

1 Thank you very much for the very useful and constructive comments. Following the
2 suggestions, we made major revisions as follows.

3

4 **Response to Reviewer #1**

5

6 **General comments**

7 [G2] The idea of using simple (and thus easily globally applicable) remote sensing techniques
8 for the derivation of crop cycles is not entirely new. Especially the use of simple multispectral
9 vegetation indices such as the NDVI is very critically discussed among the remote sensing
10 community, because VIs only provide relative estimations and must rely on a high degree of
11 empiricism, if land surface information shall be provided by them. However, the authors have
12 compiled a data set that holds some potential for future applications. Due to reasons of data
13 scarcity, the authors resort to averaged data from three consecutive years (2004-2006). The
14 data product generated from this study therefore is of limited use for the direct
15 parameterization of global growth models. However, taking the current development in Earth
16 Observation into account (e.g. the development of ESA's Sentinel series), data scarcity will
17 soon be less critical compared to now. The proposed method represents a simple and thus
18 easily applicable approach that can potentially make use of large amounts of temporally
19 highly resolved global optical Earth Observation data and may provide interesting input
20 parameters for global land surface models.

21 **Response:** We agree with you that VIs only provide relative estimations. As we noticed this
22 characteristics, we proposed normalized NDVI (i.e., nNDVI) to estimate the CC using the two
23 CC parameters (nNDVI_{pl} and nNDVI_{hv}). Our algorithm therefore is easily applicable to the
24 global cropland and additional satellite observations. We state it clearly in the revised
25 manuscript (P15L26–P16L3).

26

27 [G4] I experienced some difficulties with understanding the paper. Some of them surely were
28 due to language and style, while others were rather due to a too unspecific description of the
29 approach. Nonetheless, I think that the methods and assumptions in general are valid. The
30 authors, however, should concentrate on precise and unmistakable phrasing. Reading some

1 passages, I have gained the impression that the authors mean to describe the right thing, but
2 resort to unfavourable terms. For example, the authors should more clearly discriminate
3 between “food” and “biomass” or between “growth” and “vegetation vitality” etc. (please,
4 above all, see my detailed comments in the manuscript).

5 [Response: We apologize for some difficulties with understanding the paper. Also we would](#)
6 [like to express our deeply thanks for your giving us many suggestions in the supplemental](#)
7 [file. We have revised the manuscript carefully following the suggestions.](#)

8

9 [G5] True validation is hard to achieve in global studies. The authors therefore compare their
10 results to the MIRCA2000 data set and analyse the disagreement. Deviations between the two
11 data sets are very large in some regions (up to 4,5 months). However, it is hard to decide
12 which data set is closer to the truth. I also think that neglecting triple cropping systems (only
13 two crops during one growing cycle are taken into account by the presented algorithm) will
14 lead to errors in some parts of the globe. This should be taken into account in the discussion
15 section. Also, the fact that bimodal distributions of NDVI may occur on agricultural sites that
16 are not part of a managed cultivation cycle, e.g. in the case of volunteer crops, is not
17 discussed.

18 [Response: In the revised manuscripts, we considered triple cropping. We have added the](#)
19 [discussion about difference between the satellite-derived cropping intensity and climate-](#)
20 [derived cropping intensity \(Zabel et al. 2014; P7L4–P8L7, Table 3, Figs. 5 and 6\). Also we](#)
21 [have included the discussion about effect of bimodal distribution of NDVI in the discussion](#)
22 [session \(P15L16–P15L25\).](#)

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24 [G6] From my point of view, it is hard to follow how the involved empirical thresholds were
25 generated (e.g. which assumptions led to their determination). It is e.g. mentioned in section
26 2.3 of the manuscript that “*The values of two CC parameters $nNDVI_{pl}$ and $nNDVI_{hv}$ are*
27 *determined for each crop to minimize the errors between planting/harvesting dates of*
28 *determined and MIRCA2000 over pure grids.*” However, it is not described how this
29 optimization was performed (automated or manually), which statistical indicators were
30 analysed to determine the error, which thresholds of confidence were applied etc. Also the

1 determination of other empirical parameters, such as NDVI_{param} used for noise suppression,
2 is not explained.

