Topic editor decision: Publish subject to minor revisions (review by editor)

Public justification (visible to the public if the article is accepted and published): Congratulations! Your revised manuscript has been accepted in principle. The reviewers are satisfied with your revisions, and only minor, final adjustments based on this round of comments are required.

Reply to the Topic Editor:

We sincerely thank the Topic Editor and the Reviewers for the positive evaluation of our revised manuscript and for recognizing the improvements made in the previous revision. We are very pleased that the manuscript has been accepted in principle.

In response to this final round of comments, we have carefully revised the manuscript and Supplementary Materials. Specifically, we further clarified the temporal representativeness of the five-year composite products, added a quantitative annual-versus-composite uncertainty assessment for rice cropping intensity, incorporated additional local visual comparisons with reference imagery, revised potentially misleading wording related to strict annual interpretation, and corrected the typographical and citation issues identified by the Reviewer.

We believe these final revisions have improved the clarity, rigor, and usability of the dataset for future users. We greatly appreciate the Editor's and Reviewers' constructive guidance throughout the review process.

Anonymous Referee #1

I appreciate the authors' efforts in clarifying the effectiveness of the multi-year composite strategy and providing additional experiments and map comparisons to address the introduced systematic errors. By comparing the annual mapping results (2020–2025) with the five-year composite mapping, it is evident that the composite method primarily impacts the captured planting intensity. For instance, in Fig. R2, the areas identified as multiple rice have expanded significantly, and the authors should provide a physical or methodological explanation for this phenomenon in the manuscript.

Reply:

We sincerely thank the Reviewer for this constructive and helpful comment. We agree that the apparent increase in multiple-season rice in some local intensive rice-producing areas requires a clearer physical and methodological explanation in the manuscript.

Following the Reviewer's suggestion, we have added a dedicated discussion on the temporal representativeness of the five-year composite products in Section 4.3 of the revised manuscript. We clarified that the larger multiple-season rice areas identified in the five-year composite product should not be interpreted simply as a direct expansion of rice fields within a single year. Instead, this pattern mainly reflects the improved detectability of multiple cropping signals when observations from a multi-year window are composited.

Specifically, in intensive rice-producing deltas such as the Ayeyarwady Delta and Mekong Delta, rice cropping cycles may begin in the preceding calendar year or extend into the following year. Persistent monsoon cloud contamination can also cause single-year optical composites to miss key flooding, transplanting, or peak-growth phases. As a result, annual maps may omit or downgrade one or more rice seasons when valid observations are insufficient during these short diagnostic windows. The five-year compositing strategy increases the probability of capturing these diagnostic phenological and flooding signals, thereby improving the detection of multiple-season rice in such regions.

To support this explanation quantitatively, we incorporated the annual-versus-composite experiment into the Supplementary Materials. The annual results showed that the broad rice extent was comparatively stable at the regional scale, with a mean total rice extent of 50.67 Mha and a coefficient of variation of 6.7% during 2021–2025. In contrast, cropping-intensity classes were more sensitive to annual observation availability, particularly double- and triple-season rice, whose coefficients of variation reached 15.4% and 31.9%, respectively. Compared with the annual mean, the five-year composite product showed only a moderate difference in intensity-weighted rice area (+5.3%), indicating that the main influence of multi-year compositing lies in the allocation and detectability of cropping-intensity classes rather than a fundamental change in the broad rice-growing extent.

These revisions have been incorporated into the revised manuscript in Section 4.3 and supported by the new Supplementary Note, Tables S2–S3, and Figs. S8–S13. We believe these additions provide clearer guidance for data users regarding the interpretation of multiple-season rice in the five-year composite products.

Furthermore, the results demonstrate that the rice planting distribution within the study area remains relatively stable. This successfully addresses my primary concern regarding whether the five-year composite would compromise the identification of rice in alternating planting areas. Quantitatively, the improved data availability and mapping stability afforded by the five-year composite outweigh the negative effects of multi-year smoothing; missing phases in single-year imagery could otherwise lead to severe, large-scale under-identification, particularly in earlier periods (e.g., pre-2000) when available data were scarcer. Based on the provided experiments and comparative analyses, I agree that the five-year composite strategy is reasonable and its impact within the study area is well within a controllable range. I suggest the authors reorganize these findings and incorporate them into the Discussion Section of the main text to provide clearer insights for data users.

