Interactive comment on 'Deriving a per-field land use and land cover map in an agricultural mosaic catchment'

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1 Comments #2

1.1 General comments

Comment 1

> *G*eneral Comments: Seo et al. present a high resolution land use and land cover (LULC) map for an agricultural catchment with frequent land cover change in South Korea. In addition to providing LULC coverage's for 2009-2011 with multiple classification schemes, they compare their dataset with a MODIS global land cover dataset. The authors point out that this area has been studied intensively, this dataset will be useful in other studies dealing with agricultural practices in the area, particularly by alleviating some of the scaling and change/time issues. The data is easily retrievable, and has detailed metadata for the different classification schemes.

1.2 Specific comments

Comment 2

> *S*ection 3.3 line 9- It is stated that there is general agreement between the survey data and the MODIS data for croplands and grasslands. Direct comparison with differences in the deciduous broadleaf forest might suggest that, but considering uncertainty due to access to the forest if the deciduous broadleaf forest and mixed forest classes are combined, they represent about 82-90% (2009 & 2010) of the survey reported area. In contrast if the cropland and cropland/natural vegetation mosaics classes are combined the MODIS data over predicts the area by 140-160% (2009 & 2010). Although it is important to relate directly to the IGBP classes, the differences, particularly in relation to agricultural classes, should be noted.

Answer Regarding the comment, we have revised the section as follows. We made an in-depth comparison between the two datasets in the previous communication. That may help readers to comprehend both of the datasets.

Section 3.3 (Current) The upper row of Fig. 7 shows our study site classified according to the IGBP 17-class system and the lower row compares our observations to the MODIS Land Cover Type (MCD12Q1). The survey data shows a general agreement with the MODIS product for "Croplands" and "Grasslands". In contrast, the area of "Deciduous Broadleaf Forests" is substantially greater and that of "Mixed Forests" lower in our survey data (Table 8). This suggests that forest classes differ between the two datasets. One possible explanation is that limited access to forested areas caused inaccuracies in our data. However, it is also possible that MODIS is less accurate due to its coarser resolution (500 m). Indeed, "Water Bodies" and "Urban and Built-Up Lands", for example, were not detected by MODIS presumably because of the coarse spatial resolution. We reclassified rice paddies as "Croplands" unlike in S2, which distinguishes "Paddy field" from the other agricultural types. Note that in Haean, as well as in South Korea in general, it may be important to distinguish (paddy) rice fields from the general cultivated areas due to its edaphic and socio-economic implications.

Section 3.3 (Revised) The upper row of Fig. 7 shows our study site classified according to the IGBP 17-class system and the lower row compares our observations to the MODIS Land Cover Type (MCD12Q1). For "Croplands" the survey data (24.3%,two years average) shows a moderate agreement with the MODIS product (29.0%, two years average) (Table 8). "Cropland/Natural Vegetation Mosaics" type does not exist in our survey data because we separately recorded the classes instead of the mosaic class. In connection with that, we have more than 5% of shrubland classes in the survey data which are not found in the MODIS product.

We have over prediction of the agricultural area by the MODIS product compared to our ground observation. The four agriculturally relevant classes – 'Croplands', 'Closed Shrublands', 'Open Shrublands' and 'Cropland/Natural Vegetation Mosaics' – add up to 29.2% in our survey data while 37.1% in the MODIS land cover for the two years average. On the contrary, forested area is under represented by MODIS. In the two years average, "Deciduous Broadleaf Forests" is 55.4% in our survey and 31.2% in the MODIS product. That of "Mixed Forests" is 2.08% for our survey and 18.5% for MODIS. With those forest classes combined, we have 57.5% of forest in our survey and 49.7% in the MODIS data.

The disagreements in the agricultural and the forest types may be due to the coarser resolution of the MODIS product (500 m). This becomes more problematic for land cover types smaller than the MODIS pixel in its typical dimension. Indeed, linear elements such as "Water Bodies" and "Urban and Built-Up Lands" were not found in the product. Additionally for the forest classes, our limited access to the surrounding forest may have caused inaccuracies in our data.

