RC1 Anonymous Referee #1, 21 Oct 2021	
RC1 comments	*Authors' answers*
In this study the short-term effects of conservation agriculture practices evaluated for their effect in three soil physical properties. Different soil cultivation and soil cover treatments evaluated for their effects on bulk density, penetration resistance and hydraulic conductivity + sorptivity. The authors used mixed effects models to analyse the effects and interactions. The outcome of the research is highly relevant to improve the existing knowledge on CA and promote proper adoption of CA practices in the region of the study site. The authors have used a proper experimental design and experimental procedures combined with state of the art and advanced statistical analysis. The manuscript though, needs language refinement and additions especially in the introduction section and results presentation to achieve an excellent overall quality.	Thank you. This comment helped us to give important context to the reader in the Introduction. We both modified and made the terminology consistent to avoid any misunderstandings. We took care to consider each observation and integrate it considered each observation and used it to improve the manuscript. The whole text was revised by a professional English reviewer, who also reviewed the edited version to ensure linguistic correctness.
Specifically:	
In the introduction, in the first paragraph the benefits and drawbacks of CA should be added, coupled with results from existing literature. In the third paragraph where the situation in Italy is described the half paragraph is about general drawbacks and benefits of CA and is more suitable to be moved in the first one. The fourth paragraph describes the suitable species and situation for Italy and should be merged with the third one. Also, the tillage systems used in Italy should be mentioned.	We have clarified the Introduction as directed. Specifically, we clarified both the positive and negative results we observed and provided additional description about Northern Italy tillage practices.
In the 5th paragraph you mention that these measurements cover different spatial resolutions, but these measurements quantify different soil physical properties. It is not a matter of scale but a matter of different properties, and this should be clarified and corrected in the text. I think you should reconsider your scientific question.	We agree that the measured properties quantify different soil properties. However, these properties are usually correlated at the plant/field scale. A soil with high hydraulic conductivity is usually less dense and strong, as compared to soils with lower Ks. If these soil properties seem uncorrelated, then there might be a scale issue. Recent literature stresses the importance of considering the proper representative elementary volume in soil

	analyses. Point measurement, such as with penetration resistance, clearly showed the presence of hard horizons in the soil, but under field conditions, roots can bypass these horizons if there is cracking, biopores, channels left by degraded roots, and so on. Given this, we think that measurements made on a larger scale, such as water infiltration, can better mimic root behaviour, as it is affected by the presence of channels that roots can use for their growth. So, from a root growth perspective, considering a wider area seemed more appropriate. Still, we understand that this aspect needs clarification, so we modified our text at the end of the Introduction and Discussion sections.
In the methods section clarify the experimental design. In L 88 I suppose you mean in strips not in plots Be careful with the terms. In a split plot the whole plot is split into subplots (or strips) and the first factor is allocated there- I suppose is tillage for you- and then the second factor is randomly allocated within these in the experimental units. So, I think you have 18 experimental units. Please use the proper terminology throughout the manuscript. It would be nice to include the experimental design layout as a figure.	We understand that this aspect requires clarification. In fact, we modified the text to clarify that the main treatment consists of three different tillage intensities. These different managements were applied in a randomized main plot within each block. Subsequently, each main plot was divided into three subplots. Each subplot received a different soil covering management.
For the surveys you should add months also in Figure 1 to give a perspective of time within the year. And also specify the replicates per experimental unit (within the plot replicates) for all the measurements. Eg how many BD undisturbed samples you collected from each experimental unit.	We redesigned the figure accordingly. Then, we clarified both the timing and replicates of each sampling in the text.
Finally indicate the p value in the method.	We added the exact p value to the tables for each ANOVA comparison.
In the results you refer to texture measurements, effects and correlation without presenting the variation of texture within the plots.	The differences in soil texture among the plots were limited and not significant. We emphasized will this point and added more information on texture and its variability.
Detailed comments:	
L6: CA relies in three main piles add also crop rotation	We modified accordingly.
L7 and other places in the text: Correct soil physics to soil physical benefits or soil physical properties. Soil physics is the science and it include a wide range of properties and	Thank you for the comment. We made the modifications.

concepts	
L7: is reduced soil strength a benefit?	Average soil strength results were high in compacted soil. Its reduction may alleviate this threat.
L10: Define BD, PR in parenthesis and other abbreviations the first time appear in both in abstract and introduction before you use the short versions	We modified accordingly.
L:10 and other places in the text: Change measures to measurements. Be careful when used measurements: the quantification of attributes of an object or event e.g. measurements of BD, weight etc. Measures: actions taken to achieve a particular purpose e.g. no tillage cover crops etc	Thank you for the comment. We modified as suggested.
L10: Define what soil hydraulic measures	We added this information.
L10: To evaluate the soil quality not the results	We modified accordingly.
L13: use more or other word instead of better	We used "better" because the soil is compacted and a reduction in BD could be considered a better condition. We changed the terminology accordingly.
L13: define or the percentage change in parenthesis or write from how much reduced to the second value	We modified accordingly.
L15: see comment for line L7	We modified accordingly.
L15-16 "as evidenced by root growth-limiting threshold declines (-11% in BD values >1.55 g cm-3 and -7% in PR values >2.5 MPa)." Rephrase	We rephrased this sentence for clarity.
L16: define what measure not only soil hydraulic measurements	We add this information.
L20: specify how the strategy enhances soil physical properties	We rephrased this sentence.
L21: change to "This study demonstrates that to quantify CA effects requires monitoring several soil physical parameters." or similar	We modified accordingly.
L25-28: references needed	We add the reference HOBBS, Peter R.; SAYRE, Ken; GUPTA, Raj. "The role of conservation agriculture in sustainable agriculture. Philosophical Transactions of the Royal Society B": Biological Sciences, 2008, 363.1491: 543-555.
L28: specify what type of contrasting results have been reported	We added details to the results of the contrasts reported for this source that analysed different soil physical parameters.
L30: reference is needed	This sentence shares the reference of the previous line. We rephrased these two sentences to add more detail and to specify the