Reply:

We sincerely thank the Reviewer for the positive evaluation and constructive suggestion. Following the Reviewer's recommendation, we have reorganized the annual-versus-composite findings and incorporated them into the Discussion section of the revised manuscript.

Specifically, we added a dedicated discussion on the temporal representativeness of the five-year composite products in Section 4.3. In this section, we clarify that the five-year composite strategy improves valid observation density and mapping stability, particularly for historical and cloud-prone periods, but that the resulting products should be interpreted as multi-year composite-period rice maps rather than strict annual maps. We also summarize the key quantitative findings from the 2021–2025 annual-versus-composite experiment, showing that the broad rice extent remained comparatively stable, while cropping-intensity classes were more sensitive to annual observation availability.

Detailed annual-versus-composite comparisons, including the single-, double-, and triple-season rice area statistics and spatial comparison maps, have been added to the Supplementary Materials as a new Supplementary Note, Tables S2–S3, and Figs. S8–S13. These revisions provide clearer guidance for data users regarding both the strengths and temporal limitations of the five-year composite products.

Finally, to ensure a fairer and more comprehensive comparison, I recommend adding local image visualizations to Figure 6 of the revised manuscript to facilitate qualitative evaluation.

Reply:

We sincerely thank the Reviewer for this helpful suggestion. Following the Reviewer's recommendation, we have added field-scale local image visualizations to support the qualitative evaluation of the product comparisons shown in Fig. 6.

Specifically, we revised the Supplementary Fig. S3 to include three representative zoom-in regions corresponding to the local comparison areas in Fig. 6. For each region, we provide field-scale comparisons among our results, NESEA-Rice10, Open-SEA-Rice-10, and Sun et al. (2023). We further added corresponding reference imagery in the bottom row, including a Sentinel-2 false-color composite for the first local region and Sentinel-1 SAR pseudo-color composites for the second and third local regions. These reference images provide independent visual evidence for assessing the spatial consistency of rice-field boundaries and multiple-season rice patterns among the compared products.

To make this connection clear in the manuscript, we have also added a sentence after the description of Fig. 6 indicating that additional field-scale comparisons with corresponding reference imagery are provided in Fig. S3. We believe this revision improves the fairness and interpretability of the qualitative product comparison while avoiding excessive visual complexity in the main-text figure.

