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Comment

Interactive comment on “Potential impact of climate and socioeconomic changes on future agricultural land use in West Africa” by K. F. Ahmed et al.

Anonymous Referee #1

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The authors develop a very simple algorithm in order to translate exogenously given changes in national (regional) crop production demand to local land use and crop area changes. They motivate their methodological development by a perceived deficiency of existing studies to link climate and land use change: “Although there is a strong link between climate and LULCC, the dynamics of land use change is not explicitly represented in regional and global climate models, partly due to the difficulties in formulating the human decision-making processes influencing anthropogenic land use”. While I agree that the dynamics of climate and land use needs to be improved in integrated assessment studies, I do not see the added value of the study at hand. Particularly, I see the following deficiencies:

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1. The proposed method does not solve for the (market) equilibrium between supply and demand. Demand is exogenously given and fixed. An equilibrium approach would be needed to depict market feedback of climate change. Such an approach should endogenously depict production, consumption, and trade along with market prices. 2. No convincing justification (e.g. empirical evidence) is given for the set of rules established in section 2.1. These rules are crucial for the proposed method and thus, should be verified and validated. Otherwise, the method incorporates a substantial amount of speculation. 3. The current algorithm is not at all suitable to resolve for the missing climate land use feedback in existing studies that was mentioned as a motivation in the introduction section of the paper. This happens a) because fixed demand levels (from an economic model) are used instead of price-endogenous demand functions and b) because climate impacts on crop productivity are exogenously calculated using another exogenous model (DSSAT). 4. The proposed algorithm does not portray adaptation of crop management. An increase in local production demand is assumed to retain the current intensity but to increase crop areas as long as land resources are available. In reality (even or especially in Africa), supply side adjustments are likely to include a combination of intensification and extensification. Limited intensification in the past does not automatically imply limited intensification in the future. 5. Climate change may affect local crop mixes. By fixing the total production quantity for each crop to the outcome of lower resolution models, crop mix changes are overly restricted.

Interactive comment on Earth Syst. Dynam. Discuss., 6, 1129, 2015.

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