**Rice-Loss Layers Documentation**

This document describes the methodology to create rice fields conversion and abandonment layers for Japan (excluding Okinawa). Rice field conversion is defined as rice fields disappeared from the period 1985-94 to the period 2010-19 and converted into urban areas. Similarly, rice field abandonment is defined as rice fields disappeared from the period 1985-94 to the period 2010-19 and converted into grasslands.

**METHODS**

1. Rice fields loss estimation: To estimate rice fields loss, we first estimated “stable rice fields” for the periods 1985-94 and 2010-19. We do this to avoid temporal variation on rice field detection over periods. For the period 1985-94, we use rice field layers from Carrasco et al. (2022) In prep., for the periods 1985-89 and 1990-94 and select the pixels that were identified as rice fields for both periods. The same proceeding is done for the periods 2010-14 and 2015-19. The layers used were the post-processed ones from Carrasco et al., so that they had been water masked and the rice in Hokkaido cities with no reported rice area during the last years was deleted.

Once “stable rice fields” are identified for 1985-94 and 2010-19, we calculated the changes in rice fields between both periods, obtaining a “rice loss” binary raster layer.

All calculations were performed using gdal’s raster calculator.

1. For every lost rice pixel in “rice loss” layer, we identified the current land cover class, according to JAXA’s High-resolution Land Use and Land Cover Map (HRLULC) for the year 2014-16 (30 m spatial resolution).

The resulting layer is riceloss\_jaxaclasses.tif. Class values legend can be obtained from: <https://www.eorc.jaxa.jp/ALOS/en/lulc/lulc_index_v1803.htm>

1. We created a “rice field conversion” layer. The rice field conversion is defined as rice field loss when the current land cover class is urban (according to the HRLULC).

The resulting binary layer is riceloss\_tourban.tif

1. We created a “rice abandonment” layer. The rice field abandonment is defined as rice field loss when the current land cover class is grassland (according to the HRLULC).

The resulting binary layer is riceloss\_tograssland.tif.

All layers have a 30 m spatial resolution have a geographic coordinate system (“lat/long”).

**LIMITATIONS**

As every land cover classification created using satellite images, our layers present several limitations and associated error.

1. Our layers are based on historical rice field maps presented in Carrasco et al. (2022) In prep., which have an associated error. Please check the original rice maps documentation. Those layers had accuracies between 84-95%, depending on the validation dataset. In general, an underestimation of rice fields was observed throughout Japan.
2. We decided to estimate the rice loss using a “stable layer” from 1985-94 and 2010-19. The rationale to do that was to increase the confidence of the detected rice field pixel for both periods. However, this can lead to an underestimation of rice fields for both periods. Therefore, the number of rice loss pixels will be underestimated. On the other hand, we can have relatively high confidence that those pixels were true rice loss detections.
3. The JAXA map has, as well, associated error. For example, the reported accuracy for urban class is around 82% and for grassland is around 80% (averaging user’s and producer’s accuracies). Those errors propagate with the intrinsic error of the rice loss layer, increasing the uncertainty.
4. Although we can use the riceloss\_tograssland.tif as a proxy for “rice abandonment”, JAXA grassland class includes a wide range of “grassy” cover. For example, many parks or river plains cover with low vegetation is identified as grassland in the JAXA map (that are unlikely to represent rice abandonment, but rather rice field conversion). Post-analysis might be needed to identify true “rice abandonment” areas, by further classifying the types of grasslands from the JAXA map.