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Discussions

# *Interactive comment on* "Managing soil nitrate with cover crops and buffer strips in Sicilian vineyards" *by* A. Novara et al.

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Response to the reviewers' comments (manuscript: Managing soil nitrate with cover crops and buffer strips in Sicilian vineyards)

We have received the comments of the two anonymous reviewer and we thank them for their helpful contribution to improve our manuscript. The original comment of the reviewers (black type) and the our answers (blue type) are reported below. Abstract Page 258 Line 2: Please substitute "inadequate" by "low". done Line 3: Please add also "soil" done

Line 4: If you use the "nitrates" abbreviation before, please continue throughout the entire abstract. Please do it here and elsewhere. We delete the abbreviation here,

because we believe that for an easier reading is better using Nitrate instead of NO3-N.

Line 6: Do you mean "management" or "reduction" we used management and not reduction because thanks to cover crops and buffer strip is also possible to manage soil nitrate as concentration or distribution during the year.

Line 7-8: Please rewrite this sentence to. "The research was carried out in a vineyard located in Sicilia (Italy). In the study area, it was designed an experimental site with 10m wide and 80m long area at the bottom of a vineyard" It was rewritten

Lines 8-13: Please delete it. This information is not essential in the abstract. Please describe the most important results, conclusions and implications of your work. A sentence was added and some part were rewritten Introduction:

Line 19: Please substitute "are suffering from" by "are being subjected to". ok

Line 20: Please substitute "This intensification results in herbicides and pesticides abuse" by "This intensification increases the misuse of herbicides and pesticides, leading to soil biological degradation (Garcia Orenes et al., 2009) and soil erosion (Cerda et al., 2009a).substituted

Line 24: Please describe this environmental problems Line 24-25: Please delete "and soil and water pollution is one of those". If is possible describe the mention environmental problems and say after it "and soil and water pollution". Line 25-26: Please delete "due to the intensification of agriculture and the lack of new strategies to avoid these problems". You mentioned before that intensification of agriculture produce environmental problems. This part of introduction was rewritten

Page 259: Introduction: Line 5: Please remove "have" ok

Line 7: Please substitute "In particular, vineyard soils that are conventionally managed and frequently tilled, and thus frequently have bare soil, are prone to a high rate of organic matter mineralization and to nitrate leaching" by "In particular, vineyard soils are conventionally managed and frequently tilled, which reduces the vegetation cover

and increases the proportion of bared soil. This induces a high rate of organic matter mineralization and nitrate leaching" substituted

Line 10: Please substitute "suffers" by "are affected by" ok

Line 11: Please remove ";" and ad a "." after "land". ok

Line 11-12: Please explain better the findings of Cerda et al. 2009. It is Cerda et al. 2009a or 2009b? It is Cerdà et al., 2009b

Line 12: Please change "in soil erosion" by "of soil erosion" ok

Line 12: Please remove "and although" deleted

Line 13: Please change "is being" by "has been" changed

Line 19: Can you specify the meaning of "water leaving"? Leaving was changed with draining

Line 20-22: Please delete "By filtering the runoff water and by taking up nutrients" ok

Line 25: Please substitute "soil type and slope morphology, and buffer width.." by "soil type, slope morphology, and buffer width.." ok

Line 26-28: Do you have any reference that supports this affirmation "Buffer strip efficacy is also affected by the agricultural system (land management and crop) and the management practices used in the buffered area. We added a reference

Page 260 Introduction: Line 1: Substitute "can be also" by "is". ok

Line 1: Please change "reduces" by "decreases" ok

Line 4: You refer this idea in the line 1, please delete it and continue the idea. Line 6: Please explain why this research field have to be explored. We added a sentence to explain this and changed this part

Materials and Methods Line 17: Please add the altitude above sea level of the study

area. The altitude was added

Line 17: Please put "(Fig, 1)" after "(Italy)" ok

Line 21: Please specify the type of soil management. It was specified

Line 25: The data of monthly rainfall and groundwater nitrate concentration it is yours or from other sources? If yes, please specify it. Regione Sicilia it was specified

Line 26-27: Please rewrite this sentence and mention also the slope aspect. The slope is 7%

Page 261: Line 8: Please change "was" for "is" ok

Line 9-10: Please change "and contains 57.1% clay, 34.% silt, and 8.9% sand in the top soil (0–20 cm) based on the pipette method (Day, 1965)." By "The top soil (0-20 cm) is composed mainly by 57.1% of clay, 34% of silt and 8.9% of sand, measured based on the pipette method (Day, 1965)." ok

Line 28: "N"means "nitrogen"or "nitrate". If you use one time nitrogen do not use in other part of the paper N. If you say Nitrogen (N), please use just N in all the paper. It is easier for the reader. We have always indicated Nitrogen with N, and left Nitrate for $NO_3$-N.

