Attività enzimatiche del suolo

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Enzimi idrolitici

ENZIMA	SUBSTRATO	
β-glucosidasi	Cellulosa	Ciclo del C
α-glucosidasi	Amido	
cellulasi	Cellulosa	
Xilanasi	Emi-cellulosa	
β-xylosidasi	Emi-cellulosa	
Leucine amino peptidasi	Peptidi	Ciclo dell'N
N-acetyl –β-glucosaminidasi	Chitina	
proteasi	Proteine	
Fosfatasi acida	Esteri fosfato	Ciclo del P
Arylsulfatasi	Esteri solfato	Ciclo del S

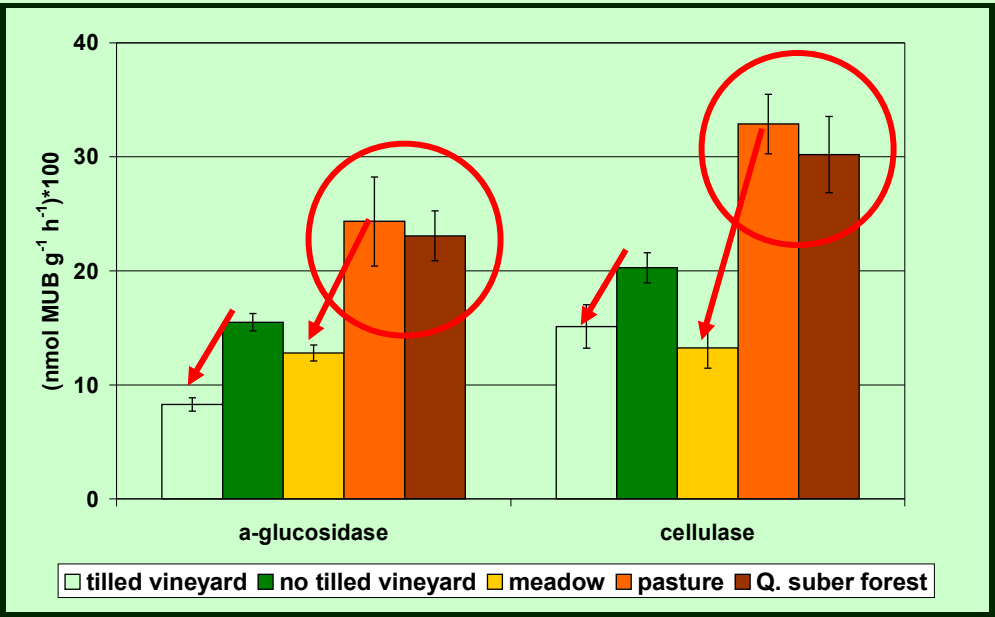
CAMPIONAMENTI BERCHIDDA:

Febbraio 2007 (21 campioni)
Maggio 2007 (21 campioni)

- Vigneto lavorato (0-20 e 20-40)
- Vigneto inerbito (0-20 e 20-40)
- Erbaio (0-20)
- Pascolo (0-20)
- Sughereta (0-20)

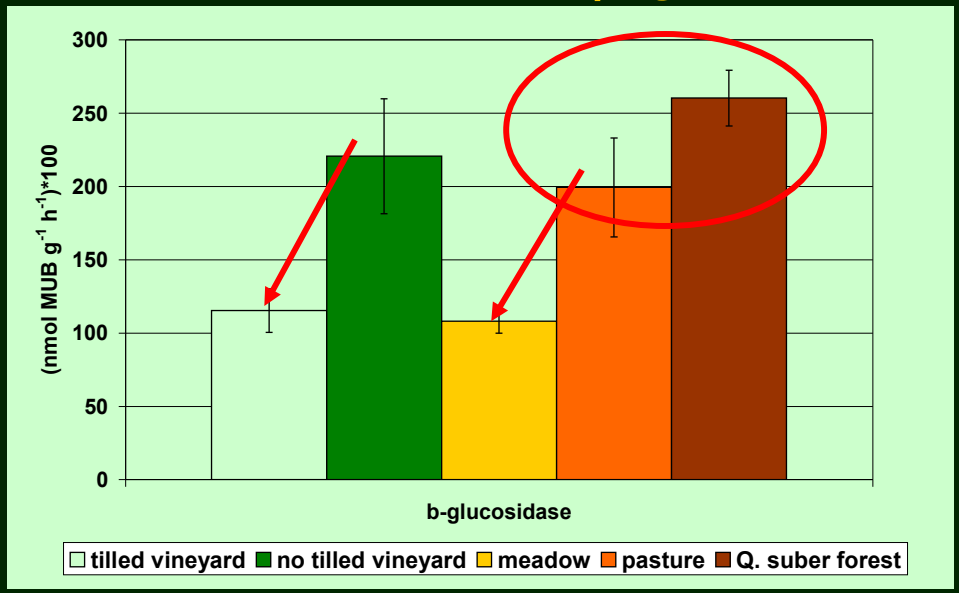
Novembre 2007 (24 campioni)

- Vigneto lavorato (0-20 e 20-40)
- Vigneto inerbito (0-20 e 20-40)
- Erbaio (0-20)
- Pascolo (0-20)
- Sughereta (0-20)
- Vigneto abbandonato (0-20)

