Response to revisor 2:

Reviewer comments appear in blue, while responses appear in black.

I have both general and more specific comments to your manuscript.

Thank you very much for the effort made in this thorough revision. The authors have taken into account all the suggestions made by the reviewer and have added them to the text. Regarding the issue of the replacement of the x's in the text by the -, we do not understand how this happened and that we did not notice it during the repeated revisions of the text. The x's have been reinstated in the text again. The reviewer's questions are accurate, and he has noticed stylistic errors that were difficult to find, for which we thank him for his work.

We believe that the text has been substantially improved by integrating the reviewer's comments. The conclusions have been rewritten in order to give a more precise answer to the question posed in the title.

General comments:

When I read your manuscript I cant find a good answer to your title. is it possible to delineate N fertilization using NDVI? I believe based on your results that the answer is no, do you agree?

Yes, we agree with you. However, we believe we are on the right track and will be able to delineate N fertilization using NDVI or other vegetative index when we have data from more plots and have done more studies on it. This is a first study related to this topic. Even so, the results obtained are encouraging since this technique is useful for 33% of the plots analyzed. And if we take into account that the spatial patterns are recurrent during several years, the results are useful for 66% of the plots. We have slightly modified the title to make it clear that this is a first attempt.

It is not enough to be able to divide the fields into management zones, you also have to define how much N should be applied to each zone before it is useful for the farmer.

Yes, of course you are right. Here we are making the first steps. In order to be able to accurately determine the fertilizer demand of wheat we need to estimate the yield of wheat, but unfortunately we are not yet in this situation. Once we have estimated the expected yield, we should multiply this by the nitrogen extraction of the wheat (25-30 kg N/1000 kg produced). In order to carry out an adequate fertilization, it would be necessary to subtract the wheat's demand from this figure.

The amount of N that the soil is capable of supplying, should be subtracted from the wheat demand. This amount is defined by soil organic matter and soil and climatic conditions. Therefore, the soil will not provide the same amount of N every year, nor will it provide it at the same time. If there is no crop, the mineralized N will be lost, while if it coincides with a time of high demand by the crop, the N will be used more. But there is no doubt that the most important factor in deciding the nitrogen fertilization are the extractions of the crop, at least in our conditions in which the organic matter is not high and the mineralization is usually produced in periods in which there is no plant (summer, autumn) and the rains are important. That is why the Nmin that we usually obtain between GS20 and GS30 is usually low as we have verified in several trials. Table 1 (data published in the thesis of Mª Arritokieta Ortuzar Iragorri) shows the Nmin values measured in different plots during other trials.

Nmin analysis is complicated for several reasons, and its application at the plot level is not considered very precise (Ravier et al., 2016). One of the main reasons is the spatial and temporal variability of Nmin. For example, authors such as Ilsemann et al., 2001 did not find spatial dependence in the values of Nmin. To capture all variability of a plot, the Association of German Agricultural Research Institutes recommends taking 15 to 16 soil samples every 90m2. For a farmer to perform this process on each of his plots is unfeasible. Therefore, in their paper of 2021, Heinemann & Schmidhalter propose a simplified methodology that produces an error of less than 10kg Nitrate-N ha^{-1}.

The arguments explained previously are the motives why this article does not provide more information about how much N need to be applied in each management zones.

Do a search and replace on upper cases like ha-1 which should be ha^{-1}

Replaced

x is replaced by

Thank you very much, we do not understand how the x's could have been replaced by -. The typos have been identified in the text and have been corrected.

More specific comments:

line 20 - define DDA

Done

line 36 and 37 - is this the reason for increased use of N? I am not sure, I believe it is due to just want to have a higher yield, I would like you to comment this.

The phrase has been rewritten in the text to clarify this term.

line 53 - PA doesnt necessarily increase yield and sustainability, you should be more critical to literature

The reviewer is right. The use of AP does not have to increase production. However, in the definition of the International Society of Precision Agriculture (ISPA) one of the improvements derived from its use is the sustainability. The definition proposed by ISPA has been added to the document.

line 58

Done

line 83 to 85 - be critical to theses suggestions, is it always true?

The sentence has been slightly changed to better define own situation. In addition, a reference has been added to reinforce the idea. The plots selected for the study (Table 2) are representative of the study area. In our region the plot average size is near to 0.8 ha, so their size is small. Thus, hiring a flight for these farmers is excessively expensive. Taking this into account, the authors believe that the use of airplanes for this purpose is not suitable.

101 and 102 - you need a reference to this

Added a reference in the text

line 125 - define what you mean by 'classified'

A short definition has been added in the text.

line 131 - 11/24/2018 is not a week

Done

line 131 - seed density, do you mean seed rate

Done

line 133 - replace made with applied

Done

line 174 - 6C^o is the correct way to write it

Done

figure 2 - title on y axis is wrong

The title has been corrected in the text

line 202 - safety buffer, is this the same as headland?

A buffer is defined as something that prevents something else from being harmed or that prevents two things from harming each other. In this paper, the term buffer is used to refer to a reduction in the size (15m) of the plot to ensure that all pixels used are within the plot. The underlying reason for this is that NDVI is sensitive to the presence of soil, and therefore, if a pixel is located partially outside the plot on a road, the values of this pixel will be lower than the rest and may alter the relationship. Therefore, the buffer corresponds to the headland.

line 378 - I don't understand this line

This sentence has been modified in the text by adding an explanation to improve its comprehensibility.

line 434 - what do you mean by ... and spike^{-1} weight..

It is normal that it was not understood, we had made a typing error when transcribing this parameter from the original article. We have revised the original article and corrected the error. The correct variable is kernel weight spike^{-1}. With this variable, we think that the text is well understood.

line 439 misspelled waterlloged and the is to much space at ..from GS 30..

Both changes have been incorporated into the text.

line 441 - what do you mean by (number of spikes^{-1}..

 The wrong variable has been replaced by the number of grains per spike in the text.

line 445 - what do you mean by meter^2

This term refers to the number of tillers per square meter in a plot of land