	references clearly.
L39-40: What situations? specify	We were referring to specific conditions, such as the presence of a hardpan, high weed pressure, or the needs of slurry managements. We clarified all.
L66- L 95: the BD and PR have already been used before. Specify only the first time mentioned in the text.	We modified accordingly.
L81 and other places in the text: Change rainfalls to rainfall.	We modified accordingly.
L107: specify the volume and height of the core and give details for the sampling depths (0-20, 20-40 etc). and how many cores per depth and per experimental plot.	We specified the information more completely.
L110: Do you mean experimental units?	We enhanced the description of the experimental design by underlining that within each plot we had four sampling zones. I.e.: 4 sampling zones x 3 soil cover managements x 3 tillage managements x 2 blocks = 72 total sampling zones. Within each sampling zone, we collected disturbed soil samples and performed four penetration measurements.
L111: change to measurements	We modified accordingly.
L112-114: I believe this belong to the results	We moved this section to the Results.
L116: threshold which is considered	We modified accordingly.
L119: You measure infiltration rates and from that you calculated the Ks and S with the Philips equation please change.	We clarified this question.
L121: Indicate the number of within the experimental plot replicates of the measurement	We clarified this question.
L126: the plot effect – remove inside each treatment.	We clarified this paragraph, by adding complete and clear information according to reviewers' comments.
L130:do you mean within the whole profile?	
L136: The DB range may not be significant statistically but is important physically. You should elaborate on the impacts of these values.	We evaluated summarizing all the data into a table. It could be useful to have more information, even if there are no significant differences. On the contrary, and based on other comments, it seems important to keep the Results section simple to avoid misunderstandings.
Table 1 change the captions/ It is not easy for the user to figure out the sampling when half of these are seasons and the other half years. Use uniform format. E.g. spring 2018 and also specify in the text why you had no applicable # (e.g. measurements only on the topsoil) Also in the first column use same format for the	We clarified this point by adding the years to the Table as suggested.

words. Some are only capital letters other start with capital etc. Specify what is GWC	
139 and many other places in the text: Some times you use Figure in the main text to refer to the figure and some other Fig. Please use the same format.	We standardized this.
L 189 and other places in the text remove the word combination next to treatment as by default the treatments is a combination of factors. So, either use for example the MT-TR treatments or the MT-TR combination	We modified accordingly.
L189: resulted in	We modified accordingly.
L199 you use respectively but you dop not refer to which treatments	We clarified that the first data is referred to as NT-WW and the other refers to the average values of all other treatments (which were not significant differences).
L 219 change the word lost with a more suitablke	We rephrased.
L222 above which of the two thresholds? Or you mean these instead of this?	We corrected to “these” thresholds.
L223 which range you mean please specify	We changed the text to be “above the two thresholds”, which was our intention.
L226 what do you mean by closed or open indicators? I think you mean solid and symbols	We meant open symbols and closed symbols. We modified accordingly.
L: 229 Which results specifically and effects on what?	We rephrased for clarification.
L231: effects on soil physical properties or soil physical condition	We rephrased to clarify. We found significant differences in the observed soil physical parameters starting with the first years of conversion from conventional tillage to conservation agriculture.
L243 wrong syntax	We revised this sentence.
L251-252 and many places in the discussion specify what these authors found instead of only mention the names. Eg The results aggree with XX who found …. and disagree with xx who fount ….	We added this information.
L300 as mentioned before these measurements are used to evaluate different soil properties. You should not compare their scale. In order to reduce the effect of soil heterogeneity you replicate the same measurement within each experimental plot more times. You cannot say that by using the infiltrometer which measure infiltration capacity can overcome the variability problems you face when measure BD just because it covers a bigger area. These are two different	We clarified this. As the reviewer correctly highlighted, the three methods considered different soil physical properties. Nevertheless, all of them provide information on soil function and soil root habitability, especially within the context of poorly-structured soil and the threat of soil compaction. Consequently, we argued that the different results could be related to the scale difference. We did not intend to suggest that the infiltrometer could replace BD or PR. As the double-ring infiltrometer investigated a

unique measurements. I think you should reconsider/remove that part	wider soil portion, it seemed to take spatial variability into account better. In fact, while PR and BD seemed to be negatively correlated with reduced tillage system adoption, the infiltrometer produced opposite results. That is, NT had the highest Ks values, which resulted in a positive impact from the reduced tillage system on soil hydraulic properties. We clarified the text to avoid any misunderstanding.

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