Innovative Agronomic Solution to Rescue Marginal Soil and to Produce Sustainable Biodiesel

Project Code: SUSBIOFUEL

Agri 2000 soc. coop.

University of Milano

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Efficient and safe production processes in sustainable agriculture and forestry

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SUSBIOFUEL → SUStainable BIOFUEL

to find innovative solutions to produce sustainable biodiesel

Phases of the project

- **FIELD PHASE**
- **OIL EXTRAXTION**
- **INDUSTRIAL PHASE**
- **BY-PRODUCT CHARACTERIZATION**
- **IMPACT ASSESSMENT**

Marginal Soils

- Wide concept
- Several causing factors (ex. Erosion, soil-born pests)
- Economic and production-oriented definition
- Which soil is marginal for which crop
- Relevance of Good quality management

Marginal Soils

A specific soil that could be marginal for a certain crop, does not necessarily need to be so for all crops

Need for more research on the performance of different crops under low levels of management on various types of non-ideal and marginal soils

Nematode in Soils

- Thread-like worms
- One of the oldest existing life forms dating back millions of years
- Plant Parasitic Nematode attack the root systems, but some attack the stems and the buds as well
- **Most growers lose 10 % or more in crop production annually due to these Parasitic Nematodes**

Nematode Treatments

Chemical treatments

- Wide spectrum compounds
- Toxic to non-target organisms and to the environment
- **Progressive restrictions of use**

Alternative strategies

- Biofumigation
- Solarization
- Resistant varieties
- Grafting
- ...

Rescue Soil Fertility of Nematode Infected Soils

- Nematode Control

Satisfy Economic Requirements

- Reliable
- Practicable
- Economical

Our proposal in a nutshell

Which Soils?

- Nematode Infected

Which Crops?

- Brassicaceae
- Tobacco

What type of Management?

- Low Input
- Crop Rotation
- Green manure of Brassicaceae
- Tobacco oilseed production

The Brassicacea Family

- Natural defence mechanism
- **Green manure: to increase soil organic matter, to disinfest the soil of soil-born pests**
- Hardy crops, low input requirements: species for autumn sowing (B. *carinata*) or spring sowing (B. *jucea*)
- Well known agronomic practice

Tobacco

- Traditionally grown for leaf production
- **Now available selections for high yield of oilseed. (Fogher at al. 2008) (www.sunchem.it)**
- Hardy crops: low input requirements