3 **Response:** We have added an appendix to describe how to identify the two CC parameters
4 (Appendix-A). We also stat derivation of parameters NDVI_{snow} (P6L26).

5

6 [G7] The authors discuss that the major benefit of the proposed approach lies in the high
7 spatial resolution compared to other global products. A second benefit of a remote-sensing-
8 based method is that actual current vegetation activity is monitored. It would be interesting to
9 compare the findings of the presented study on actual growth cycles with results on growth
10 cycles based on the agroecological potential (e.g. Zabel et al. (2014)). Such a comparison
11 could provide interesting information on the current global distribution of cropping intensity.

12 **Response:** We have added the comparison of crop intensity with Zabel et al. (2014) in the
13 revised manuscript (P7L4–P8L7, Table 3, Figs. 5 and 6).

14

15 [G8] I think the title in its current form is somewhat redundant and limits the application of
16 the SACRA crop calendars to pure agricultural simulations. From my point of view the title
17 could be shortened and should be revised, e.g.: “SACRA – A Method for the Estimation of
18 Global High-Resolution Crop Calendars from satellite-sensed NDVI” or something similar.

19 **Response:** We have revised the title following the suggestion.

20

21 [G9] The abstract should be more precise. Instead of adjectives/adverbs like “many”, “well”,
22 “similar” etc. the obtained results should be mentioned in numerical form the abstract.

23 **Response:** We have revised the abstract following the suggestion.

24

25 [G10] In my opinion, the paper should be partly restructured. For example, the crop types
26 taken into account are mentioned at a very late point in the manuscript (section 2.3, Page 8).
27 This should be stated more clearly at the beginning. Also, the authors should focus on
28 avoiding general and elusive adjectives, such as “large”, and rather include concrete results
29 in numerical form into the text. Subscripts should be explained without exception next to the

1 equations. Some figure captions should provide more detail (e.g. the labels of Figure 6 are
2 described in the text but not in the caption, the stand-alone figure thus cannot be understood).

3 **Response:** We have reconstructed the manuscript following suggestions. Also we have
4 carefully revised the manuscript by modifying unfavorable terms and figure captions.

5

6 [G11] Not being a native speaker of English myself, I don't feel fully qualified to judge
7 English Language and style. The manuscript nonetheless seems a little bit hastily prepared, as
8 indicated by a high number of typos. Trying to comprehend the manuscript, I therefore
9 inserted some proposals for possible improvement while reading it.

10 **Response:** Thank you for many specific comments and suggestions. We have revised the
11 manuscript following proposals.

12

13 [G12] The Equations should be carefully checked. In some cases (e.g. Eqs. 3 and 4) not all of
14 the subscripts are explained. Adding a comma between equation and equation numbering is
15 potentially confusing.

16 **Response:** The Equations have been carefully revised in the revised manuscript. Thank you
17 for pointing it out.

18

19 [G14] The authors cite 35 appropriate sources in their manuscript. However, I would like to
20 encourage the authors to have a look at: Waha, K., van Bussel, L.G.J., Müller, C., Bondeau,
21 A. (2012). Climate-driven simulation of global crop sowing dates. *Global Ecology and*
22 *Biogeography*, 21(2), pp.247-259, doi: <http://dx.doi.org/10.1111/j.1466-8238.2011.00678.x>
23 Zabel, F., Putzenlechner, B., Mauser, W. (2014). Global Agricultural Land Resources – A
24 High Resolution Suitability Evaluation and Its Perspectives until 2100 under Climate Change
25 Conditions. *PLoS ONE* 9(9): e107522. doi: 10.1371/journal.pone.0107522

26 **Response:** Thank you for your suggestion. We have added discussion by comparing our
27 results with Waha et al. (2012; P10L6–P13L24, Table 5, Figs. 9, 10, 11, A3, and A4)

28

29 **Specific comments**

1 [S2] Page 1335, line 9: Which crop types? Maybe add a table?

2 Response: We have added a table in the revised manuscript (Table 2).

3

4 [S3] Page 1335, line 10: This is hard to follow. Does MIRCA2000 provide subscale
5 information on crops? Did you perform majority filtering? The spatial resolution of
6 MIRCA2000 and SACRA is identical at 5 min...