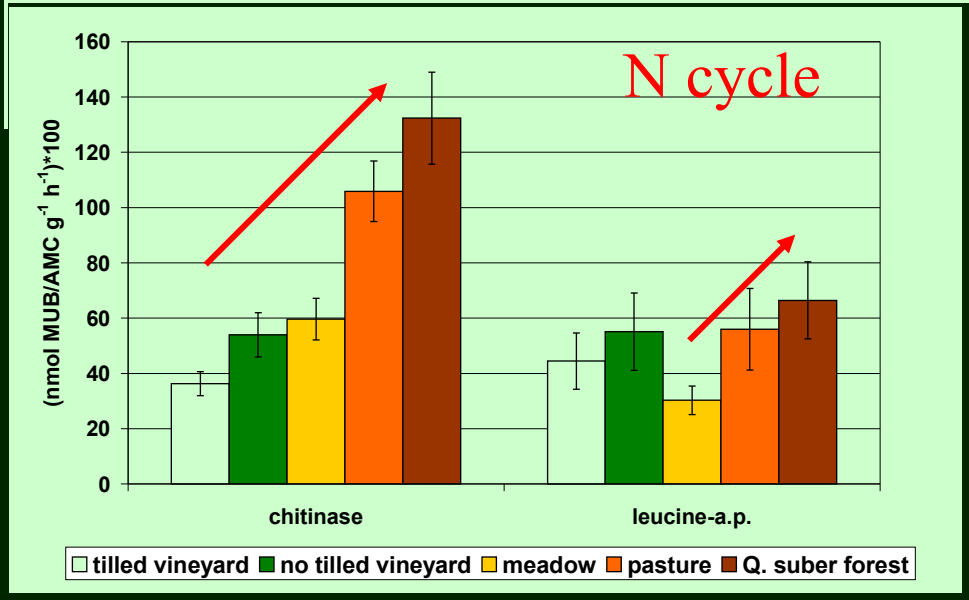


α-glucosidase
Cellulase

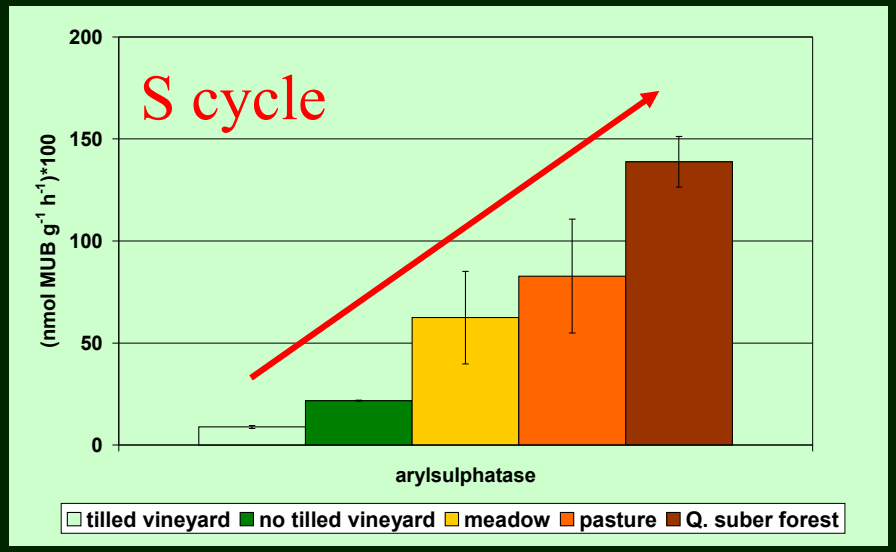
β-glucosidase

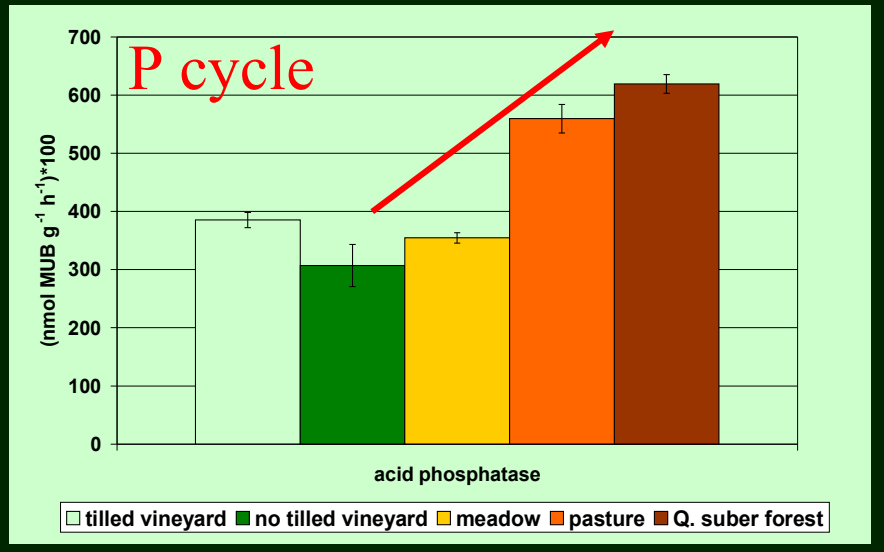


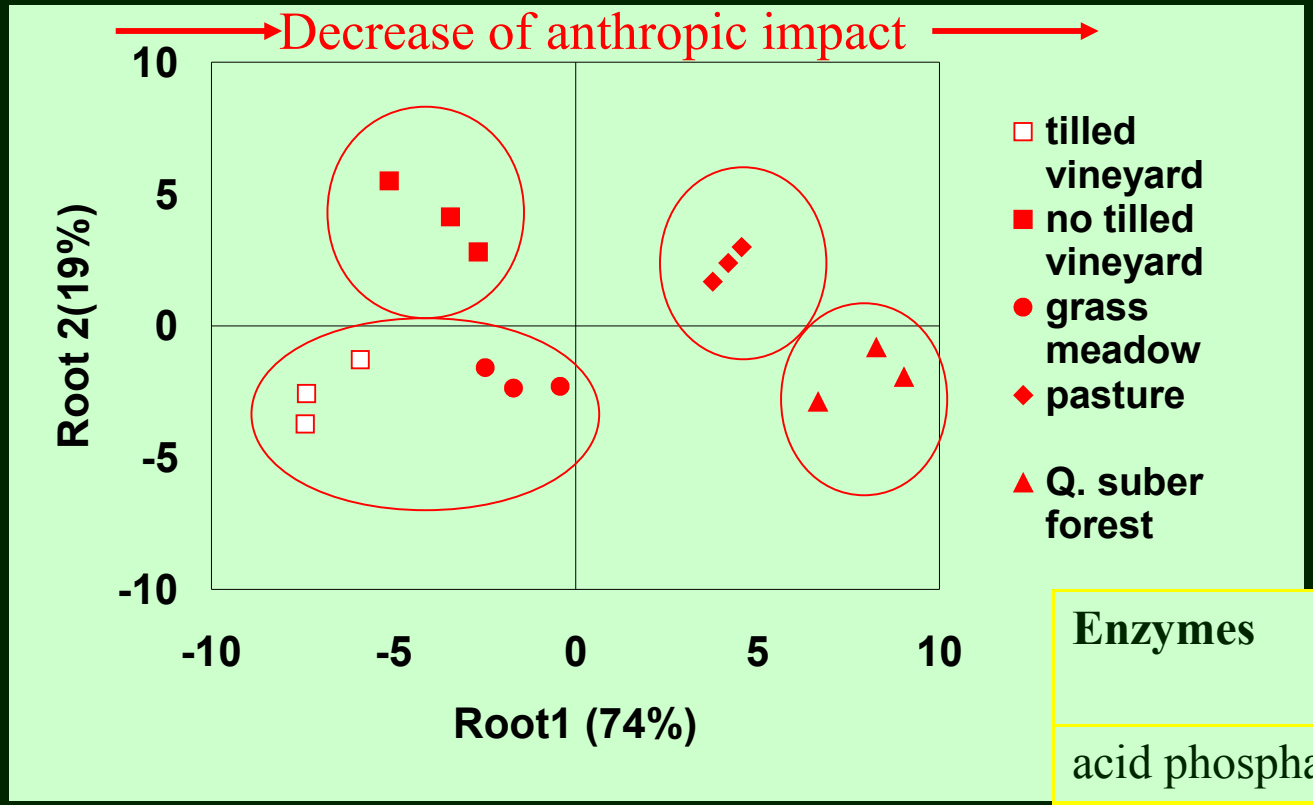
- Enzymes involved in cellulose degradation were strongly affected by tillage practices
- Highest activity rates under pasture and forest



Enzymes involved in N, P, and S cycling showed a similar pattern, with an increase of activity rates along the vegetational gradient