- Well known agronomic practice

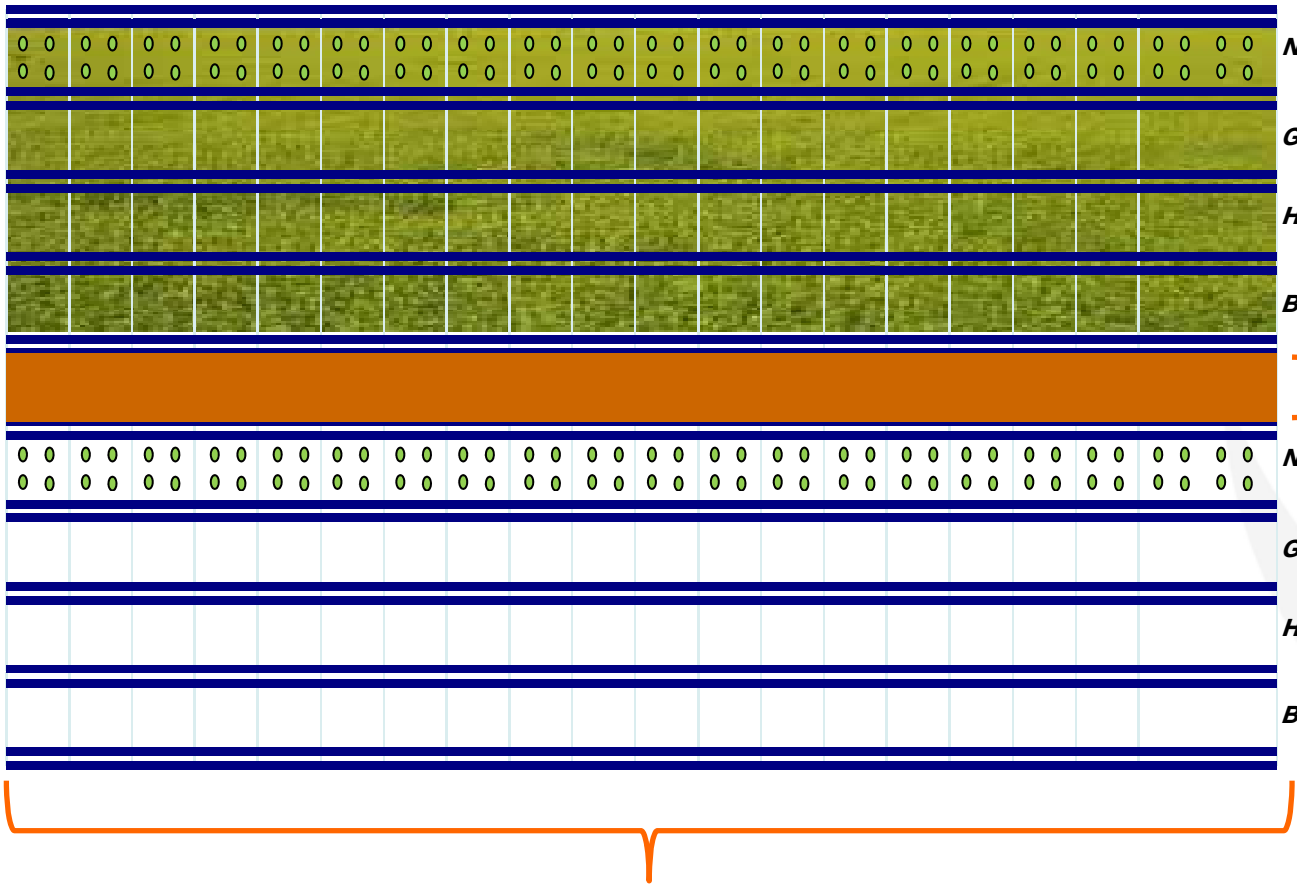
Trial Locations

Experimental design (2010)