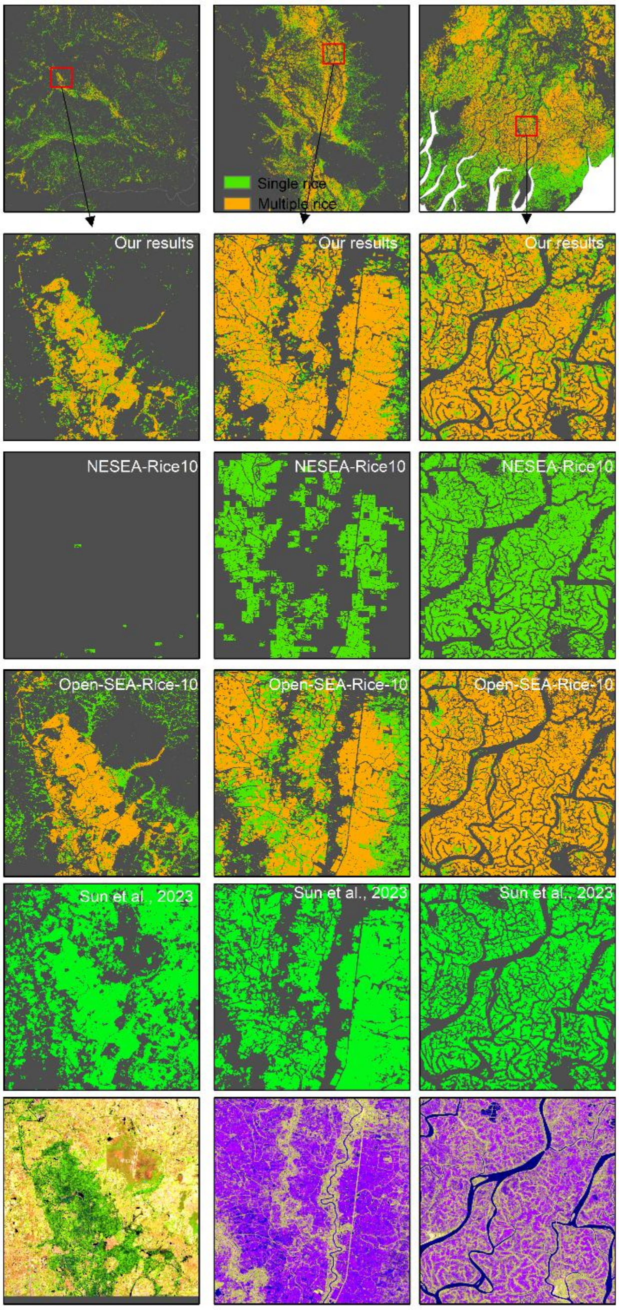

Fig. S3. Field-scale comparison of rice distribution and cropping-intensity products with corresponding reference imagery. The top row shows regional overview maps from this study, with red boxes indicating the selected zoom-in regions. The following rows provide field-scale comparisons among our results, NESEA-Rice10, Open-SEA-Rice-10, and Sun et al. (2023). Green indicates single-season rice or rice extent, and orange indicates multiple-season rice where available. The bottom row shows corresponding reference imagery used for qualitative evaluation: the first column uses a Sentinel-2 false-color composite, while the second and third columns use Sentinel-1 SAR pseudo-color composites. These reference images help assess the spatial consistency of rice-field boundaries and multiple-season rice patterns across different products.

It is recommended to cite the article "25-year, quarterly land change maps of China's Loess Plateau reveal long-term and substantial water-induced soil erosion mitigation."

Reply:

Following the suggestion, we have cited the recommended study by Cheng et al. (2026) in the introduction section.

Anonymous Referee #2

The authors have made substantial efforts to address the concern regarding the multi-year compositing strategy. However, I still have several concerns.

First, the current validation remains insufficient for evaluating the reliability of rice cropping intensity. In both the manuscript and the response letter, the reported accuracy assessment mainly focuses on binary rice/non-rice accuracy metrics, but does not provide quantitative uncertainty analysis for single-, double-, and triple-season rice. Since the authors have already conducted an annual-versus-composite experiment in the response letter, this analysis could be used to quantify the impact of multi-year compositing on cropping intensity. For example, the authors could report the differences in double- and triple-season rice between the annual maps and the composite map, or summarize the changes in cropping intensity classes between these products. In addition, the annual-versus-composite comparison described in the response letter could be incorporated into the manuscript or supplementary materials.

Reply:

We sincerely thank the Reviewer for this important suggestion. We agree that the previous revision relied mainly on binary rice/non-rice accuracy metrics and did not sufficiently quantify the uncertainty associated with single-, double-, and triple-season rice. Following the Reviewer's recommendation, we have now incorporated the annual-versus-composite experiment into the revised manuscript and Supplementary Materials as a quantitative uncertainty assessment of rice cropping intensity.

Specifically, we summarized the annual rice-intensity maps from 2021 to 2025 and compared them with the corresponding five-year composite product. The new analysis reports the areas of single-, double-, and triple-season rice, total rice extent, and intensity-weighted rice area. This allows us to quantify how multi-year compositing affects different cropping-intensity classes rather than evaluating only binary rice/non-rice discrimination.

The results show that total rice extent remained comparatively stable across the annual maps, with a mean of 50.67 Mha and a coefficient of variation of 6.7%. In comparison, annual variability was larger for the intensity classes, especially double-season rice and triple-season rice, whose coefficients of variation were 15.4% and 31.9%, respectively. This indicates that single-year optical mapping is more sensitive to missing observations when retrieving cropping intensity than when delineating the broad rice-growing extent.

We further compared the annual mean with the five-year composite product. The composite product had a total rice extent of 56.74 Mha, compared with 50.67 Mha for the annual mean, and an intensity-weighted rice area of 73.44 Mha, compared with 69.75 Mha for the annual mean. The relative difference in intensity-weighted rice area was therefore +5.3%. At the class level, the composite product altered the allocation among single-, double-, and triple-season rice classes, confirming that the primary uncertainty introduced by multi-year compositing concerns cropping-intensity classification rather than only binary rice/non-rice mapping.

