

Nat. Hazards Earth Syst. Sci. Discuss., referee comment RC2
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Comment on nhess-2021-398

Anonymous Referee #2

Referee comment on "Process-based flood damage modelling relying on expert knowledge: a methodological contribution applied to the agricultural sector" by Pauline Brémond et al., Nat. Hazards Earth Syst. Sci. Discuss., <https://doi.org/10.5194/nhess-2021-398-RC2>, 2022

The authors propose a methodological framework to understand under which conditions expert knowledge used to feed process-based models of flood damage assessment are valid. Their framework is based on 4 axes: explication of assumptions, validation, updatability and transferability. An application is proposed in France for the agricultural sector.

The focus given to the agricultural sector is well justified by the fact that agricultural lands are often flooded to reduce urban flood risk. Assessing flood damage is thus key to evaluate the efficiency of this measure and the compensation given to farmers.

General comments

This article is a very valuable contribution because it proposes a framework for flood damage assessment which is generalizable and it claims to make explicit the assumptions used in such models. Furthermore, it proposes an open source model for flood damage assessment in agriculture in the form of an R package, to be available soon.

The model is applied to the agricultural sector. It is restricted to the plant farming. What about livestock? Is this also applicable to this sector of agriculture? It could be discussed.

Comment on the Integration of farmer decision in the damage function.

When I look at your system of decision I cannot see a symmetry between the crop and plant material systems. You include the possibility to change the crop type in equation 8 but not for plant materials. One should also have the case of a farmer who decides to plant another type of trees, similarly to equation 8 for crops.

I have a major concern regarding farmer's decision/actions:

It seems to me that not all the post flood decisions made by farmers should be taken into account in the model otherwise you overestimate the damage. This is particularly the case when farmers decide to do something different from what they were doing before the flood (like in equations 8 and 12, sowing another crop or not replanting). In this case, the variation of revenues is not a damage because the reference has changed. The pre and post yields are not comparable, Y_{new} is different than Y_u because it is another crop, not because the biophysical conditions have changed in the farm because of the flood. If a farmer decides not to replant trees or crop, for example because he/she stops the activity or because she/he wants to invest in another farming activity or other species for example, then the damage function (eq 8, eq 12) is rather an opportunity cost or possibly a benefit rather than a damage. Counting equation 8 and 12 as a damage creates opportunities for farmers to operate a change in their agroecosystem and ask for money to the damage compensation organism for that change because they have been flooded. But the reason is not the flood, the reason can be economic or another reason. This will also have the perverse effect of making farmers prefer to wait to be flooded to change their agroecosystem to receive more money (in the case where they are compensated based on your damage functions.)

This does not mean that the farmer cannot anymore change the crop system after a flood, but it means that the compensation based on the damage function should not pay for the change but pay for what has been lost.

To pay for the change brings your model to the context of adaptation to climate change, not a context of compensation for flood damage. One could imagine a farmer willing change species in order to use species more resilient for floods because floods become more frequent or more devastating. This is possible but this is not what your paper is proposing. Your paper is about compensation, not adaptation. This should be discussed or corrected.

Section 4.2 validation: V2 on comparability with other models (uk , Italy, etc). Maybe you can compare the conceptual approaches between UK, Italy and France. This can help you to also highlight the contributions of your model to the literature. By literature I do not mean the case study based literature (filling the gap of having a model for the French agriculture) but the literature on the structure of flood damage assessment models (ie your figure 8). For example, is it usual to integrate decision rules in the calculation of damage or the biophysical processes? This kind of comparison will improve your

contributions (in addition to the contribution of making explicit the assumptions) and the value of the paper for an international readership.

I recommend to have the paper revised by a native English speaker: grammar, use of the article "the" (the figure x , the table x versus Table x, Figure x), etc.

Specific comments:

Tables are at the end of the paper (except Table 1) and figures in the main text. Are the tables part of an appendix or to be included in main text? If they have to be part of an appendix, please check the guidelines for authors.

Plant material or perennial crops? You have related plant material to perennial crops line 318 but you have an equation for perennial crops in the section related to crops and then several equations in a section on plant material. This is confusing.

Equation 8: What happens if $Y_{new} > Y_u$? It is no more a damage but a benefit. Does this mean that the farmer will revert money to the compensation fund because she/he earns money after the flood? This should be discussed or a constraint should appear in the system of equations.

Section Decision related to soil. It seems to me that you should also discuss the case of a variation in soil quality because of the flood (example of chemical pollution, or loss of organic matter of the first layer of the soil). This affects yield also. Does this correspond to equation 6? Or would this be a case of double counting if you add an equation for that?

Figure 8. Following my concern about accounting for decision rules and actions in the modelling of the damage functions. My concern is now visual: depending on the decision/action, the farmers has the possibility to increase the damage if he/she chooses the appropriate action. To maximise the damage and so the future compensation can become a strategy for the farmers in this model. This is a perverse strategy in my sense but your model allows it if I understand it well. The damage should be based on past losses not on future losses in case of changing practices. I am Ok with accounting for future losses in case of deterioration of soil quality, or in case of sowing the same crop again.

Technical corrections:

L24: check grammar

L265: correct Action functions models...

L 281 correct group and "in average"

Farm building. Is the cadastre a possible source for the data on agricultural buildings?
What are the limitations to not use it if it exists?

Correct the use of the article "The" throughout the text: the figure x instead of Figure x

L298: correct interfers

L351: are, not ar

L372: correct typo "farmmers"

Equation 6 : alpha and gamma are not defined in the text (or a too late in equation 10).
And some variables are also not defined like D_{crop} P_u and Y_u

Equations: make the unit is expressed in all the equations (per hectare or not)

L458 what is FHRC?

L 468 process-based. Check it also in the rest of the paper.

L500 data should be plural

L503 show in plural

L 506-507: date or dates, come or comes

L515: correct "are showed"

L 523 consider using more appropriate terms to describe a duration: short, medium, long very long instead of low medium, high, very high)

L534 in figure 8 instead of on figure. correct also in other sections.

L542. this adaptation requires

L548, L554: Harmonize agro-economic or agroeconomic. check it also in the rest of the paper

L557: correct the sentence in Mao (2019)....

L566 Nortes Martinez et al. show

L567 over or underestimation

L614: relying on what?

L624: a word is missing in the sentence.