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A sustainable N management in processing tomato by fertigation

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Fertigation

- **N rate splitting according to the crop requirement at any growth phase**
- **localised placement of fertiliser close to the roots**

↓

high water- and N-use efficiency

In Italy

- about 70% open field vegetables
- most processing tomato

What we have done in Perugia

Methods

- **growth analysis**

  - aerial biomass and total-N accumulation by lab analysis

- **crop nutritional status evaluation by QUICK TESTS**

  chlorophyll meter readings (SPAD) →

← petiole sap test

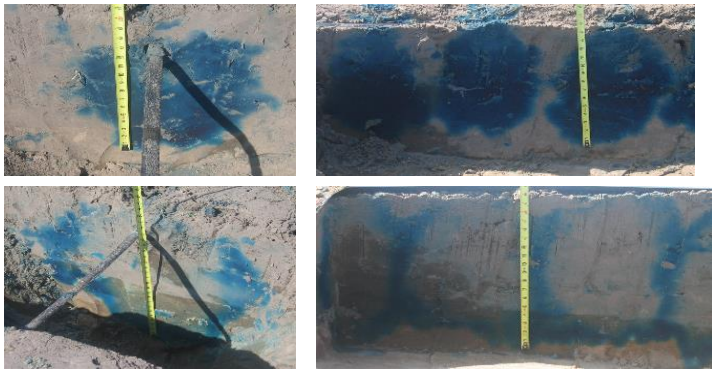
- **Assessment of N leaching risks**

  suction cup lysimeters

1) effect of fertigation-irrigation frequency

- **sandy soils** (Farneselli et al., 2008)

  daily time interval influence soil water distribution



2 hours

8 hours

- **clay-loam soils** (Farneselli et al., 2015)

  high fertigation and/or irrigation frequency (3 times/week) increase N uptake efficiency in processing tomato fed with very high N and water supply

2) Effects of N sources and management strategies (Farneselli et al., paper under construction)

The EXPERIMENT

Cover crops	pure barley	**B100**
	pure hairy vetch	**V100**
	mixture barley-hairy vetch	**B75V25**
		B50V50
		B25V75
Broadcast organic fertiliser	Poultry manure	**O_pN100**
	Leather by-product	**O_lN100**
Fertigation	Organic fertiliser	$F_{org}N200$
		$F_{org}N100$
	Mineral fertiliser	$F_{min}N200$
		$F_{min}N100$
Controls	bare soil- unfertilised	**BS-N0**
	removed barley-unfertilised	**RB-N0**

SOME RESULTS

- the use of pure vetch as cover crop, while assured an optimal N status to the succeeding crop increased the risks for nitrate leaching in the first phase of growing season
- low barley portion in the mixture proved to be effective strategy for N management: able to assure quite adequate amount of N while reducing the N-NO_3 concentration in soil solution available for leaching in case of heavy rains
- source of broadcast organic fertilizer did not affected the agronomic performance of processing tomato: both insufficient N availability
- fertigation increased the N efficiency in case of organic fertilizer at the optimal N dose or of mineral fertilizer at the sub-optimal N rate
- the marketable fruit yield showed similar trend of above-ground biomass accumulation

3) effects of fertigation and cover crops as complementary tools for N fertilization (Farneselli et al., paper under construction)

The EXPERIMENT

Cover crops	pure barley	**B100**
	pure hairy vetch	**V100**
	mixture barley-hairy vetch	**B75V25**
Cover crops+fertigation	pure barley + fertigation	**B100+fert**
	mixture barley-hairy vetch + fertigation	**B75V25+fert**
	removed barley + fertigation	**RB+fert**
Controls	bare soil + fertigation	**BS+fert**
	bare soil- unfertilised	**BS-N0**
	removed barley-unfertilised	**RB-N0**

SOME RESULTS

- the aerial biomass accumulation and N uptake was the highest in treatments where fertigation was applied, with or without cover crops
- the tomato biomass accumulation in V100 was quite similar to that measured in all fertigated treatments while B100 and B75V25 recorded similar values of two unfertilised controls
- the marketable fruit yield showed similar trend of above-ground biomass accumulation
- the $N\text{-}NO_3$ concentration in suction lysimeters during tomato growth cycle that succeeded pure and mixed cover crops was very low and similar to the values measured in the unfertilised controls
- the incorporation of cover crops reduced the environmental impact related to the mobility of N along the soil profile during the tomato crop cycle

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