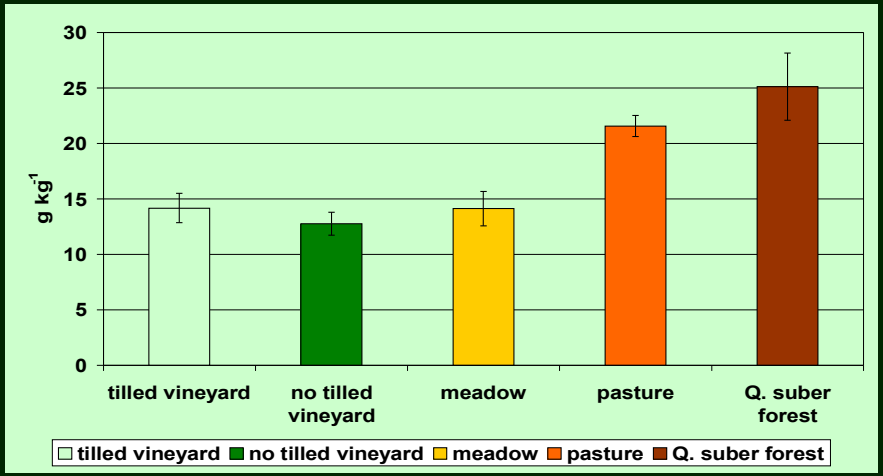




FUNCTIONAL DIVERSITY:
enzyme activities discriminated soils under different land use

Enzymes	Root 1	Root 2
acid phosphatase	***	n.s.
β-glucosidase	*	n.s.
α-glucosidase	***	n.s.
Cellulase	***	n.s.
NAG	***	n.s.
arylsulphatase	***	n.s.
LAP	n.s.	n.s.

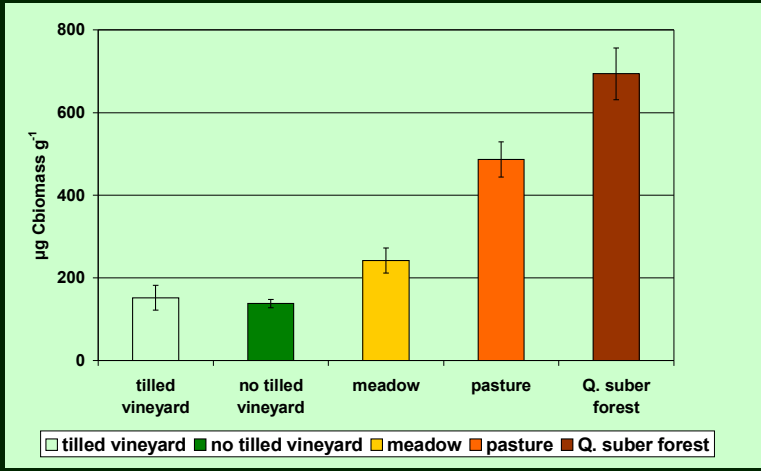
Along the vegetational series...



