

**Manuscript nhess-2019-61 “AGRIDE-c, a conceptual model for the estimation of flood damage to crops: development and implementation” – Final response to referee comment 1**

We would like to thank the referee both for his appreciation of our paper and for the work he did on our manuscript; we greatly appreciate his comments as they may contribute to increase the manuscript robustness and, in general, to improve its quality and readability. In the following, we supply a point by point answer to the general and specific comments raised by the referee.

**General comments:**

**RC1:** Please briefly discuss and justify the consideration of the element “damage to soil” in the model framework against the background that no approach to estimate this damage type as yet exists. From a theoretical point of view the implementation of this damage type is fully comprehensible and reasonable as 1) it ensures a comprehensive view of potential consequences of flooding in the agricultural sector, and 2) damage to soil can significantly contribute to overall flood damage in this sector. However, from a practitioners perspective, the fact that the consideration of damage to soil is suggested on the one hand, but no concrete approach for such an estimation is provided (since not existent) on the other hand, can cause ambiguities. Further, a consideration of damage to soil in the model application using rough assumptions and proxies for this variable could introduce noise to the overall loss estimation rather than valuable information.

**Answer:** We thank the reviewer for this comment and we fully agree with him on this point. Indeed, our choice to include the “damage to soil” component in AGRIDE-c, although in a simplified way, was driven by the two main reasons also raised by the reviewer: comprehensiveness of model structure and importance of this sub-component in the overall flood damage figure to agriculture; in particular, this last point clearly emerged during the interviews with local experts, who pointed out the occurrence of such damages even for flood events characterised by shallow water depths and not particularly high flow velocities. In the revised version of the manuscript, we will include these considerations in Section 4.4 in order to justify the necessity of modelling this sub-component and we will also include in Section 5 a critical discussion of possible impacts of the modelling assumptions and proxies for this component on the overall loss estimation.

**RC2:** The AGRIDE-c spreadsheet plays a central role in the model concept. It is currently provided to the reader via a hyperlink to a project website in Italian language. Due to language constraints of non-Italian-speakers as well as potential expiry of the hyperlink I suggest to additionally provide the spreadsheet in the supplement of this paper, if technical requirements of NHESS can be met or bypassed (Excel sheets cannot be uploaded to NHESS supplements). This would ensure unlimited availability and better access of the spreadsheet.

**Answer:** We will check with the NHESS editorial support office whether the spreadsheet can be added as supplement material. Otherwise, we will upload it in a repository with an easier access.

**Specific comments:**

**RC3:** Page 2, l. 6-8: The given characteristics of limited model transferability and applicability are not exclusive for agricultural sector, but rather represent general difficulties in flood damage modeling, i.e. often also apply to models for e.g. the residential or the commercial sector. I suggest to rephrase the sentence to avoid the impression that these aspects are exclusive problems of agricultural models.

**Answer:** We agree with the reviewer that the transferability of damage models represents a general issue in flood damage modelling, affecting all exposed sectors. Agriculture is probably one of the most critical in terms of transferability, due to large variability of the features affecting damage mechanisms for this sector. For more clarity, in the revised version of the manuscript we will revise L.6-8 in P.2 by specifying: “Nonetheless, available damage models for agriculture are not only few in number, but are also affected by many limitations, the major related to the lack of information/data for their validation and to the large variability of local features affecting damage (i.e. strong linkage with the context under investigation) which limits their transferability to different contexts more than other exposed sectors, as the residential or commercial ones”.

**RC4:** Page 2, l. 23: “The paper is organized in four parts” is a bit confusing. To match this number, the exclusion of the sections “introduction” and “conclusion” is required. Moreover, in the subsequent sentences you list five different sections. Please rephrase the sentence towards a more unambiguous statement. For example, “the paper is organized as follows”.

**Answer:** The reviewer is right. In the revised version of the manuscript we will rephrase the sentence accordingly in order to avoid confusion.

**RC5:** Page 3, l. 1: “The main available damage models [ : : ]”. This statement is unclear to me. Do you mean “prominent examples of damage models”? Please clarify

**Answer:** Yes, we do. We will then revise the sentence as suggested.

**RC6:** Page 9, l. 27-30: Although in a European context floods usually have a negative effect on soils, the studies of e.g. Hein et al. (2003) and Tockner et al. (1999) show that such events can also have clearly positive effects, namely in the form of an increase of soil fertility. The fertility increase is explained by a (re-)distribution of river sediments and organic matter in the course of flooding. These river sediments replenish carbon and nutrients in topsoil and, hence, can make agricultural lands more fertile. I suggest to briefly discuss this aspect in the paper. An adaptation of Figure 2, where the box “damage to soil” currently states only the negative effect of flooding, could also be considered.

**Answer:** We thank the reviewer for this important comment. In the original version of the manuscript we only referred to negative flood effects on soils, because in Italy these are the most common impacts observed from past events. However, we fully concur with the reviewer on the importance of including also positive effects (e.g. increase of soil fertility) in the general conceptual model represented in Figure 2, which will be revised accordingly. In the revised version of the manuscript, we will also include some discussion on this point in subsection 4.4 (the title “Damage to soil” will be changed to “Impact to soil” in order to be more comprehensive).

#### **Technical corrections:**

Page 12, l. 16, w. 11: Grammar issue. “nor” should be replaced by “neither”.

Page 19, l. 2, w. 13-15: Consider rephrasing “in another terms”. For example, into “in other words”.

**Answer:** These technical corrections will be fixed in the revised version of the manuscript