7 Response: MIRCA2000 provides subscale information on crops. At each grid, we identified a
8 dominant crop that has the largest “maximum monthly harvested area“ in MIRCA2000. We
9 have revised the manuscript to avoid the misunderstandings (P4L1–P4L18).

10

11 [S4] Page 1335, line 15: This is a major drawback, because sowing dates of winter crops
12 largely affect the yield potential. Although I understand that the derivation of sowing dates is
13 not possible with the proposed approach, information on sowing dates of winter crops would
14 be very important for improving yield estimations of winter crops. This should be highlighted
15 in the discussion section.

16 Response: The manuscript highlights the disadvantage of our algorithm in the discussion
17 section (P15L3–P15L15).

18

19 [S5] Page 1336, line 13: Is this an automated optimization process? What are the regulations
20 for the optimization?

21 Response: We manually optimized the parameters (see Appendix-A for details).

22

23 [S6] Page 1336, line 25: This is too vague. What are the error sources?

24 Response: With time series of NDVI, we determined sowing dates with NDVI_{pl} and
25 harvesting dates with NDVI_{hv}. Therefore, cultivation period (from sowing date to harvesting
26 date) are largely affected by shape of the NDVI (e.g., kurtosis of the NDVI curve). We have
27 described it in the revised manuscript (P9L9–P9L12).

28

1 [S7] Page 1338, line 13: How do you define "large" here? The legend of Fig. 6. (a) indicates
2 that "large = red = 3,5-4,5 months of disagreement between both data products. Please be
3 more specific in the text.

4 Response: We specify the definition of "large" in the revised manuscript (more than 135
5 days) in P12L4.

6

7 [S8] Page 1339, line 6: Actually, this cannot be seen very well in Fig. 6 b-1 and b-2. Although
8 the histogram of the sowing months indicates two growing seasons, SACRA only detects one
9 season in Arizona and Uzbekistan and "misses" the second peak. Or is only one of the
10 detected seasons shown in Fig. 6? Please clarify.

11 Response: The revised manuscript compares CCs averaged over administrative units
12 (P11L16, Table 5, Figs. 9, 10, 11, A3, and A4), because it is difficult to demonstrate whether
13 the variability is correct around the globe without knowledge of the local CC information
14 (P11L11).

15

16 [S9] Page 1340, line 3: I think "downscaled" is the wrong term here. Surely SACRA would
17 have to be recalculated with higher resolution remote sensing data (e.g. from future Sentinel-
18 2) rather than downscaled, if higher resolution land cover maps become available.

19 Response: We have revise the manuscript following the suggestion (P14L13).

20

21 [S10] Page 1340, line 11: Actually, yearly information on CC would provide very interesting
22 input data for global growth modelling, while averaged CC can be nice for the analysis of
23 long-term patterns. I think this should be included in the discussion.

24 [S11] Page 1340, line 19: This is only feasible, if SACRA is not applied on data averaged
25 from several years...

26 Response: Due to data scarcity, we have not produced annual CC. However, taking into
27 account the current development in Earth observation, data scarcity will soon be less of an
28 issue. We discuss the annual CC in discussion (P15L26–P16L3).

29

1 [S12] Page 1340, line 21: The wavelengths required for the calculation of the NDVI are
2 relatively easy to measure from satellite sensors. The error in NDVI measurements therefore
3 is rather small. I think the accuracy of SACRA is mainly determined by the temporal
4 resolution of adequate observations, which again depends on the availability of sensors, the
5 revisiting time of the applied systems and last but not least the weather (cloud cover).

6 **Response:** We agree with you that the accuracy of SACRA was mainly determined by not
7 NDVI measurement but temporal resolution and mixture of other phenology (e.g., forest,
8 minor crops and volunteer crops). We describe it in the revised manuscript (P16L4– P16L15).

9

10 [S13] Page 1347, Table 3: What "judgement" is meant here? Since the SACRA algorithm
11 only is applied on regions that have already been identified as cropland from census-based
12 data, here no discrimination between managed and natural surfaces is required. The decision
13 rather is, whether the managed land is currently cultivated or temporarily disused.