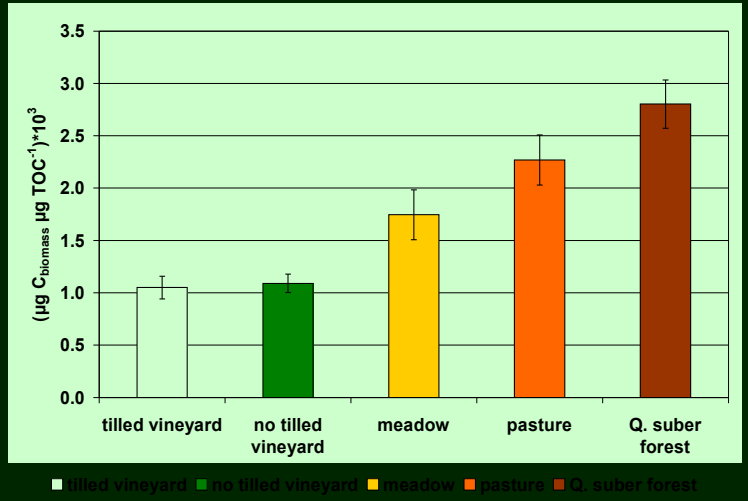
Total organic C

Similar trend for microbial biomass and organic C

Microbial biomass C

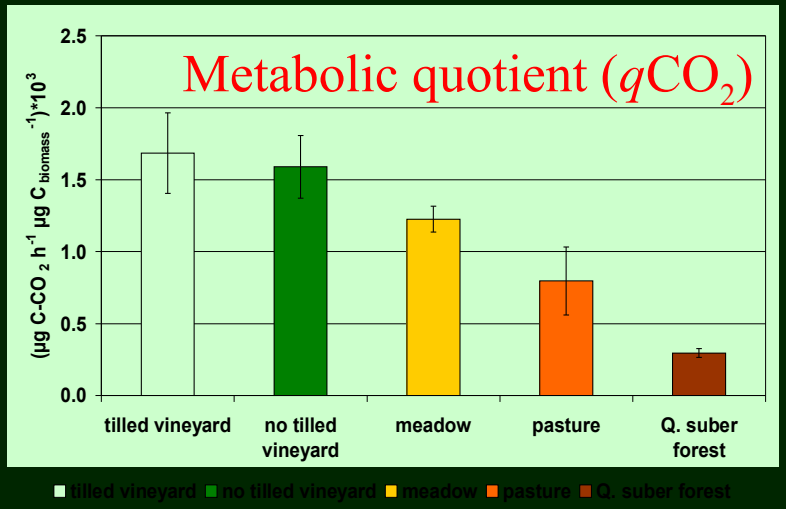


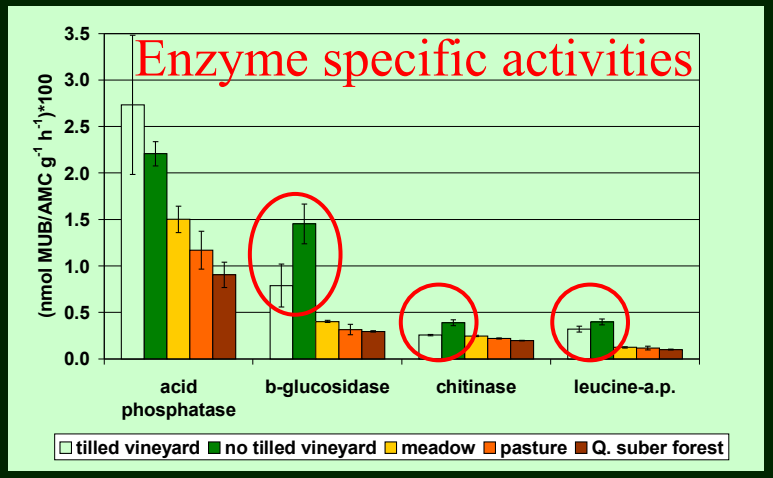
Microbial quotient



larger substrate availability to the soil microorganisms

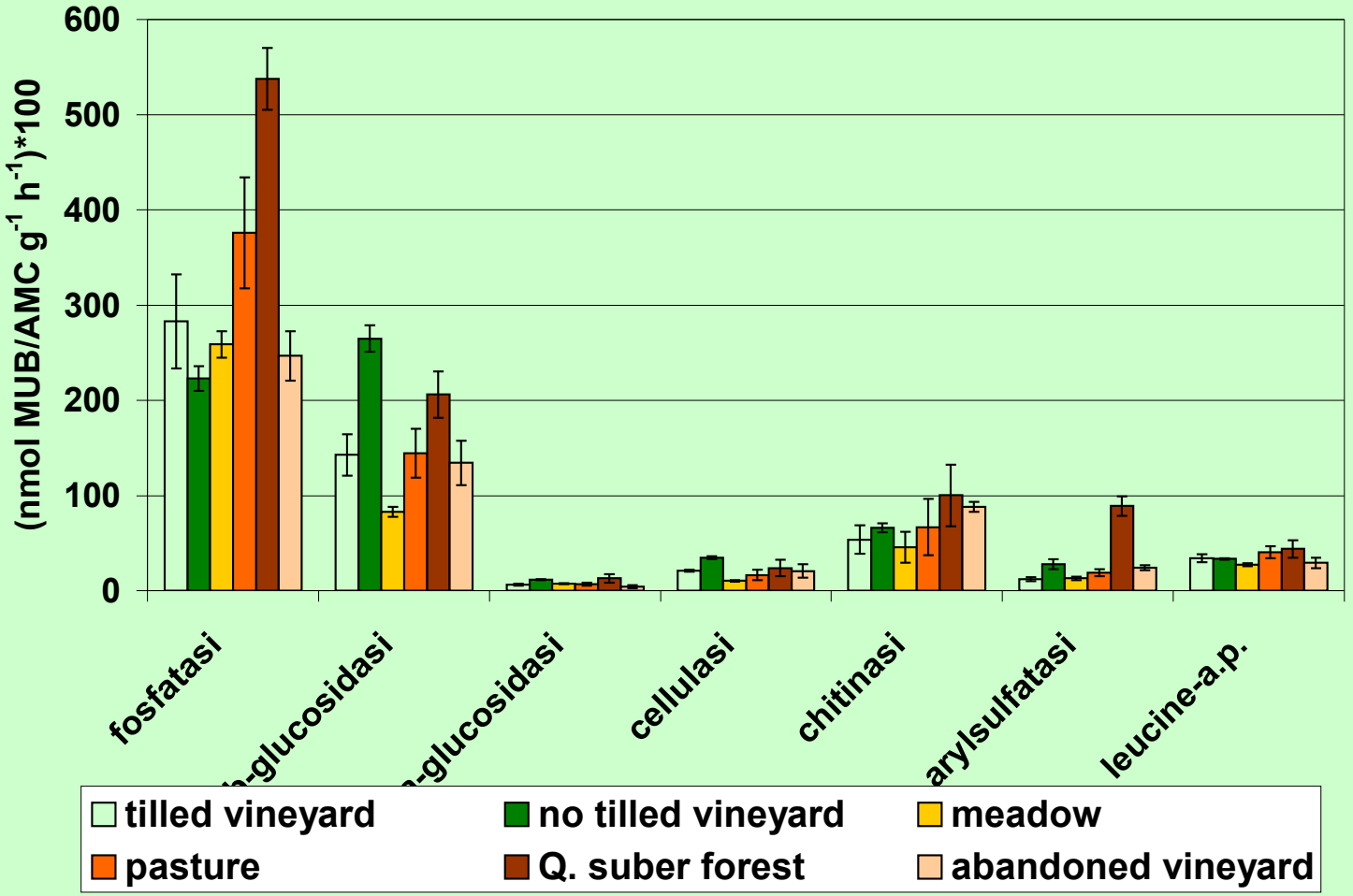
Along the vegetational series...





increase of microbial efficiency in the use of available resources

Berchidda – novembre 2007



CAMPIONAMENTI AGUGLIANO:

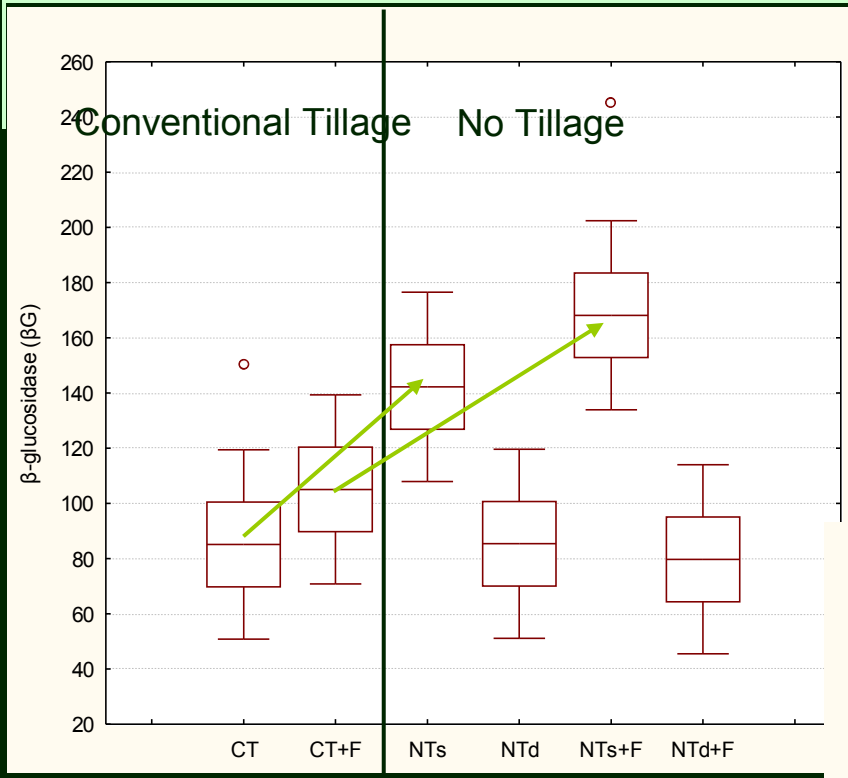
OTTOBRE 2006 (60 campioni)

- MAIS E FRUMENTO 5 repliche
- lavorato (0-40) – non lavorato (0-20 e 20-40)
- Fertilizzato (90 kg ha^{-1}) – non fertilizzato

