

Table S1. The correspondence of the reclassification of the land use and cover changes.

Raster value	Label	Reclassify
0	no data	No-data
10	cropland, rainfed	Cropland
11	herbaceous cover	Cropland
12	tree or shrub cover	Cropland
20	cropland, irrigated or post-flooding	Cropland
30	mosaic cropland (>50%) / natural vegetation (tree, shrub, herbaceous cover <50%)	Mosaic area
40	mosaic natural vegetation (trees, shrub, herbaceous cover >50% / cropland <50%)	Mosaic area
50	tree cover, broadleaved, evergreen, closed to open (>15%)	Forest
60	tree cover, broadleaved, deciduous, closed to open (>15%)	Forest
61	tree cover, broadleaved, deciduous, closed (>40%)	Forest
62	tree cover, broadleaved, deciduous, open (15-40%)	Forest
70	tree cover, needle leaved, even green, closed to open (>15%)	Forest
71	tree cover, needle leaved, even green, closed (>40%)	Forest
72	tree cover, needle leaved, even green, open (15-40%)	Forest
80	tree cover, needle leaved, deciduous, closed to open (>15%)	Forest
81	tree cover, needle leaved, deciduous, closed (>40%)	Forest
82	tree cover, needle leaved, deciduous, open (15-40%)	Forest
90	tree cover, mixed leaf type (broadleaved and needle leaved)	Forest
100	mosaic tree and shrub (>50%)/ herbaceous cover (<50%)	Mosaic area
110	mosaic herbaceous cover (>50%)/ tree and shrub (<50%)	Mosaic area
120	shrubland	Forest
121	evergreen shrubland	Forest
122	deciduous shrub land	Forest
130	grassland	Grassland
140	lichens and mosses	Bare area
150	sparse vegetation (tree, shrub, herbaceous cover) (<15%)	Forest
152	sparse shrub (<15%)	Forest
153	sparse herbaceous cover (<15%)	Forest
160	tree cover, flooded, fresh or brackish water	Forest
170	tree cover, flooded, saline water	Forest
180	shrub or herbaceous cover, flooded, fresh / saline / brackish water	Forest
190	urban areas	Built-up area
200	bare areas	Bare area
201	consolidated bare areas	Bare area
202	unconsolidated bare areas	Bare area
210	water bodies	Water area
220	permanent snow and ice	Water area

Table S2. The area of suitable habitats (before and after optimization) of apple trees on the Loess Plateau ($10^4 \times \text{km}^2$). The CUH represents the class unsuitable habitat.

Periods and climate scenarios	Unsuitable habitat		Low suitable habitat		Moderate suitable habitat		High suitable habitat		CUH
	Before	After	Before	After	Before	After	Before	After	
2050SSP1-26	41.80	31.22	15.24	9.04	7.43	4.03	0.42	0.17	20.42
2030SSP1-26	40.31	31.56	18.38	11.10	6.12	3.07	0.08	0.03	19.12
1970-2000	43.78	36.15	12.31	7.66	7.94	2.80	0.85	0.23	18.05
2030SSP5-85	36.70	28.05	18.02	11.84	9.78	5.67	0.39	0.18	19.15
2050SSP5-85	37.23	26.15	16.51	10.78	10.43	7.06	0.71	0.46	20.43