We have summarized these key findings in Section 4.3 of the revised manuscript and added the detailed annual-versus-composite comparison to the Supplementary Materials, including a new Supplementary Note, Tables S2–S3, and Figs. S8–S13. We have also clarified that this analysis should be interpreted as an annual-versus-composite uncertainty assessment rather than an independent ground-truth validation. These revisions directly address the Reviewer's concern by quantifying the impact of the five-year composite strategy on single-, double-, and triple-season rice.

Table S2. Annual mapping experiment for rice cropping intensity during 2021–2025

Year	**Single-season rice**	**Double-season rice**	**Triple-season rice**	**Total rice extent**	**Intensity-weighted rice area**
2021	32.42	14.46	0.56	47.44	63.02
2022	35.05	18.74	0.96	54.75	75.40
2023	30.81	21.18	1.08	53.07	76.41
2024	33.46	16.99	0.56	51.01	69.12
2025	30.52	15.49	1.11	47.11	64.81
Mean	32.45	17.37	0.85	50.67	69.75

Range	30.52–35.05	14.46–21.18	0.56–1.11	47.11–54.75	63.02–76.41
CV (%)	5.8	15.4	31.9	6.7	8.7

Unit：Mha

Table S3. Area differences between annual maps and the five-year composite product

Metric	Annual mean 2021–2025	Annual range	Five-year composite 2024	Difference	Relative difference
Single-season rice	32.45	30.52–35.05	41.80	+9.35	+28.8%
Double-season rice	17.37	14.46–21.18	13.17	−4.20	−24.2%
Triple-season rice	0.85	0.56–1.11	1.77	+0.91	+106.6%
Total rice extent	50.67	47.11–54.75	56.74	+6.07	+12.0%
Intensity-weighted rice area	69.75	63.02–76.41	73.44	+3.69	+5.3%

Unit：Mha

Second, these products should be interpreted as multi-year composite products rather than strict annual maps. However, the manuscript uses expressions such as “for the years 1995, 2005, 2015, and 2024” and “within a single year”. Such wording may mislead readers regarding the temporal representativeness of the products, especially for cropping intensity.

Reply:

We sincerely thank the Reviewer for pointing out this important issue. We agree that the previous wording could mislead readers into interpreting the products as strict annual maps, particularly for cropping intensity. We have therefore carefully revised the manuscript to clarify the temporal representativeness of the dataset.

Specifically, we replaced potentially misleading expressions such as “for the years 1995, 2005, 2015, and 2024” and “within a single year” with terms such as “nominal reference years,” “multi-year composite periods,” “composite-period products,” and “composite-period cropping intensity.” These revisions were made throughout the Abstract, Methods, Results, figure captions, Data availability, and Conclusions. We also added an explicit clarification in Section 4.3 and the Data availability section that the products should be interpreted as multi-year composite-period rice maps rather than strict annual maps, especially for cropping intensity.

Finally, there are several typos in the manuscript. For example, Table 1 lists Landsat-5 for the 2015 composite period, although Landsat-5 was no longer operational during 2014-2016. In the description of Eq. (4), the second "NDVImin" should be "NDVImax". The citation "Zhao et al. (2025b)" in the Data availability section is incorrect. There are other similar issues that I have not listed here. Please carefully revise the manuscript to correct these issues.

Reply:

We sincerely thank the Reviewer for carefully identifying these errors. We apologize for these oversights and have carefully checked the revised manuscript, Supplementary Materials, figure captions, tables, equations, and references to correct these and other similar issues.

First, we corrected Table 1 by removing Landsat-5 from the 2015 composite period, because Landsat-5 was no longer operational during 2014–2016. The 2015 product is now correctly listed as being generated from Landsat-7 and Landsat-8 observations for the 2014–2016 composite period. We also revised the table heading from "Reference Year" to "Nominal reference year" to more clearly indicate the temporal representativeness of the products.

Second, we corrected the description of Eq. (4). The second "NDVImin" has been changed to "NDVImax", so that the sentence now correctly defines NDVImin as the minimum NDVI value and NDVImax as the maximum NDVI value within the considered period.

Third, we corrected the citation in the Data availability section. The Zenodo dataset is now cited as Zhao et al. (2025a), consistent with the dataset citation used elsewhere in the manuscript. We also added a clarification that the products correspond to multi-year composite periods represented by the nominal reference years 1995, 2005, 2015, and 2024, and should not be interpreted as strict annual maps.