14 I therefore would rather settle for: "Detection of current cultivation activiy" or somethong
15 similar..

16 **Response:** We use the “detection of current cultivation activity“ in the revised manuscript
17 (Table 6 and P14L18–P14L24).

18

19 [S14] Page 1348, Figure 1: Figure 1 is not entirely clear:

20 The numbers inside the boxes indicate the sections of the paper, where the different
21 processing steps are described.

22 The numbers outside of the boxes indicate the spatial resolution of the respective data sets.

23 This should be explicitly mentioned in the caption.

24 **Response:** Following the suggestion, we state them in the caption of Fig. 1.

25

26 [S15] Page 1352, Figure 5: Did you chose this subset for a reason? Are the differences
27 between SACRA and MIRCA2000 especially visible in South Asia or are Figs. a-2 and b-2
28 just an arbitrary example to highlight the higher spatial variability in the SACRA results?

1 Response: We chose the region arbitrary to highlight the higher spatial variability in the
2 SACRA results (P11L1).

3

4 [S16] Page 1353, Figure 6: Figure (a) only shows positive values. The shown differences
5 therefore must be absolute differences. However, the direction of the deviation would be
6 interesting. Is SACRA signalling earlier or later sowing dates compared to MIRCA2000?
7 How are the results compare to the agroecological potential.? Do farmers sow/harvest early or
8 late compared to the agroecological optimum?

9 Response: We have checked whether the SACRA is signalling earlier or later by revising the
10 legend of Figs 10 and A3. We compare the satellite-derived cropping intensity with climate-
11 derived cropping intensity (Zabel et al. 2014) in P7L4–P8L8, Table 3, Figs. 5 and 6. Also we
12 add a comparison the SACRA with model-based crop calendar (Waha et al. 2012) in
13 P10L6–P13L24, Table 5, Figs. 9, 10, 11, A3, and A4.

14

15 **Response to Reviewer #2**

16

17 **General comments**

18 [G4] As Anonymous Referee 1, I also experienced some difficulties understanding the
19 manuscript, first due to language and style, but mostly due to the often too short, rather vague
20 and often repetitive description of the approach and methods, while the approach in general
21 appears to be valid. Also, I often missed precise and unmistakable wording. Like for
22 Anonymous Referee 1, while reading the text it appeared to me that the authors want to
23 express the right aspect, but use unfavourable phrases and wording, e.g. unspecific terms or
24 various terms for the same meaning. E.g. "typical crop" should be replaced by a better term,
25 e.g. "dominant crop" which also includes the meaning of the maximum area covered per grid
26 cell.

27 Response: We apologize for the difficulties in understanding the manuscript because of
28 insufficient and vague descriptions. We have revised the manuscript following the
29 suggestions.

30

1 [G5-1] As Anonymous Referee 1, I agree on the difficulty of global-scale validation, e.g.
2 always regions with mismatch occur. In the comparison of crop calendars of remotely-sensed
3 SACRA to MIRCA2000, it is hard to tell which one is better. While SACRA uses more
4 current information, MIRCA2000 rather states average conditions and possibly conditions of
5 nearby administrative units, used because of lack of more detailed reference information. So it
6 would be possible that both are correct, e.g. if they referred to different time periods. The
7 authors should also state why they preferred crop calendars of MIRCA2000 to the ones of
8 Sacks et al. 2010, as the latter ones possibly might be better suited.

9 Response: We agree with you that both MIRCA2000 and SACRA can be correct. We state it
10 in the revised manuscript (P13L14–P13L24). We selected the MIRCA 2000 arbitrarily as one
11 census-based CC. To see the characteristic of SACRA from different aspects, we compare
12 SACRA with model-based crop calendar (Waha et al. 2012) in P10L6–P13L24, Table 5, Figs.
13 9, 10, 11, A3, and A4.

14

15 [G5-2] One important aspect is also no discussed: MIRCA2000 delivers crop calendars for
16 either irrigated or rainfed crops, which possibly, but not necessarily coincide for a given
17 administrative calendar unit. How is this fact represented in the evaluation or validation/
18 comparison?

