*RV# 2:*
*This paper is well-written and understandable for a greater audience. It provides a clear description of the study and outcomes. The authors display relevant knowledge of global data sets for irrigation mapping, using references. The method to combine statistical data and remote sensing data is interesting. The methodology section and the validation sections may require some additional clarification. The following points can be further elaborated or explained.*

Authors:
Thank you for reviewing the article and your valuable comments. Please find our suggestions for improvement below.

*RV# 2*
*The different data sets used in this study, cover different time periods (Table 1). For instance the GMIA has a time frame of 2000-2008, and Globcover covers 2004-2006. However, the study provides an irrigation map of 1999-2012. It is unclear how the different data sets from different periods are agglomerated and if any discrepancies can be caused by comparing different years of data. For instance, if a pixel is fallow during the period of Globcover, it will be excluded from the analysis because it was not considered cropland. The GMIA is downscaled using a data set of a different time frame (2004-2006). This might cause some inaccuracies. In addition, it is unclear what the effect is of averaging the NDVI values over 14 years. Several different cropping patterns might exists. Some further explanation will be useful for the reader to understand this part of the methodology.*

Authors:
It is correct that the inputs refer to different time periods. Nonetheless, all data focus around the year 2005. Since it is global approach, land use change within +- 3 years is supposed to be relatively small in comparison to uncertainties within the input data. Further, global data often are not available for specific years.
The downscaling of the GMIA was done with a bimonthly-maximum NDVI of the years 2004-2006, more precise November 2004 – June 2006. We chose this time period because it represents, more or less, the center of the covered time period of GMIA. If there is a change in land use during the covered time period the different time periods definitely have an influence on the result – but mainly on the local scale. We will discuss this issue in the revised version of the paper.
In case of different cropping patterns or occasionally fallow field the influence on the NDVI is low. A change of crops or a lower NDVI every few years do not change the averaged NDVI critically. For a better understanding we will extend the methodology part with a more detailed description of the chosen input data and provide more transparence for the reader.

*RV#2:*
*The methodology and processing diagram (figure 3) shows that the results are highly sensitive to the accuracy of the land cover map (Globcover or ESA-CCI-LC) and the suitability maps. The author can acknowledge this influence and determine the uncertainty of these data sets. Possibly this can be done by validating these 'intermediate' data sets.*

Authors:
We agree, the uncertainty of the input data should be better discussed and questioned critically. We think a regeneration of the validation is not feasible but we will mention the validation results

of the applied data sets. We will discuss the validation results of the intermediate products. We already some potential sources of uncertainties within the suitability map, since it only considers 16 crop types and may be inaccurate in some regions due to drought resistant varieties.

*RV#2:*
*The validation paragraph includes a description of the methodology, which is better placed in the methodology section.*

Authors:
Thank you for your comment, we will change that.

*RV#2:*
*The validation process can be elaborated by including additional data sets, besides Europe. Also results can be compared with existing regional irrigated areas maps.*

Authors:
We agree that the validation must be improved. Basically, a validation with national statistics is methodically not appropriate, since we are interested in the differences to the statistics. Therefore, we used proven ground truth information for samples. We also requested for ground truth data outside Europe, but it was not possible to get some. For improving the validation and also the comparison with existing approaches, we will include a statistical comparison of our results with Salmon et al. (2015) and Thenkabail et al. (2009) (if data is available).
We agree that a regional validation should be part of the study. We will focus the validation on areas where irrigation is an important part of agriculture. If we get access to the data we suggest to compare the irrigation map with the publication of Ozdogan and Gutan (2008) (USA), Ambika et al. (2016) (India) and Zhu et al. (2014) (China).
For improving validation and discussing uncertainties, we suggest adding a table on total irrigated area for the different global and regional approaches (e.g. Thenkabail, Ambika, Ozdogan, etc.) together with national statistical data for each country worldwide for a detailed comparison between the different irrigation data in a supplement.

*RV#2:*
*Some minor comments in addition to the points mentioned above are: - The use of the term water use efficiency on p.1 l.34 is confusing because it is interpreted differently by different disciplines. In the referenced paper the term irrigation efficiency is used, which is my suggestion as well.*

Authors:
Thank you, we will change that.

*RV#2:*
*The captions of figure 5 and figure 8 can be improved to give a better description of the figure (without needing to read the text).*

Authors:
Thank you for this comment we will suggest following captions:
Figure 4: Global distribution of the irrigated areas identified by different approaches. The blue areas are the downscaled data set of Siebert et al. (2013) which is based only on statistics and

provides the basis of this map. Green, red and yellow are the extended areas by the approaches developed in this study.

Figure 5: The results of the new irrigation map (dark) and the downscaled irrigation map of Siebert et al. (2013) (bright). The bar at the right side represents the total sum of the global irrigated area and A, B and C shows the amount of additional irrigated area derived with the developed methods.

*RV#2:*
- *The role of supplemental irrigation, meaning the role of irrigation only during the summer (dry) period, is excluded in this study. Supplemental irrigation is relevant especially for regions having sufficient rainfall during the spring and fall. This might be an explanation for a few of the results.*

Authors:
It is correct that supplemental irrigation is difficult to detect just by the combination of suitability and NDVI data. This is the main reason why we based our approach on the Siebert et al. (2013) data, where these areas are included in the statistical dataset used for calibration.

*RV#2:*
*Overall, the paper provides good information and an interesting approach. If these parts of the methodology are elaborated it will be more understandable and transparent for the reader. Also being critical of the 'intermediate' products (land suitability and Land cover maps) will improve the paper and give suggestions for future work.*

Authors:
Thank you.

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