B. juncea

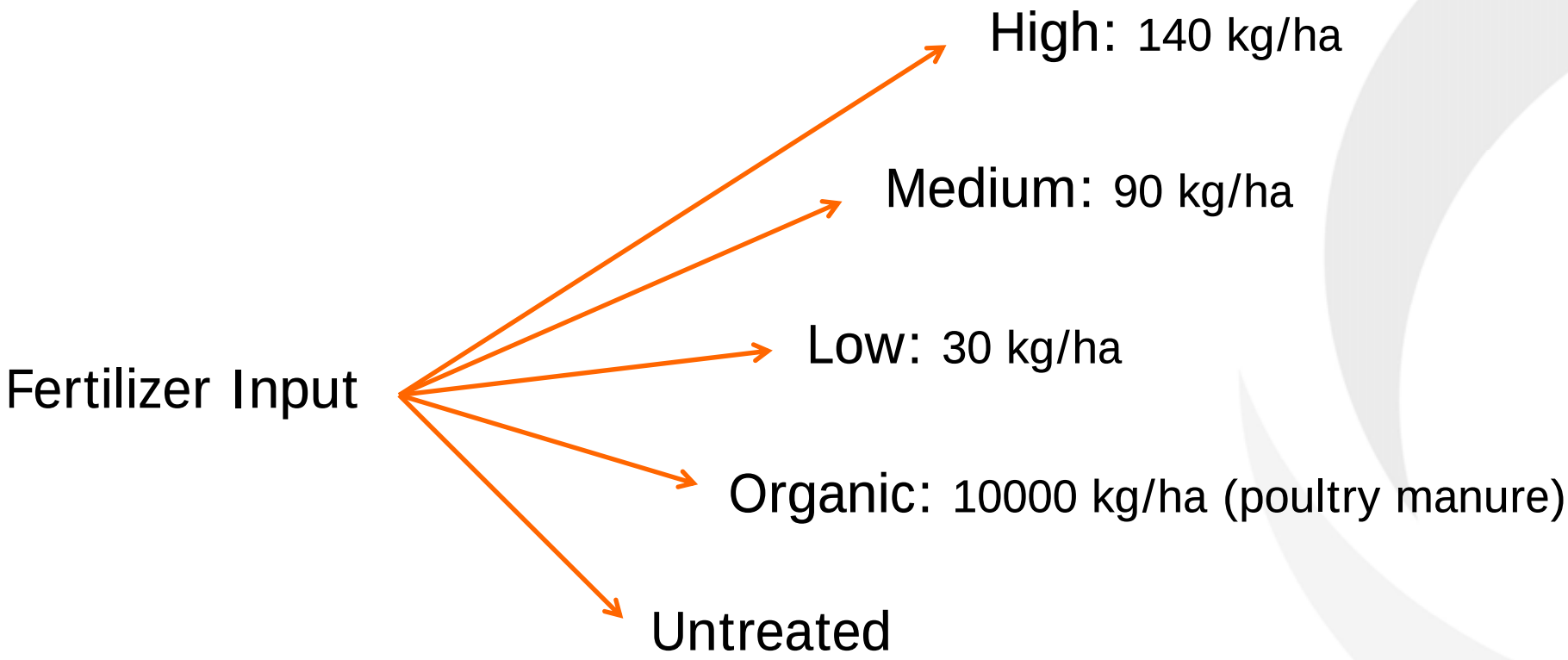
+

Green manure



RANDOMIZED COMPLETE BLOCK (4 repeats):
5 fertilizer treatments

Experimental design (2010)

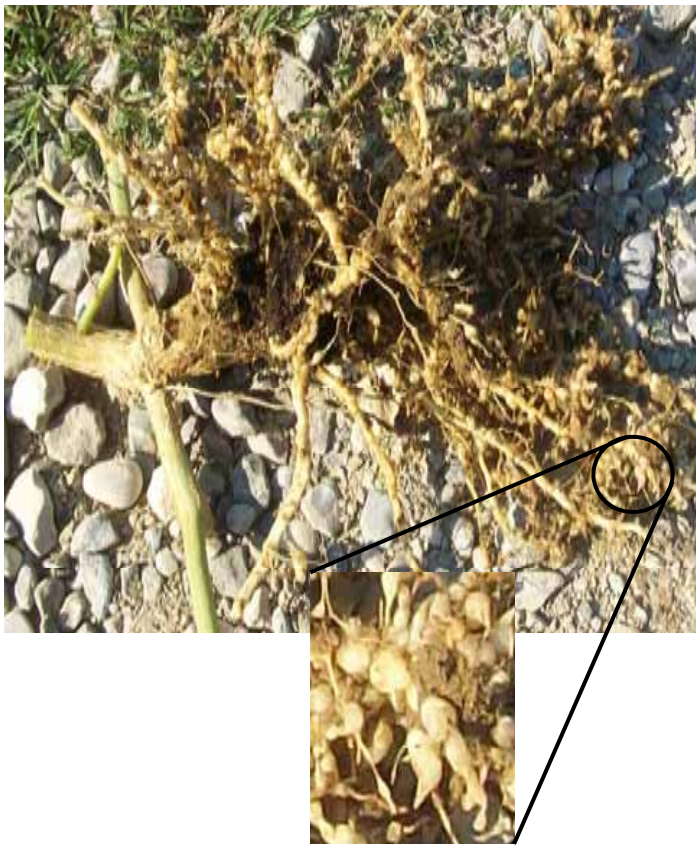


Fertilizer: 46% urea

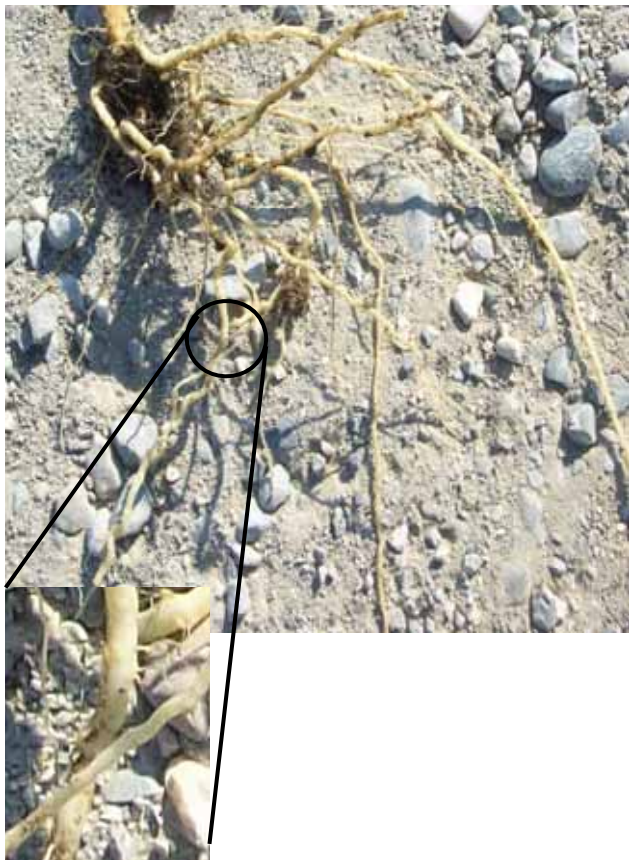
Preliminary results: visual evaluations (1)