19 Response: As pointed out, we do not distinguish CC for irrigated and rainfed crops. We
20 assumed that the two CC parameters (NDVI_{ipl} and NDVI_{ihv}) are depending on crop species.
21 We also assumed that the two CC parameters are independent on cropping style (i.e., irrigated
22 or rainfed). The CC of SACRA can be different from CC of irrigated/rainfed crops of
23 MIRCA2000. We state the assumption in the revised manuscript (P15L16–P15L25).

24

25 [G5-3] Anonymous Referee 1 mentions the importance of triple cropping. I am not sure to
26 what extent triple cropping is really important, but multiple cropping occur with the
27 cultivation of different crops on the same fields, especially in countries with intensive
28 cropland use like India or China. How does the SACRA algorithm / analysis of NDVI deal
29 with that?

30 Response: We added an explanation to identify the multiple cropping in the SACRA
31 algorithm (P6L11–P6L20).

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[G5-4] In the case where two crops with nearly identical area in MIRCA2000, to what extent would the selection of the dominant crop influence the validity?

Response: As we described in the original draft, we assumed that NDVI-Filled represents the phenology of the dominant crop at an administrative unit. As pointed out, selection of the dominant crop can affect the validity in the case here two crops with nearly identical area in MIRCA2000. We state it in the revised manuscript (P15L16–P15L25).

[G5-5] In Fig. 6, the differences in planting months of MIRCA2000 and SACRA are only broadly shown, but not discussed on the basis of the specific dominant crops.

Response: We add the discussion on the basis of dominant crops (P11L23–P13L24, Table 5, Figs. 9, 10, 11, A3, and A4.).

[G9] Line 21: Why is the peak date of importance? With a monthly crop calendar, this probably refers to peak NDVI or derived vitality. The indication of a possible application or usefulness, e.g. reference for vegetation modelling, would be helpful.

Response: Some of crop-growth models simulates growing stage (e.g. Horie et al. 1987). Peak date can be useful to simulate peak date accurately by calibrating model parameters. The possible application is stated in the revised manuscript (P14L30).

[G10] Again, I agree to Anonymous Referee 1 that the manuscript should be partly restructured. Especially the selection of the considered crops should be mentioned before section 2.4 (page 1336).

I think that the aim of the manuscript on page 1332 is clearly stated, but afterwards the description flattens considerably. Especially Figures 1, 4, and 6 are not very clearly produced or commented.

Response: We have reconstruct the manuscript following the suggestions from two anonymous referees. Also, we state the all figures sufficiently in the revised manuscript.

1 [G11] Some more precise wording would be appreciated to bring in more clarity and the
2 ability to fully understand.

3 **Response:** We have revise the manuscript following the comments by two anonymous
4 referees.

5

6 [G15] No supplementary material is currently provided with the manuscript. A freely
7 available data set via a website would be probably greatly appreciated by many scientists
8 involved in global modelling. I suggest to introduce some version numbering, as it seems to
9 me that some probably necessary update of methodology will provide new calendars or
10 regional improvements. Then the version number (e.g. of the method) would held distinguish
11 the different resulting data sets.

12 **Response:** Thank you for the invaluable comment. The version number would be added when
13 we open the SACRA to science community.

14

15 **Specific comments**

16

17 [S1] Page 1334, line 2 : In Eq. (1) the case of $t=tpv$ is not exactly defined.

18 **Response:** We have reconstructed the manuscript and tpk is defined before the corresponding
19 equation in the revised manuscript (P6L12).

20

21 [S2] Page 1334, line 11: It is not clear how NDVI-filled is produced. This is critical for the
22 later evaluation. It would be nice to know the percentage of grid cells occupied by either
23 NDVI-Crops or NDVI-Filled.

24 [S12] It would be nice to have a map / see the location of the pure grid cells, e.g. in Fig. 5 or
25 Fig. 6.

26 **Response:** We added an explanation of production of NDVI-Crop (renamed from NDVI-
27 Filled) in P5L22–P6L7 and Fig. 4. Also, we show the calibration grids in Fig. A2.