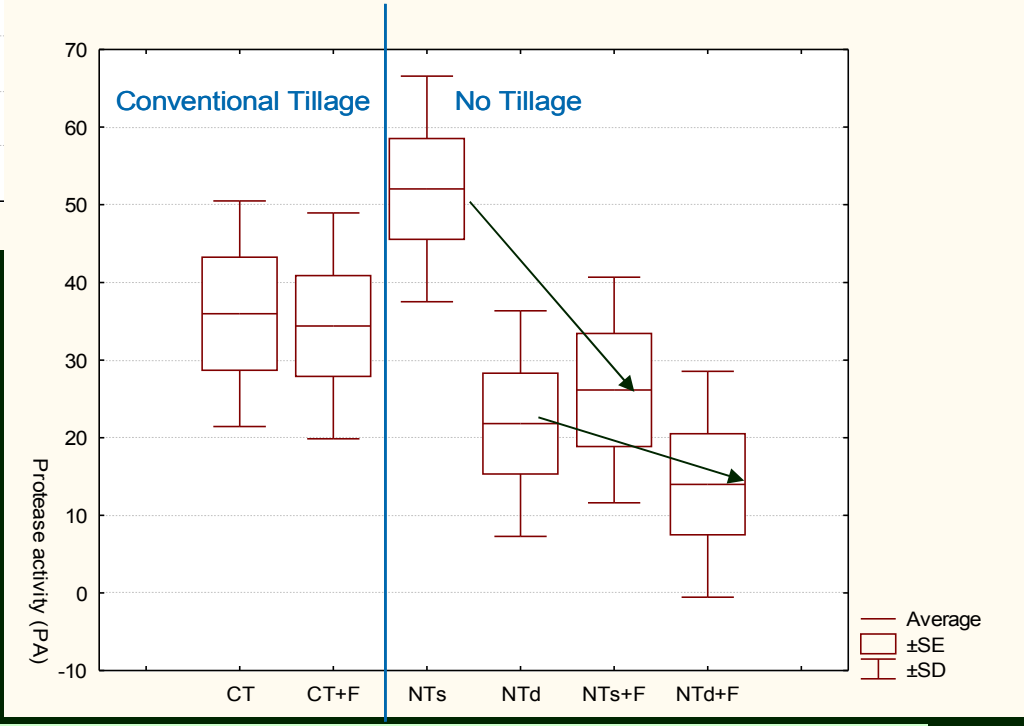
GIUGNO 2007 (24 campioni)

- MAIS E FRUMENTO 3 repliche lavorato (0-20) – non lavorato (0-20)
- Fertilizzato (90 kg ha-1) – non fertilizzato

Agugliano – ottobre 2006



Ciclo del C



Proteasi

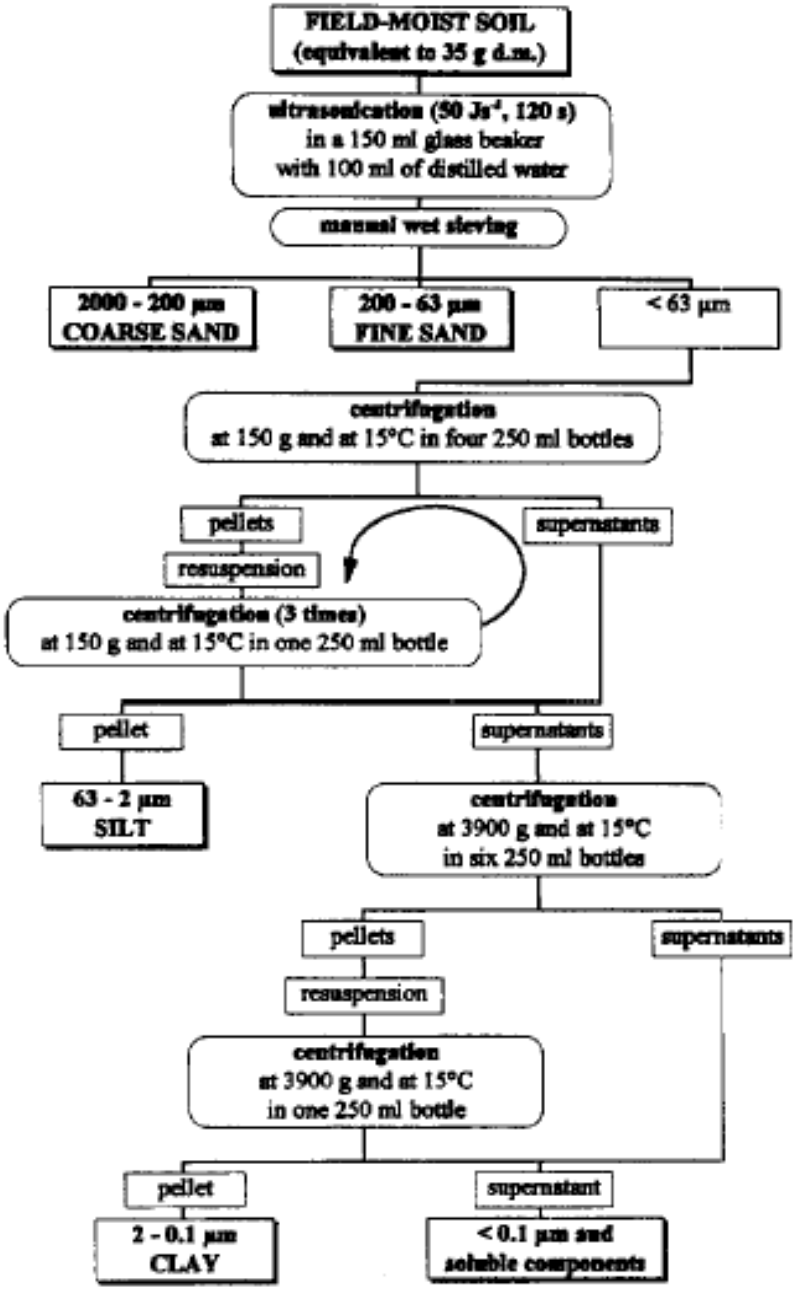


Fig. 1. Flow-chart for the particle-size fractionation method.

Bulk soil

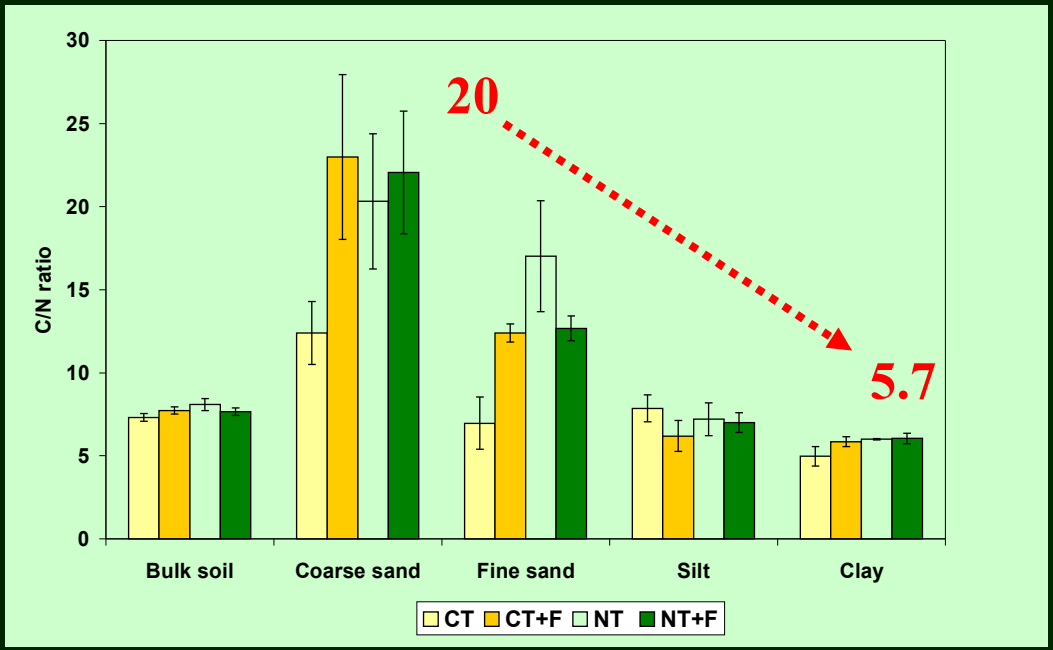
POM

1. Coarse sand *(250-2000 µm)*
2. Fine sand *(63-250 µm)*
3. Silt *(2-63 µm)*
4. Clay *(0.1-2 µm)*
5. ~~Fine clay (<0.1 µm)~~