Note that we reclassified rice paddies as "Croplands" unlike in S2, which distinguishes "Paddy field" from the other agricultural types. In our study site as well as generally in South Korea in genera, it is important to distinguish (paddy) rice fields from the general cultivated areas due to its edaphic and socio-economic implications.

Comment 3

> *A note specifying that in 2011 only half the catchment was surveyed should be added to the relevant tables.*

Answer For Table 3, 4, 5, 6, 7, and 8, we will add a note that the survey data of 2011 is incomplete.

Comment 4

> *I*n the introduction a strong case is made for the need for better resolution LULC data, yet the summary (Section 5) is very brief. Adding additional discussion as to what the results of this study mean for the use of MODIS or other global data sets for running Earth system models would be beneficial.

Answer We have revised text as follows.

Section 5 (Current) We provide an annual per-field land use and land cover data set for the agricultural mosaic Haean (South Korea). During the study period many dry fields were converted to perennial crops such as ginseng and orchards probably due to governmental policy measures. The comparison between our survey data and the

MODIS land cover for the target period revealed that the limitation of MODIS cover in identifying irrigated fields could be a substantial source of error. Linear elements such as water bodies were not identified in the remote sensing product due to its coarse spatial resolution. Due to its detailed information, our LULC data set could be used for well environmental modelling as well as for ecosystem services research and decision making analysis.

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We evaluated the land cover information of the MODIS product. The overall accuracy of the MODIS land cover has been well informed (75%) for the primary cover type (Friedl et al., 2002), while the secondary cover type has been seldom evaluated. The use of the secondary cover has been seldom. We hope that our evaluation of the information promotes further utilisations of it.

Global Earth system models are major information sources for global environmental discussions and decision makings. These models are commonly based on satellite-borne land use/land cover datasets with very few agricultural types. Due to that, one or two 'general' agricultural land types are usually adopted in large scale Earth simulation models.

However complex agricultural landscapes are not sufficiently represented by few excessively generalised cropland classes. For example, Berger et al. (2013a) pointed out that lack of paddy soil and subsoil studies despite its potential impact on global Carbon and Nitrogen circulations. The Earth system research proceeded in our study site repeatedly suggested that complex agricultural landscapes need a greater attention (Shope et al., 2013; Arnhold et al., 2013; Zhao and Lüers, 2012; Berger et al., 2013a; Berger et al., 2013b; Kim et al., 2014; Kettering et al., 2012; Ruidisch et al., 2013). Thus thematic improvement of global land cover databases is of a great importance.

We publicise our data with a hope that it is used in developing/validating Earth system simulation models. Due to its detailed information, our LULC data set could be used for well environmental modelling as well as for ecosystem services research and decision making analysis. Participating in the development of land use/land cover databases would be another way of contributing to Earth system research. As an example, we are developing a method for estimating spatially and thematically elaborated land use/land cover (Bogner, Seo, and Reineking, 2014). It may be particularly useful to researchers working in complex agricultural mosaics.

1.3 Technical comments

Comment 5

> *H*aeanCover_Legend.xls this file has very detailed land cover information, but there are cells that are highlighted in green/red/yellow- is this significant for

the end user? If so, an explanation in the HaeanCoverREADME.pdf would be useful. In the table associated with the 2.2 Legend section of that document the description of Super class reads 'Super-class value was given in case specific type was not identified', revising to 'in the case that a specific type...' would make it more clear. This was of specific interest as it is the only column in the Legend.xls that does not have something in every cell. A minor note considering the data is available for those interested, but in Fig. 5 the inland water and semi-natural areas are not distinguishable.

The colours of the cells should have not been exposed to end users thus we have decolorised it. We will also update the text and the figure following your suggestions.

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