

## Supplementary Materials.

Table S1. List of enzymes (name and abbreviation) used to assess the impact of TCs also on biogeochemical cycle. It's showed also the main substrate for each enzyme, the soil function and references.

| Enzyme                            | abbreviation | biogeochemical cycle | Substrate                        | Soil function                                                      | References |
|-----------------------------------|--------------|----------------------|----------------------------------|--------------------------------------------------------------------|------------|
| arylsulfatase                     | aryS         | S                    | Organic S compounds              | Source for plants, nutrient for microbial biomass                  | 38         |
| chitinase                         | chit         | N                    | Chitooligosaccharides            |                                                                    | 1          |
| leucine-aminopeptidase            | leu          | N                    | Hydrolysis of aminoacid residues | N source for plants, nutrient for microbial biomass                | 2          |
| trypsin- and papain-like protease | trip         | N                    | Hydrolysis of large proteins     |                                                                    | 3          |
| alfa-glucosidase                  | $\alpha$ _G  | C                    | Maltose                          | C energy source for the growth and activity of soil microorganisms | 4          |
| beta-glucosidase                  | $\beta$ _G   | C                    | Cellobiose, cellotriose          |                                                                    |            |
| cellulase                         | cell         | C                    | Cellulose                        | Organic decomposition matter                                       | 38         |
| xylosidase                        | xil          | C                    | Hemicellulose                    | Organic decomposition matter                                       | 1          |
| glucuronidase                     | uro          | C                    | D-xylans, hemicellulose          | Organic decomposition matter                                       | 5          |
| acetate-esterase                  | ester-AC     | C                    |                                  |                                                                    |            |
| nonanoate_esterase                | ester-nona   | C                    | Organic matter                   | Indicator of microbial activity (Humification)                     | 70         |
| palmitate-esterase                | ester_palm   | C                    |                                  |                                                                    |            |
| acid phosphomonoesterase          | acP          | P                    |                                  |                                                                    |            |
| phosphodiesterase                 | bisP         | P                    |                                  |                                                                    |            |
| pyrophosphate-phosphodiesterase   | piroP        | P                    | Organic phosphorus               | P source for plants, nutrient for microbial biomass                | 38         |
| inositol-phosphatase              | inositP      | P                    |                                  |                                                                    |            |
| alkaline phosphomonoesterase      | alkP         | P                    |                                  |                                                                    |            |

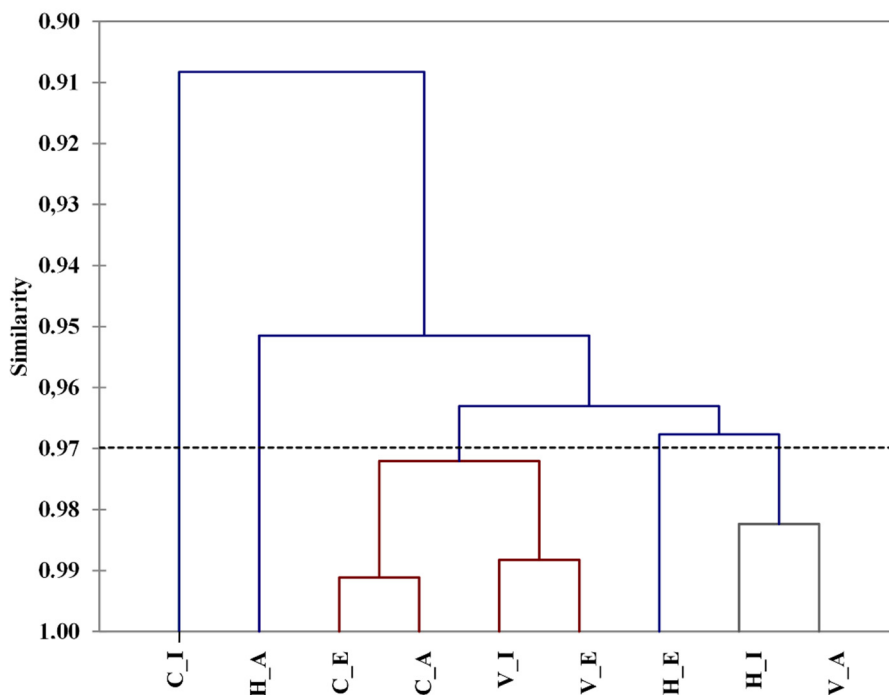


Figure 1. Dendrogram of similarities among all tested conditions based on soil quality traits. H, hazelnut orchards, C, citrus groves, V, vineyards; I, intensive cultivation, E, extensive cultivation, A, abandonment.

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