✓ Total organic C, total N

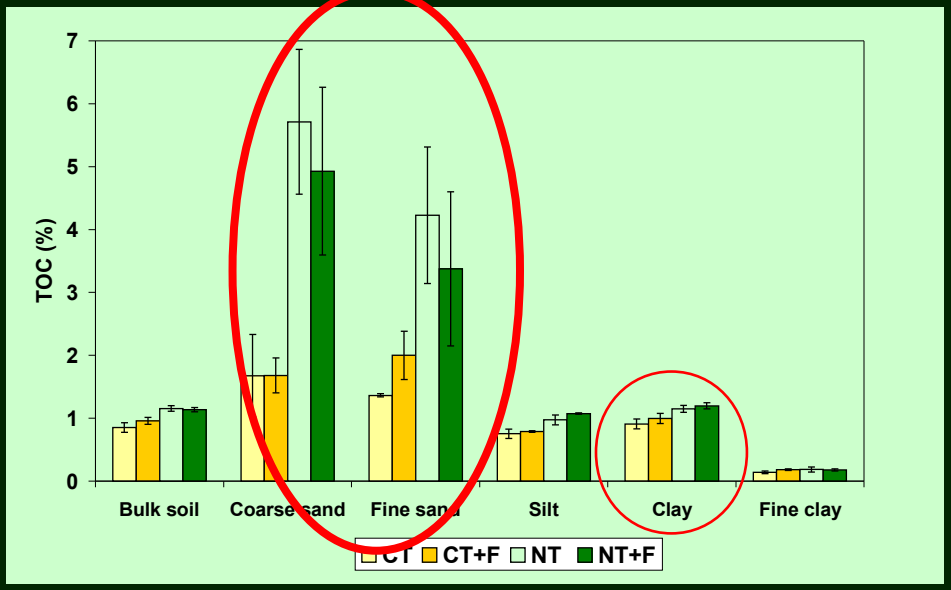
✓ Microbial biomass C

✓ enzyme activities (C, N, P, S)

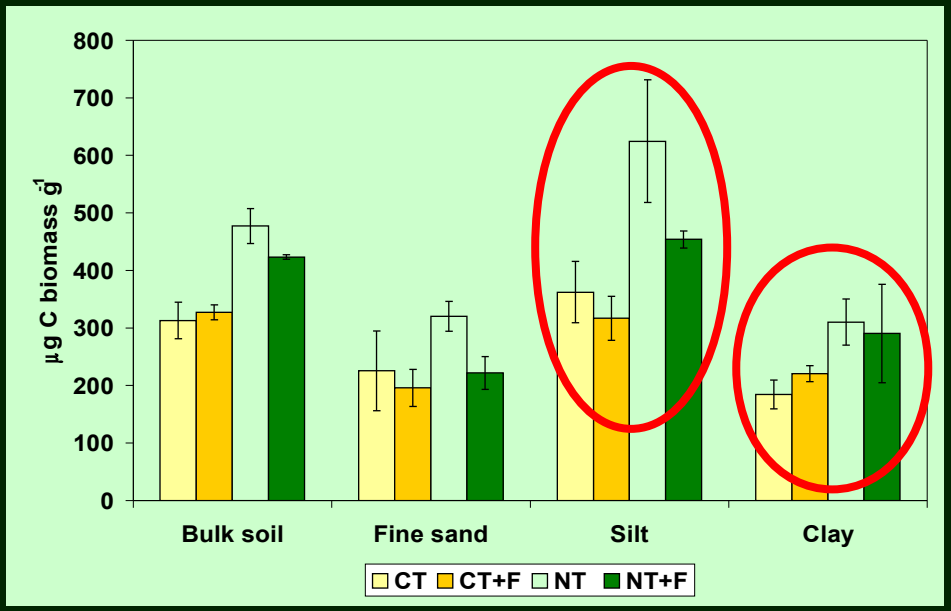


The decline of the C/N ratio towards the smaller fractions reflected the disappearance of plant debris and its replacement by microbial material with a low C/N ratio

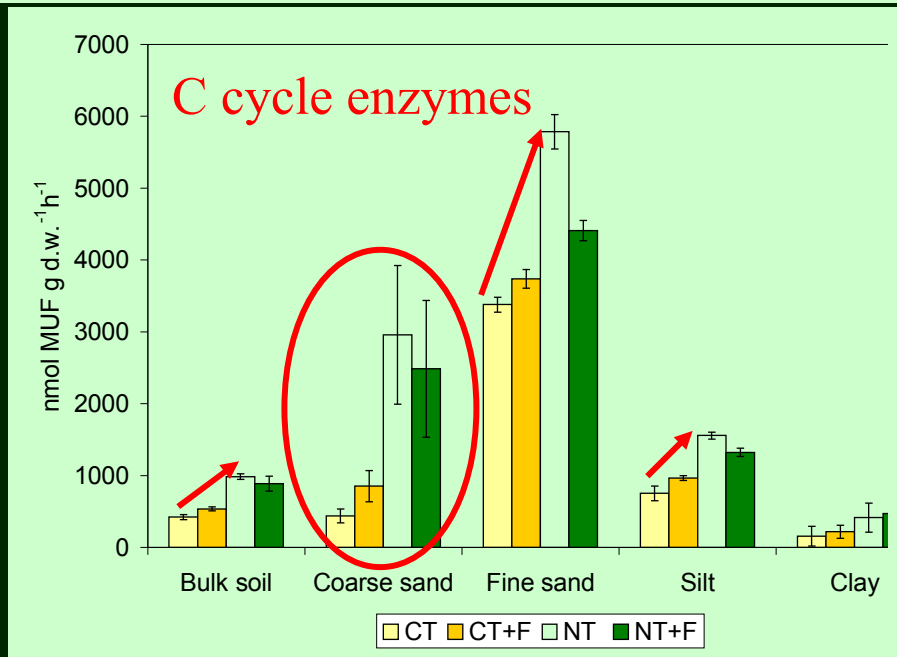
Increase of turnover time of organic matter towards smaller fractions