Preliminary results: visual evaluations (2)

WITHOUT green manure

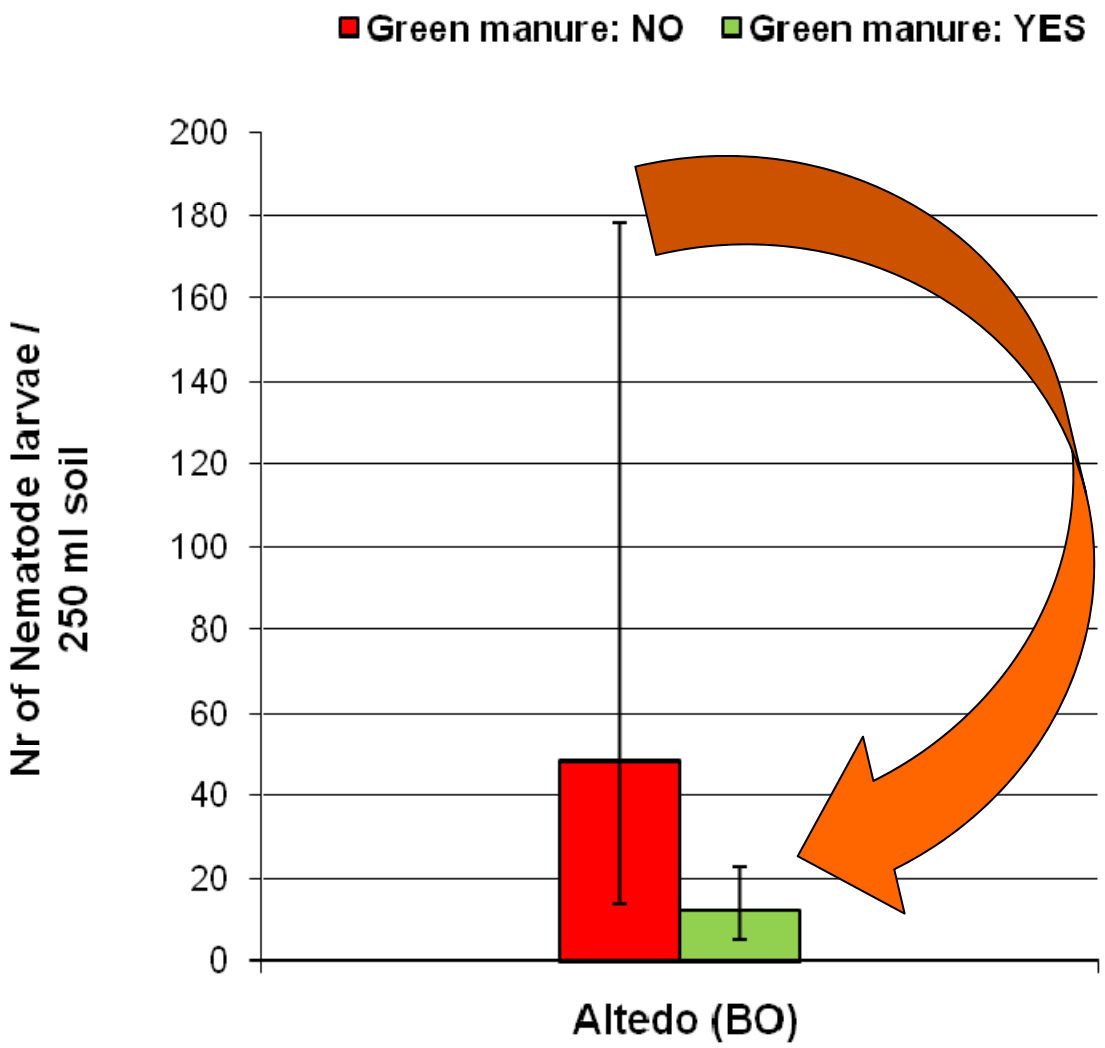


WITH green manure



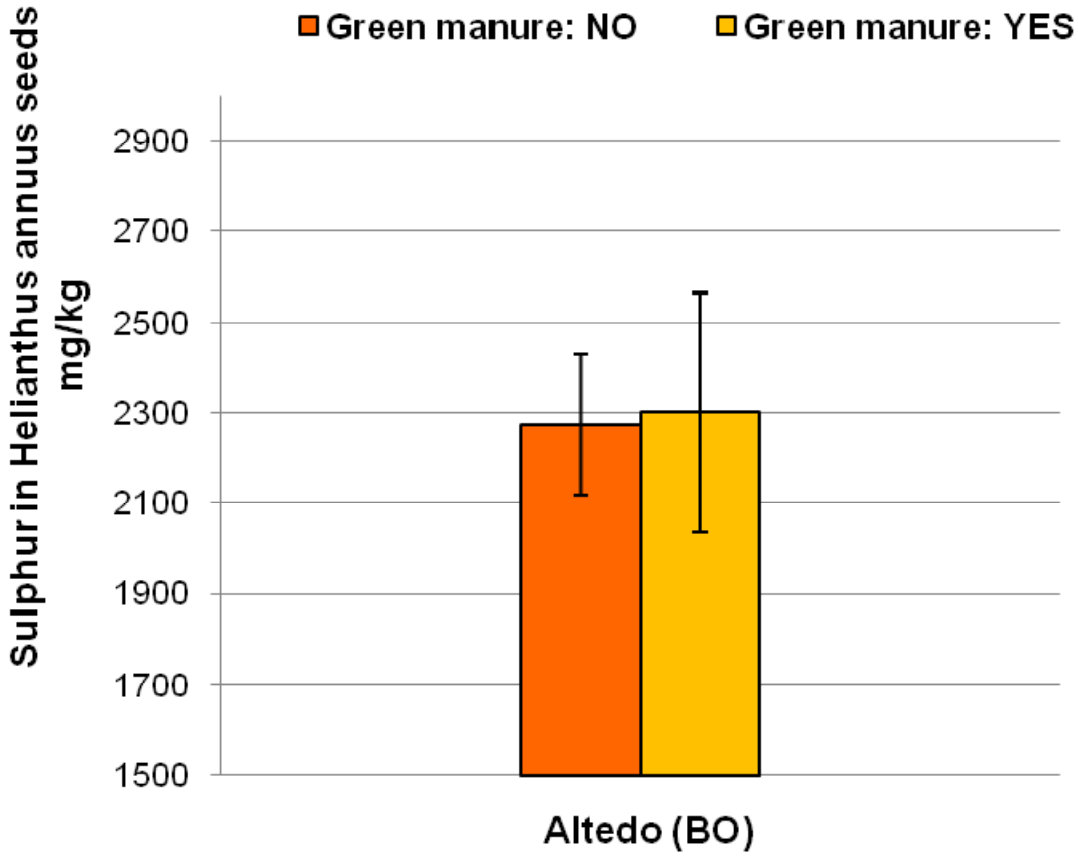
Green manure makes roots quite free from knot galls

Preliminary results: nematological analysis



Number of larvae found in the soil drastically decreased !!!

Preliminary results: sulphur analysis



No statistical difference between seeds produced after green manuring or not

Conclusions and Future perspective

- *B.juncea* green manure resulted in drastically decreased nematode infestation and improved soil quality, reflected in higher biomass of crops in agronomic succession.
- The agronomic solution contributes significantly to a wider portfolio of land-use strategy.
- In the first year of study we had experience of the agronomic parameters useful to improve the setting up of the agronomic proposal.
- In the first year of experimentation *B. juncea* was preferred to *B. carinata* because of its suitability to spring planting (starting period of the SUSBIOFUEL project).
- Winter sowing of *B. carinata* will be carried out in the next years and an alternative promising patented variety of tobacco (selected for seed production) is currently being tested.

Conclusions and Future perspective

- More results will be obtained over the next years: seed yields and an evaluation of the weed control potential of *B. juncea* following green manuring or not.
- Assessments of seed yields is necessary to provide data in terms of functional unit as required by a life cycle thinking approach.
- In this context we aim to develop an agronomic indicator for land usage which could give a more comprehensive sustainability evaluation of biodiesel production following the innovations introduced by the SUSBIOFUEL project.

***Partner* for innovative projects to develop the agro-food chain**

www.agri2000.it