28

1 [S3] Page 1335, line 11: Typical crop is the crop with the most crop area in MIRCA2000. Is
2 the distinction of irrigated and rainfed areas important? Is it the maximum monthly area
3 (growing area) or is it the harvested area. These might be different in grid cells with multiple
4 cropping systems, e.g. of wheat and rice in India. What about the effect of mixed pixels when
5 aggregating for NDVI calculation?

6 [S10] What about the distinction of calendars for rainfed and irrigated in MIRCA2000? How
7 is this important for this analysis?

8 **Response:** At each grid, we identified a dominant crop that has the largest “maximum
9 monthly harvested area“ in MIRCA2000 (P4L9). The distinction of irrigated and rainfed areas
10 and effect of mixed pixels are discussed in P15L16–P15L25.

11

12 [S4] Page 1335, line 20 "reanalysis temperature" of Hirabayashi et al. 2011. It would be nice
13 if you mentioned/discussed the data source (ERA40, ...) behind that source, but especially
14 how you used the 0.5 resolution of that data set within your 5 arc-min resolution, e.g. some
15 necessary downscaling.

16 **Response:** We added an explanation about the reanalysis forcing data (P4L25).

17

18 [S5] Page 1335, line 25: "Because we define winter crops by temperature, cultivated wheat in
19 Australia and Northern India is defined as spring wheat. Regions having the minimum
20 monthly-averaged temperature below 5.0 in Fig. 4c are categorized as winter wheat or fodder
21 (permanent crop) in Fig. 4a."

22 This wording is totally confusing, and it remains unclear when or whether you speak about
23 (existing) MIRCA2000 or (new) SACRA, or of both, and whether Fig. 4 (a) is MIRCA or
24 SACRA, and if it were MIRCA, how Fig. 4(c) would relate to Fig. 4(b) or what you want to
25 show via Fig. 4(c).

26 **Response:** The explanation has been revised (P4L1–P4L28).

27

28 [S6] Page 1336, line 6: The author mention they consider crops "spring wheat, maize, rice,
29 soybean, and cotton", but later (line 19) they refer to winter wheat which calendar is replaced
30 by the one of summer wheat. But how this important aspect is done, remains unclear. And

1 how grid cells with MIRCA2000 winter wheat are treated with possibly observed summer
2 crop calendars. But does not Fig. 2 (page 1349) show that winter crops are somehow treated /
3 treatable? Fig. 4 (a) (b) (page 1351) obviously depict MIRCA2000 (or not ?) e.g. also
4 specifying in Fig. 4 (b) sngWinter crops, but this is not stated in the figure caption.

5 **Response:** The CC of winter wheat was not replaced by the CC of summer wheat. The
6 description has been revised (P8L18, P9L17).

7

8 [S7] Page 1338: USDA 1994 is missing in the list of references.

9 **Response:** The sentence, including USDA1994, was removed in the revised manuscript.

10

11 [S8] Line 23 "multiple usages of the two products are useful to take into consideration the
12 uncertainty of the CC." I do not understand the meaning of this sentence, please be more
13 specific.

14 **Response:** In the application of a CC for agricultural simulations (e.g., estimations of food
15 production and irrigation water usage), we would think about uncertainty of the CC. The
16 description has been revised (P13L22).

17

18 [S9] Page 1346, Table 2: How do you compare monthly calendar (MIRCA2000) (planting:
19 possibly first day of month, harvest: possibly last day) with daily calendar (SACRA)? Do the
20 pure grids (5 arc-min?) include multi-cropping? If yes, which season do you consider? Are
21 there grid cells with triple rice cropping of MIRCA2000 included?

22 **Response:** We apologize for insufficient explanations. The comparison with monthly CC is
23 described in P10L27, and P11L20. We compare the CC with only single cropping grids
24 (P11L19).

25

26 [S11] How do you calculate the average error? Isn't it the average difference (in days)? Then
27 again the question about the used reference date at MIRCA2000 is important (first day, 15th
28 of each month,...)

1 [S13] It is strange that the differences ("errors") here are below one month, while in Fig. 6 (a)
2 and (b) considerable areas have differences larger than 1.5 months. How can this phenomenon
3 be explained, given also the monthly resolution in MIRCA2000? Perhaps one reason is the
4 assumption of centred planting/harvesting days in MIRCA?