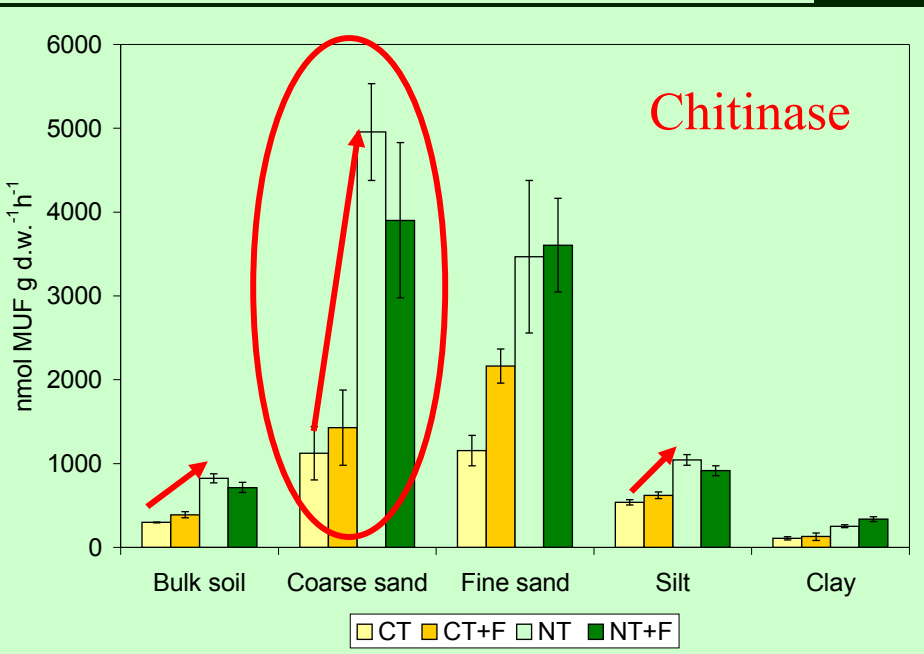


High input of crop residues into surface of no-tilled soils. Larger C sequestration capacity of NT in labile pools (+217%), smaller but significant even in pools with slow turnover times (+23%)



Physico-chemical protection in the clay fraction and in microaggregates sustained a larger microbial community under NT

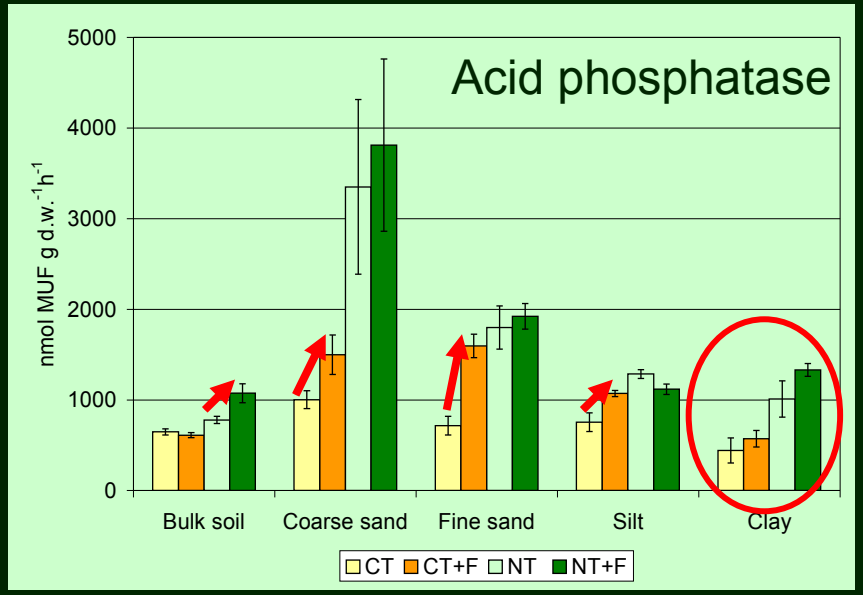


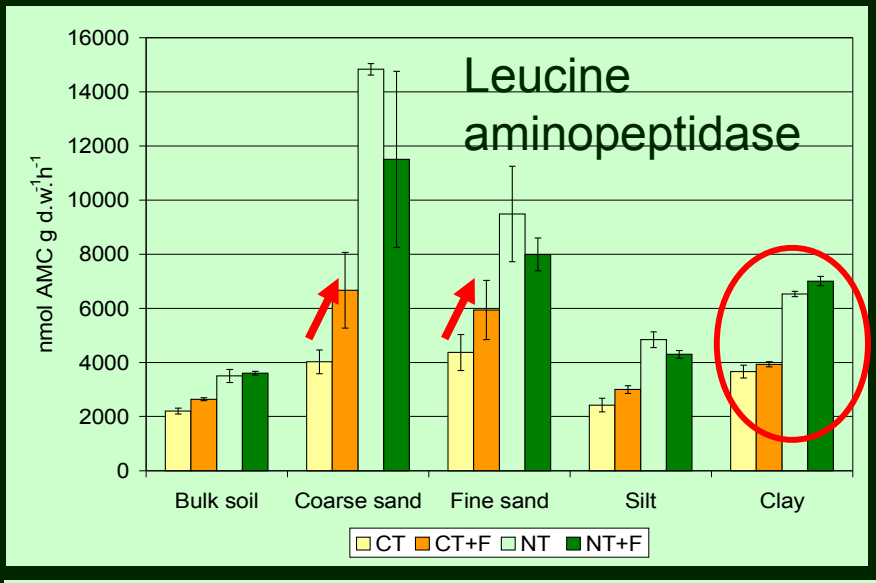


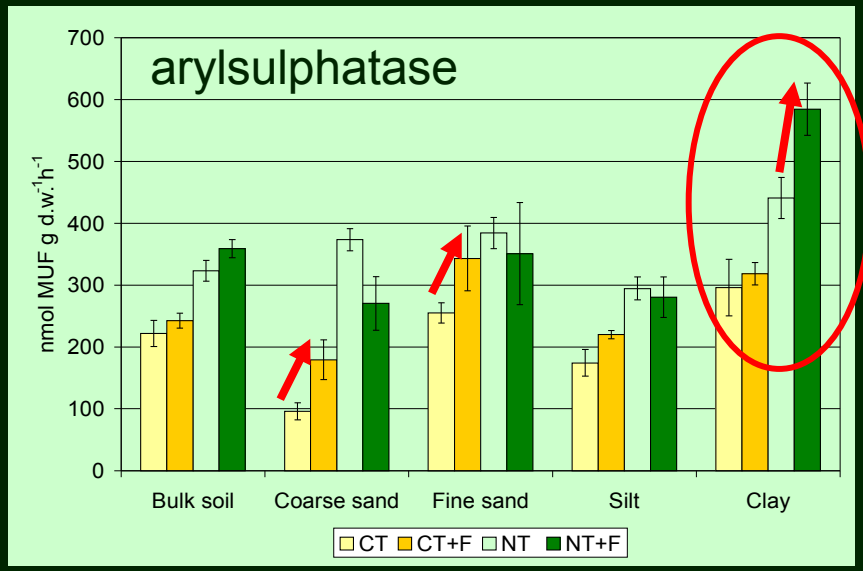
- Enzymes increased the most in the coarse sand fraction (+ 432% on average) of NT soils, where decomposable plant residues were concentrated: the distribution of enzymes reflected the availability of their corresponding substrates.
- The increase was larger in the un-fertilized *versus* fertilized soil: the higher nutrient requirement in unfertilised soil probably further enhanced enzymatic degradation of plant residues under NT

