

Interactive comment on “Defining sowing and harvest dates based on the Asian Summer Monsoon” by Camilla Mathison et al.

Anonymous Referee #2

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The authors have identified a relevant issue for improving broad scale climate impacts modelling for crops and adaptation studies. That being that using generic dates for crop sowing and harvesting are problematic, because sowing dates vary from year to year, and from location to location, and any simulation study that assumes they are uniform will be prone to potentially significant errors. They proposed a method to estimate sowing and harvest dates for two crops in sequence (in this case rice-wheat) using the onset of the Asian monsoon, and demonstrated performance of their new method. I think the topic is novel and important and is well suited to this journal. The article is well-written and illustrations are clear. The methodology and results presented clearly demonstrate improved performance compared with other previous/alternative methods cited (eg Sacks et al. 2010) however I am left with some significant questions

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about whether they have really demonstrated improved results over generic guesses for sowing and harvesting dates. I shall attempt to state these issues below:

1. I think their method for estimating monsoon rice sowing date across time and space is likely to be good, however I am less convinced with the estimate of harvest date. From what I can gather, they make the assumption that the retreat of the monsoon is predictably associated with rice harvest, with certain lag. This is very often not the case in South Asia, with the monsoon stopping well before rice harvest in many years (leaving crops with a dry finish) while in other years the crop is ready and waiting for harvest in the field with the monsoon ongoing and preventing farmers from harvesting. In my experience of working in this region with rice-wheat systems (10 years now), I have never felt that rice harvest is reliably predictably from date of monsoon retreat. They present results to show the degree to which observed harvest dates and estimated ones agree, but I believe the variability/error in that might overshadow all the improvements in estimation of sowing date they have gained?
2. I am also wondering why estimation of harvest date is required by crop models to which this method might be applied? Don't crop models actually simulate when the crop is ready for harvest, given an input of 'sowing date'? Estimating the sowing date is of great value as a model input parameter, no doubt, but why estimate harvest? Why not simulate?
3. Even if not simulating harvest date, wouldn't it be better to simply use their climate models to accumulate daily thermal time after sowing to better estimate harvest time, rather than using retreat of the monsoon?
4. I also understand that the authors have used a fixed time (days) after retreat of the monsoon to estimate wheat sowing date. This is similarly worrying for me, due to the variability in when the monsoon retreats, compared with the actual year-to-year constancy of the date in which many farmers (particularly those with access to irrigation water for growing rabi wheat) sow their wheat crops in South Asia. Sowing of rabi wheat

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is almost never triggered by soil water availability or time from the monsoon finish, or rainfall. It is triggered by a recommended ideal or optimum sowing date, advised by the local agronomic extension service or university. When you have irrigation water, you are not dependant on rainfall for sowing. All rabi wheat in South Asia is irrigated to the best of my knowledge. So, once again I would suggest that the optimum sowing time for rabi crops like wheat is a better estimation of actual wheat sowing date than the method the authors have presented. This will vary slightly between locations in South Asia, but not greatly. I suspect a lot less than the estimated sowing dates from the author's methods. Also, this 'optimum' sowing date will change with a changing climate of course, but crop models can simulate that.

5. Once a sowing date for wheat has been estimated (by whatever method), I would suggest that the best method to estimate harvest date is simply to simulate it using crop models. They take into account thermal-time accumulation requirements for different crops and varieties, slowed or hastened by things like water stress, N-stress etc.. But if an even more simplified method is desired just from climatic data, why not just accumulate thermal time from the climate data following the estimated sowing of the crop, until the specified thermal time requirement for that crop is met?

6. Lastly, I guess a significant reason why I am not yet convinced by the presented methodology is that the authors have not provided adequate evidence that it works for estimating things like "crop duration" which eventually leads to crop yield (most likely the key aspect on which an adaptation strategy is assessed). Just showing error in sowing date and harvest date and claiming that they're individually not too bad doesn't fill me with confidence. For example, a 15% +ve error in estimating sowing date, combined with a 15% -ve error in harvest date could mean a 30% error in crop duration. This would have a huge effect on grain yield. Apart from estimating sowing date correctly, how often does method estimate 'crop duration' correctly? That would be more meaningful question for me. A check on whether their method is regularly getting 'crop duration' correct would be a good test that they may be easily able to add

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to this manuscript?

Forgive me if I have misunderstood aspects of the paper, as I am not a climatologist, I am an agronomist, however I suggest that the authors need to respond to these points adequately and explain why their method is better than doing what I have suggested, before their work is suitable for publication. I like the basic premise of their work, and I congratulate them on it. But I think it could be better, and could be evaluated more robustly.

Other miscellaneous points- Title – wouldn't 'Estimating' or 'Predicting' be a better word than 'Defining' in this context? Ln 12 – replace 'are' with 'is'; insert 'more representative' before 'climate' Ln 24 – replace 'site' with 'field' ? Ln 61 – add 'and cropping environments (soils etc)' after 'climatic conditions' Ln 89 – Basmati rice is really only grown in Pakistan to my knowledge, but most 'local' rice varieties are long-season and highly photo-period sensitive. Ln 307 – 'is still good agreement' – this is very qualitative. Why is it 'good'? What are your criteria for 'goodness'? Ln 403 – 'Sowing and harvest dates are an important input within crop models...' - is this true? Sowing date is an important input, yes, but harvest dates are usually simulated??? What crop models are you talking about that need to be told the harvest date?

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