Hydrol. Earth Syst. Sci. Discuss., 7, C2410–C2413, 2010
www.hydrol-earth-syst-sci-discuss.net/7/C2410/2010/

Hydrology and Earth System Sciences Discussions

Interactive comment on "Risk of water scarcity and water policy implications for crop production in the Ebro Basin in Spain" *by* S. Quiroga et al.

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Received and published: 21 September 2010

The paper could be of interest for HESS but probably it would fit better in a journal related with water management. The difficulty with the paper is that supporting concepts are not clear, including they may be wrong, and material and methods are insufficiently described and include wrong assumptions. A few comments are given below to help the authors revising and improving their paper:

a) page 5897 lines 17-18: there is confusion on the use of the terms water use, consumption and demand: water demand corresponds to water use and therefore includes non-consumptive uses. In the Ebro Basin, which is a highly populated and industrial area, agriculture cannot reach up to 90% or more of water demand; may be authors

pretend to refer to water consumption. 90% or more of water demand for agriculture only occurs in non-industrial areas with low population.

b) page 5897 line 19: I suppose that the National Irrigation Plan (2001) is deeply changed in the last years, thus such a tremendous increase is not likely to occur. However it is of interest to assess what could happen if it would be applied.

Introduction The considerations in the introduction suggest a inter-sector conflict for water. Something could be added about non-agricultural water use sectors. More important, the introduction lacks i) a formulation of objectives of the study (independently of what already said in the abstract ii) review/discussion of methodological approaches that support methods used in this paper, as well as show possible advances relative to current knowledge. In the Material and Methods section there is some but limited review; however in this section methods should be described in a focused way and references should be used just to support further information for readers

c) Section 2.1 is written as it is usual for an introduction and not for material and methods

d) page 5898 lines 12-14: Authors write: “we estimate linear regression models by ordinary least squares (OLS). Statistical models of yield response have proven useful to estimate the water requirements” Unfortunately it is totally unclear what kind of models are referred and, of course, if they were calibrated and/or validated and how this was performed. two pages later, El Jamal – should be El Jamal et al. - is called but it is not clear how this model applies to Ebro, and how was it parameterized/calibrated for crops and climates different of those by the developers.

e) page 5898, eq.2: i) why the Solow-Stiglitz model was selected? The question is raised because it has more than 30 years when there are many others more recently developed? I do not say it is inappropriate but I ask a short discussion and justification be given in the paper ii) the variables are not identified nor units are given.

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f) page 5900 line 11: “Crop yield is defined as the ratio between production (T) and agricultural total area (ha)”. Is this referring to each crop?? Please be more specific. Why a T is used when the common symbol for yield is Y?

g) page 5900 lines 24-26: It is written that “The crop-water production function is linear in the deficit irrigation section because all the applied water is used for evapotranspiration, and the production function is equal to the evapotranspiration production function.”. This is not true because ET is water consumption and applied water is water use, which includes provision for inevitable water wastes or operational losses, and for leaching (the Ebro basin has salinity problems in various locations that require leaching). Moreover, it is necessary to specify if the analysis is done only at parcel level or if it is up-scaled to the farm, where distribution water wastes also occur, or up-scaled to the system level, where more water wastes need to be considered. Anyway, equaling water application to ET is an absolutely unacceptable assumption.

h) Model of page 5901: it is not enough to send the reader to a table but it is necessary: i)to identify all variables when an equation is presented ii)to give units iii)to explain how parameters are obtained iv)to evidence the goodness of model parameterization (in results section)

i) page 5902 lines 5-7: ” To date, it is difficult to characterize droughts because of their spatial and temporal properties and the range of indicators required”; this is a wrong sentence because there are various good papers by Spanish colleagues identifying droughts in the Ebro basin

j) page 5902 lines 20-21: Authors assumed “a dummy variable that equals 1 if the year t is a drought year (with SPI smaller than -1) and 0 in other cases” for their modeling approach. This is totally inappropriate because the lack of water affects crops differently according the intensity of water shortage and periods when timing of water shortage. The approach is therefore too much rough. Literature has numerous examples how to deal with water scarcity impacts on yields.

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k) page 5903 lines 2-15: This text is written as for a summary and any reader may have extreme difficulties in understanding. For instance, writing “to help in the choice of appropriate models, we have used Akaike (1973) and Schwarz (1978) and adjusted R squared criteri\” is not all sufficient for a reader to understand what was performed. The basic information on the approaches by these authors, eventually the fundamental equations used, should be given. In addition R2 refer to which kind of relations? Which are the observed variables that could be related with simulated ones??. In addition, the VIF equation, includes a R2; it refers to which regression? Since you have k variables, thus k VIF values, which are the criteria for evaluation and elimination of variables??

l) Eq. lnGAV: the beta values are the same as for the model presented before? However, if the model is crop specific and various beta are used, in this equation beta refer to each crop and can not be the same. But it is not clear at all how these beta are obtained. The épsilon use to be residuals; in this case they are residuals of what? Which are the observed values, i.e., nothing is said about what is observed?

m) page 5904 lines 3-4: authors say: “Diagnostic tests were conducted as in the crop-water production function estimation process.” However it is essential to explain what kind of tests were used and which criteria were used to accept results.

n) 2.5 Montecarlo risk analysis this section is insufficiently described. It is not necessary that the article explains montecarlo approach but that be more clear about how it was used.

I could not clearly understand a large part of Material and methods and I deeply disagree of some assumptions made. Therefore I could not assess the Results and Conclusions sections.

From what said above, and particularly considering that assumptions referred above in g) and j) are unacceptable errors, the paper cannot be accepted for publication

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 7, 5895, 2010.