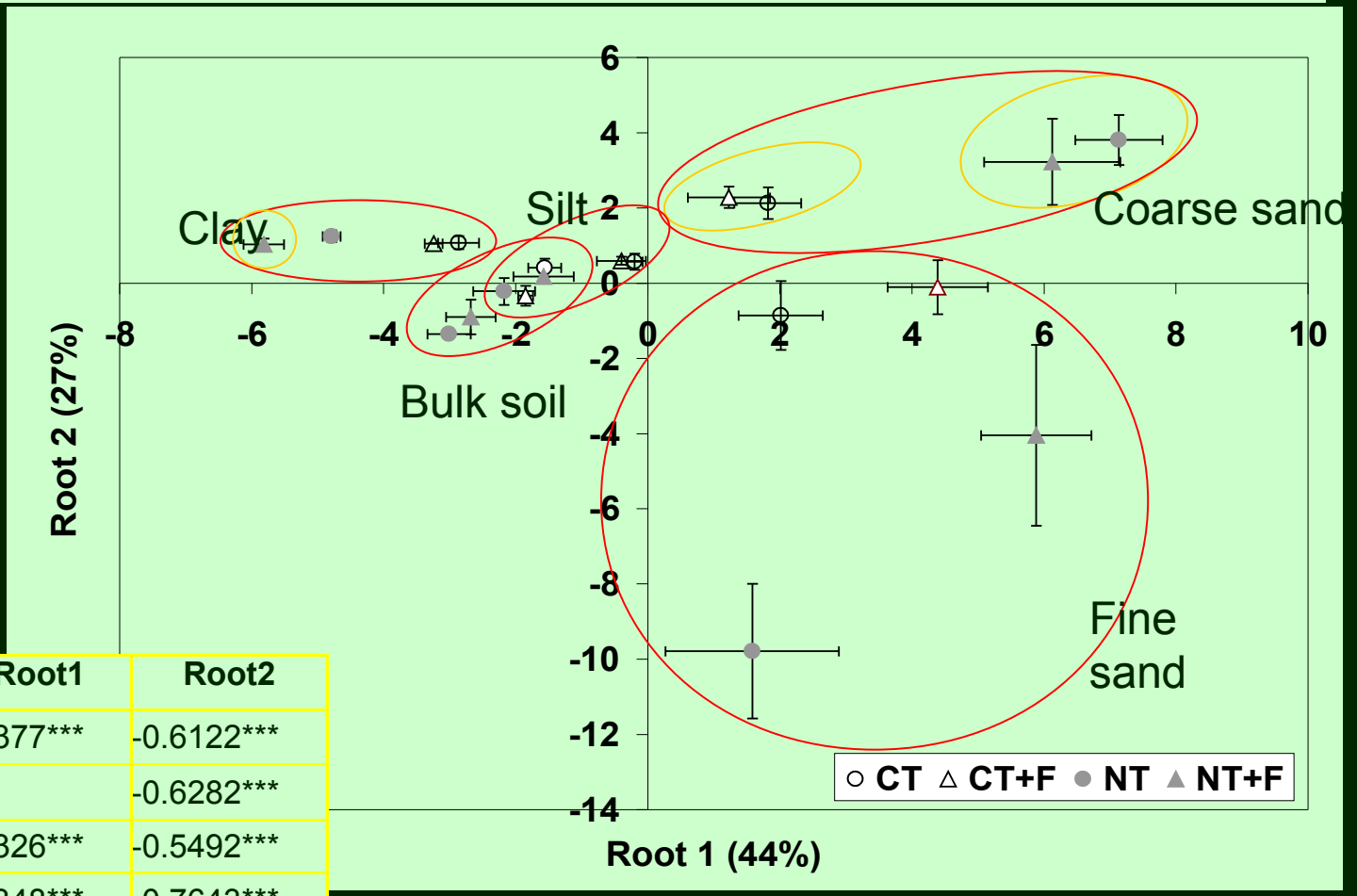
Fertilization stimulated the decomposition of organic N-, P- and S-compounds in the sand and clay fraction.

The physico-chemical protection due to NT stabilised those enzymes additionally produced in the clay fraction (average increase 226%).









Enzymes	Root1	Root2
β-glucosidase	0.6377***	-0.6122***
α-glucosidase	n.s.	-0.6282***
Cellulase	0.7326***	-0.5492***
Xylosidase	0.5348***	-0.7643***
Chitinase	0.8392***	n.s.
Phosphatase	0.6496***	n.s.
Arylsulphatase	n.s.	n.s.
Leu. a. peptidase	0.6004***	n.s.

- ✓ Greatest functional diversity in sand fractions
- ✓ discrimination of soil management within sand and clay fractions
- ✓ Sensitivity of C cycling enzymes

Presentazioni a convegni:

1. Lagomarsino A., Moscatelli M.C., Orsini R., Iezzi G., Grego S. Impact of tillage and fertilization on soil enzymatic activities in a long term experiment: preliminary results. III conferenza internazionale "Enzymes in the environment: activity, ecology, applications", Viterbo 15-19 luglio 2007.

2. A. Lagomarsino, S. Grego, S. Marhan, M. C. Moscatelli and E. Kandeler. Impact of tillage and fertilization practices on enzymatic activities in soil particle-size fractions. EGU General Assembly 2008.

3. A. Lagomarsino, S. Marinari, M. C. Moscatelli, L. Pompili, A. Benedetti, S. Grego. The influence of different land uses in Mediterranean environment on soil biochemical indicators and functional diversity. EGU General Assembly 2008.

4. Pompili, L., Lagomarsino, A., Moscatelli, M.C., Grego, S., Benedetti, A. Soil organic matter, microbial carbon pool and enzymatic activity in differently managed agricultural systems. EGU General Assembly 2008.

Lavoro sottomesso all'European Journal of Soil Science

A. Lagomarsino, S. Grego, S. Marhan, M. C. Moscatelli, E. Kandeler
Soil management modifies micro-scale abundance and function of soil microorganisms in a Mediterranean ecosystem

Abstract al convegno SISS 2008 (Ancona):

Lagomarsino A., Pompili L., Moscatelli M.C., Marinari S., Benedetti A., Grego S.
Effetto delle lavorazioni sulla biomassa microbica e la sua attività metabolica in due agroecosistemi del Centro Italia

Prosecuzione dell'attività:

1. Separazione dei macroaggregati, microaggregati, POM, limo e argilla e determinazione delle attività enzimatiche e del C organico sulle diverse frazioni sui suoli di Berchidda

2. Enzimi ossidativi (perossidasi e fenol ossidasi) da sommare a quelli idrolitici al fine di determinare la diversità funzionale (suoli di Berchidda e Agugliano)