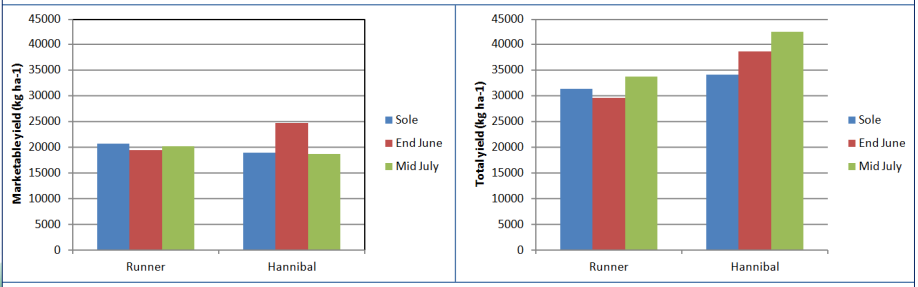
13. November 2012

Leek 2012 - cultivars and mulch sowing date

preliminary



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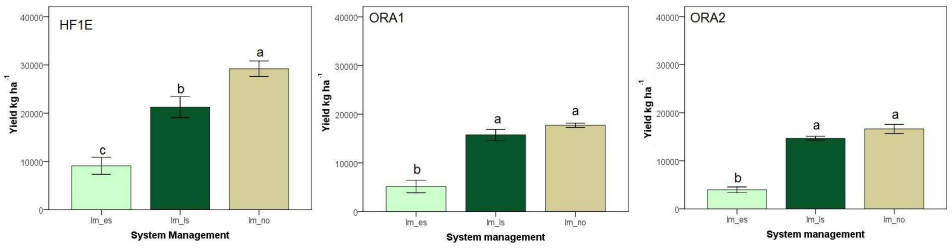
IT Cauliflower _ year 1_ total yield



IT exp and pilot farm, Canali, 2012


Cower crop – mix
Cower crop – solo
Leeks on the foil
SLO, Bavec and Robacer, 2012


Microlysimeters in cauliflower (cower crop late sowign
SLO, Bavec and Robacer, 2012