5 **Response:** The difference ("error") in Table 4 represents the error among the calibration grids.
6 The procedure to calculate the average error is also described in [Appendix-A](#).

7

8 [S14] Page 1347, Table 3: The crop calendars (CC) should be more explicit where they are
9 for more than one crop (MIRCA2000) as SACRA is only for the dominant crop for a given
10 unit. Also perhaps distinguish between calendars of MIRCA2000 and Sacks et al. 2010?

11 **Response:** The census-based and model-based approaches can contain CCs for more than one
12 crop for every administrative unit ([P15L19](#)). Also, we performed further comparisons with
13 climate-based crop calendar (Waha et al., 2012) in [P10L6–P13L24](#), Table 5, Figs. 9, 10, 11,
14 [A3](#), and [A4](#).

15

16 [S15] Page 1348: Fig. 1 is not clear. You do not distinguish between detection of dominant
17 crop and the crop calendar. Is SACRA-Filled the result of SACRA? What is the difference
18 between NDVI-Filled and SACRA-Filled? What do you do with discontinuities of SACRA
19 and SACRA-Filled (page 1337, line 9) because of filling? How does this filling influence the
20 comparison in Fig. 6, for the selected regions?

21 **Response:** Following the suggestion, we have revised the [Fig. 1](#). We apologize for confusing
22 terminology of SACRA-Filled and NDVI-Filled. Since SACRA-Filled were not used in the
23 discussion, we removed the description of SACRA-Filled in the revised manuscript.

24

25 [S16] How is SACRA cultivation period adjusted to MIRCA (page 1338, line 2-3)?

26 **Response:** We have added the description ([P9L14–P9L29](#)).

27

28 [S17] Page 1350, Fig. 3 (a) and (b): NDVI in (b) for 2004-2006 is smoother than in (a) (only
29 2004). It would be interesting to see the inter-annual variability, too.

1 Response: We added the annual NDVI (2004, 2005, and 2006) in Fig. 3b.

2

3 [S18] Fig. 3 (b): Why is nNDVI for period 2 smaller than zero for September to December?
4 Probably because NDVIbas of period 2 is defined in June. But shouldn't negative nNDVI be
5 avoided? Or at least suppressed, for better subsequent treatment, which might be corrupted
6 through? It would help to have tpl, tpk, and thv as in Fig. 2 also for this more complex case.

7 Response: We do not need to avoid negative nNDVI in our algorithm. Following the
8 suggestion, we added tpk, and tbtm in Fig. 3. Thank you for the suggestion.

9

10 [S19] Page 1353, Fig. 6 (a) the unit for the comparison of the crop calendars are missing
11 (probably months as units). How are planting months in different years considered, e.g. seen
12 in Fig. 6 (b-3 Mongolia) and (b-8 Shandong)? Again as for Table 2: How do you compare
13 monthly calendar (MIRCA2000) (planting: 1st day of month) with daily calendar (SACRA)?
14 How are daily data of SACRA transferred to monthly calendars in Fig. 6 (b)? Why not
15 specifying differences in days, too, as done in Table 2 (page 1346), rather than months, as
16 days would yield more precise differences? It would be nice to have the differences as
17 positive and negative deviations, as proposes by Anonymous Referee 1. Are then the
18 differences MIRCA - SACRA or SACRA - MIRCA? In Fig. 6 (b) the dominant crops that are
19 used should be specified. Without this information, an interpretation of differences is not
20 possible. The case of Fig. 6 (b-1) needs to be explained: Two NDVI peaks get only one
21 cultivation season in SACRA, without considering the major peak for the season? Are the
22 crops perhaps defined differently (one rainfed, the other irrigated)?

23 Response: 1) The unit is clearly described in Figs. 10 and A3. 2) We have checked whether
24 the SACRA is signalling earlier or later by revising the legend of the figure (P11L29). 3) The
25 comparison was conducted with averaged CC for each administrative unit (P11L16). 4) We
26 described how to compare monthly CC (MIRCA2000) and daily CC (SACRA) in P11L16.

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