

## Appendix A. Supplementary Material

### **Land Cover Changes and Their Driving Mechanisms in Central Asia from 2001 to 2017 Supported by Google Earth Engine**

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## 1. Relationships of land cover types in different land classification system

Table S1 Relationships of land cover types in different land classification system

Land Cover Class	GlobeLand30	MCD12Q1	GlobCover 2009
Cultivated land	10 Cultivated land	12 Croplands 14 Cropland/natural vegetation mosaic	11 Post-flooding or irrigated croplands 14 Rainfed croplands 20 Mosaic cropland (50-70%) / vegetation (grassland, shrubland, forest) (20-50%) 30 Mosaic vegetation (grassland, shrubland, forest) (50-70%) / cropland (20-50%)
Forest	20 Forest	1 Evergreen needleleaf forest 2 Evergreen broadleaf forest 3 Deciduous needleleaf forest 4 Deciduous broadleaf forest 5 Mixed forest	40 Closed to open (>15%) broadleaved evergreen and/or semi-deciduous forest (>5m) 50 Closed (>40%) broadleaved deciduous forest (>5m) 60 Open (15-40%) broadleaved deciduous forest (>5m) 70 Closed (>40%) needleleaved evergreen forest (>5m) 90 Open (15-40%) needleleaved deciduous or evergreen forest (>5m)
Grassland	30 Grassland	8 Woody savannas 9 Savannas 10 Grasslands	110 Mosaic forest-shrubland (50-70%) / grassland (20-50%) 120 Mosaic grassland (50-70%) / forest-shrubland (20-50%) 140 Closed to open (>15%) grassland 150 Sparse (>15%) vegetation (woody vegetation, shrubs, grassland)
Shrubland	40 Shrubland	6 Closed shrublands 7 Open shrublands	130 Closed to open (>15%) shrubland (<5m)
Wetland	50 Wetland	11 Permanent wetlands	160 Closed (>40%) broadleaved forest regularly flooded - Fresh water 170 Closed (>40%) broadleaved semi-deciduous and/or evergreen forest regularly flooded - saline water 180 Closed to open (>15%) vegetation (grassland, shrubland, woody vegetation) on regularly flooded or waterlogged soil - fresh, brackish or saline water
Water bodies	60 Water bodies	0 Water	210 Water bodies
Artificial surfaces	80 Artificial surfaces	13 Urban and built-up	190 Artificial surfaces and associated areas (urban areas >50%) GLOBCOVER 2009
Bareland	90 Bareland	16 Barren or sparsely vegetated	200 Bare areas

Permanent snow and ice	100	Permanent snow and ice	15	Snow and ice	220	Permanent snow and ice
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Table S2 Relationships of forest and cultivated land in different land classification system

Land Cover Class	Global Forest Change dataset	Global Food Security Support Analysis dataset
Cultivated land		1 Irrigated: wheat and rice 2 Irrigated mixed crops 1: Wheat, rice, barley, soybeans 3 Irrigated mixed crops 2: wheat, rice, cotton, orchards 4 Rainfed: wheat, rice, soybeans, sugarcane, corn, cassava 5 Rainfed: wheat, barley 6 Rainfed: corn, soybeans 7 Rainfed mixed crops: wheat, corn, rice, barley, soybeans 8 Fractions of mixed crops: wheat, maize, rice, barley, soybeans
Forest	treecover2000	

## 2. Scripts for training point selection

Links to the original Google Earth Engine training point selection

<https://code.earthengine.google.com/dc6f6b9c3a013b01568bf17cafb8fc12>

## 3. Scripts for image pre-processing, classification, and accuracy assessment

Links to the Google Earth Engine image pre-processing, classification, and accuracy assessment

<https://code.earthengine.google.com/7a8ee256d36d6e609ff282a20460621d>

## 4. Download link of reference sample points

Links to the Google Drive of reference sample points

<https://drive.google.com/drive/folders/1l0YB9ceNZYkqmn6IELCrv2b-MxYzJGlk?usp=sharing>

0- Forest, 1- Grassland, 2- Shrubland, 3- Cultivated land, 4- Artificial surfaces, 5- Water bodies, 6- Wetland, 7- Permanent snow and ice, 8- Bareland

## 5. Download link of land cover dataset

Links to the Google Drive of land cover dataset

<https://drive.google.com/drive/folders/12igBMOuMRw--IoB7j9KR8OV5fVEgvOwz?usp=sharing>

0- Forest, 1- Grassland, 2- Shrubland, 3- Cultivated land, 4- Artificial surfaces, 5- Water bodies, 6- Wetland, 7- Permanent snow and ice, 8- Bareland

## 6. The accuracy of each land cover type and overall accuracy of reference sample points

Table S3. The accuracy of each land cover type and overall accuracy of reference sample points

Land cover	Accuracy
Forest	100.0%
Grassland	97.6%
Shrubland	96.3%
Cultivated land	100.0%
Artificial surfaces	94.1%

Water bodies	92.6%
Wetland	94.7%
Permanent snow and ice	100.0%
Bareland	90.7%
<b>Overall accuracy</b>	<b>95.8%</b>