Line 28: Please change "were" by "was"?

Page 262: Line 7: How many soils samples were collected in each sample period in each treatment and buffer area? We added the number of replicas

Line 13: Have you collected one soil sample in each position slope (upper, middle, and lower)? Line 20: Please change "studying", by "study". ok

Page 263: Line 11: Please explain with better detail the "linear mixed effects model used"Line 11: Please change ": : :and repeated ANOVAs were used to evaluate the fixed effects and temporal effects of soil management.." by "...and repeated ANOVA

tests were use to observe the fixed and temporal effects of soil management" ok

Line 11: Was the data subjected to some previous statistical assessment previous to use ANOVA repeated measures?. ANOVA requires that data follow the normal distribution. Please explain it The statistical description was revised and rewritten Line 17-19: Please delete this sentence. Put this information in the beginning of the paragraph, where you describe the ANOVA analysis. Were the significant differences among time and treatments observed at a $p < 0.05$?. If yes, please mention it. What software you have used to make the statistical analysis?

We have rewritten From line 11 to 19 Results and discussion: Page 263

Line 21: In the description of the results, please mention only if there was significant differences among treatments and time as you show in the table 1. Were the differences significant at $p < 0.05$? we added the p value.

Page 264

Line 3: Please substitute "Our results are in agreement with those of several other studies showing that cover..." by "Our results are in agreement with previous studies, which observed that cover ..."ok

Line 5: The study did not consider SOM analysis. Please deleted do not discuss what you did not analyzed. ok

Line 6: Where the SOM was studied in this work? If was in previous works, please mentioned it. Was the study carried out by (Barretta and Burke, 2000) carried out in this area? Ok

I think that this reference is wrong. Please change in the references "Barretta" for "Barret". See the correct reference in: http://www.sciencedirect.com/science/article/pii/S0038071700000894 ok

Line 14: Please change "mineralization, uptake by vines and uptake by the cover crops"

by "mineralization, uptake by vines and cover crops" ok

Line 19-20: Do this study contributes to the understanding of this complex dynamic. If yes please mention it. Yes

Line 24-25: Please substitute "Soil nitrate values, which were lowest in spring and highest in late summer or autumn (Fig. 3), ranged from 1.45 to 26.56mgL" by "Soil nitrate values were lower in spring and high in late summer or autumn (Fig. 3). The values ranged from 1.45 to 26.56mgL..." ok

Line 28: Please remove "mainly" ok

Page 265

Line 2: Please substitute "in" by "of" ok

Line 7: Please substitute "Seasonal soil nitrate contents were similar..." by "Seasonal soil nitrate concentrations were not significantly different". ok

Is this information shown in the table 1. If yes please mention it?. In the table 1 the differences among time are significant. Where are the results of seasonal comparisons? Which methods you used to do it?. Please refer it.

This statistical analysis is not reported in table 1. We used t student test , to check the nitrate trend between years.

Line 7 and following were changed .

Line 15-17: Please substitute "This data demonstrate the leaching of nitrates by the surface wash and subsurface wash, and confirm that the bottom slope buffer strips of the slope can be a good strategy to avoid the pollution with nitrates" by "The results showed that nitrates are leached by surface and subsurface wash. It also confirms that the buffer strips are a good strategy to mitigate nitrate soil pollution" Soil nitrate in the buffer and nonbuffer strips ok

Page 265: Line 23: Please change "This result" by "This results" Page 266:ok

Line 5-7: Which statistical analysis. Where they are shown? Are they in the figure 3? It was added Table 1

Line 8: Why the authors did not analyzed the non-buffer strips effect, as they made in the other treatments? It is mentioned that "nonbuffer strips was significantly affected by vineyard soil management (treatments V, T, and C)", but where this results are shown? It was added in table 1

15N tracer in biomass Page 266:

Line 20: Have you done some statistical comparisons to identify differences among distances in each period of study. If yes, please provide the results. If not, please remove "significantly", because induce the reader in error.

It is possible to see this statistical difference for altitude in each period in fig. 4 . Standard deviation is shown and added in the caption. Page 267:

15N tracer in soil Line 1-2: Please where are shown the statistical tests results that shown the "significant" differences. We deleted significantly.

Implications

Line: 18: Please substitute "avoid nitrates pollution" by "reduce nitrates excessive concentration". ok

Line: 23-25: Please do not repeat the results and discussions. Be only focused in the implications of it and if they measures studied in this work are important to reduce the nitrate leaching.

Page 268:

Line 9: Please remove "although" and "therefore" deleted

Line 13: You did not studied the C:Nratio. Please do not mention the implication of it.

Please be focused in the outputs of your results. ok

Table 1. Please explain what you want to mean with altitude. Please explain what differences you are comparing. It is the position in the slope (upper, middle, and lower)?. If yes, please name it with "slope position. It is slope position . The table was changed

Figure 1: Please use the same font size in both graphs. If possible differentiate it (e.g a and b). The monthly rainfall corresponds to the average? No, it is the total amount for each month

Figure 3: Please describe the figures with a, b and c in the caption. Do the horizontal black line covered the period where differences are significant, between time and treatments (soil management)?. ok

Do these differences are observed at a $p<0.05$. If yes please mention it in figure caption. Please substitute in the caption "Horizontal lines represent statistical difference according to repeated measure statistical analysis" by Horizontal lines represent statistical difference according tp ANOVA repeated measures statistical analysis test" ok

Figure 4: Please substitute "histograms" by "bars". Are the hanging bars representing the standard deviation or standard error? How many samples have you measured per distance? It is standard deviation . 3 samples for distances ok

Figure 5: As in the figure 4 please substitute "histograms" by "bars", and please describe what represent the hanging bars. Please show also how many samples you analysed per distance.ok

Second reviewer Firs at all, I found the abstract not sufficiently explicative, and is really difficult to understand what is the experimental scheme.

The abstract was changed

After, I think that more clarifications in the statistical analysis are needed, in particular regarding the analysis of ANOVA requirements, and the criteria used for multiple

comparison. Another important consideration is about the consideration at page 260, lines 20-25. Please give a little bit more information about the NO3 concentration in groundwater. The data in fig. 1 are obtained from a well or a piezometer in the site or represent an average condition of a wider area? In the first case, are they due to vertical recharge only, and really due to agricultural activities? I don't know the groundwater structure in Sicily, but the reported values are very high, greater than that are reported in critical areas with very high intensity of livestock. The data in fig 1 were obtained from wells and they are due to vertical recharge only (see Map of Nitrate vulnerable zone in Sicily) . I was agree with the reviewer with high absolute value of nitrate. They were obtained during a sampling over 4 years by Sicilian Regional government. The area is characterized with an intensive agriculture with high nitrate input use.

Minor comments As a premise, I fully agree with the detailed work done by the Referee #1. Page 261, lines 23-28. The experimental scheme is for sure an RCB one for the effect of cover crop, but is a split-plot when the subplots are presence/absence of buffer strip is analyzed: please, anticipate here this difference, because the reader can suppose an error in the interpretation of the data scheme. This doubt is totally dissipated only at line 15 of page 262. We moved a paragraph about statistical analysis to clarify this

Page 263, lines 20-25: it is not clear if the differences among nitrate contents are referred to an average of all sampling or to someone else.

It is an average of all data

Page 267, lines 1-5. The reported standard deviation for 15N differs for a factor of 10. I have some doubt that the assumption of homogeneity of variances needed for ANOVA is not meet. My impression is confirmed by the error bars in figure 4 and 5. Or have the Authors used a mixed model there the structure of covariance matrix is considered?

Paragraph of statistical analysis was changed according to reviewer 1 and you.

Table 1: the caption is not sufficient to understand what is reported in the table. The word "Altitude" is present only in this caption. IN the description of the experimental scheme there is the need to describe this factor. Moreover, factor like "altitude" (if I understand well, this factor is represented by the 3 sampling point within each plot) is impossible to correctly randomize, so a more in depth consideration could be done about this effect.

Altitude was changed with sampling position and it was specified the number of samples for each sampling altitude

Please also note the supplement to this comment:
http://www.solid-earth-discuss.net/5/C171/2013/sed-5-C171-2013-supplement.pdf

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Interactive comment on Solid Earth Discuss., 5, 257, 2013.