



Relationships of multiple ecosystem services and their influencing factors on the Qinghai-Tibet Plateau

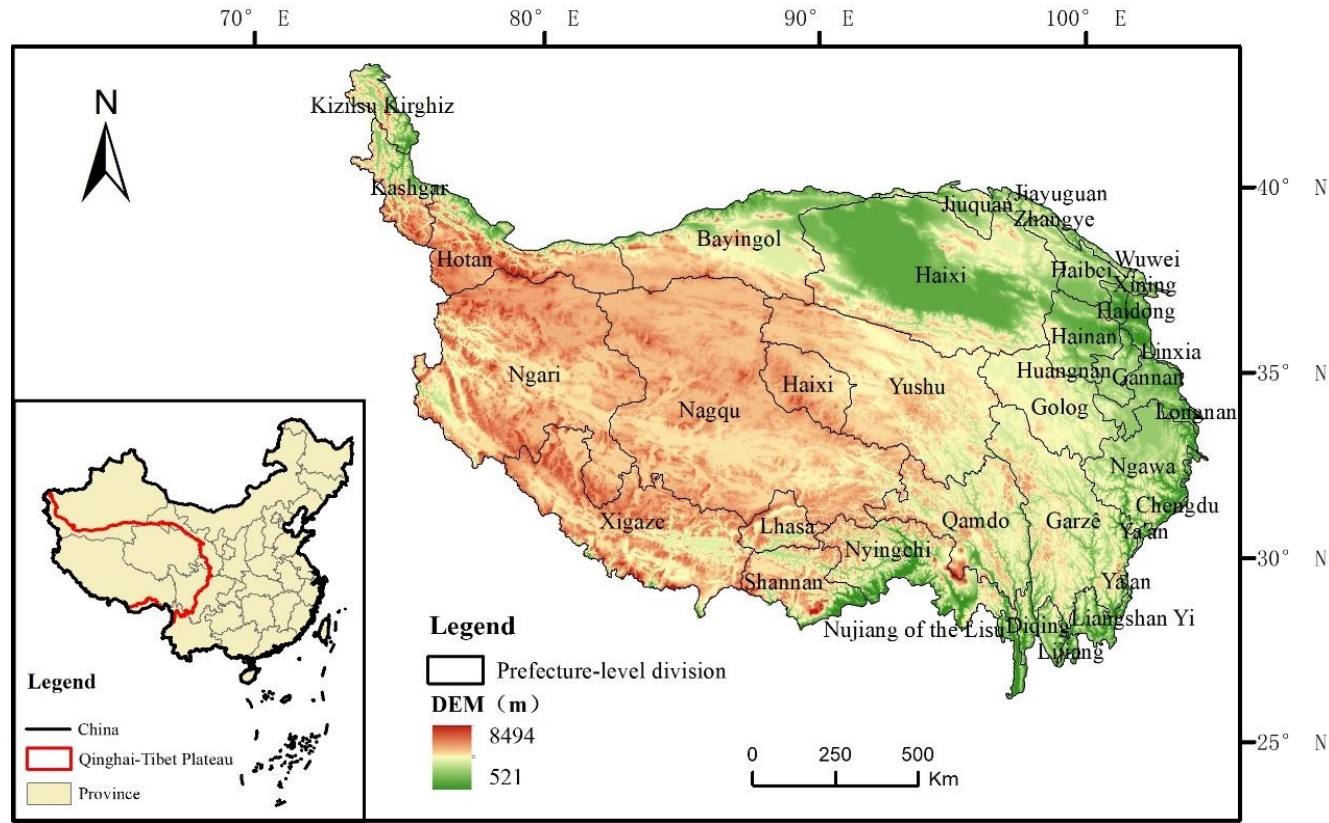
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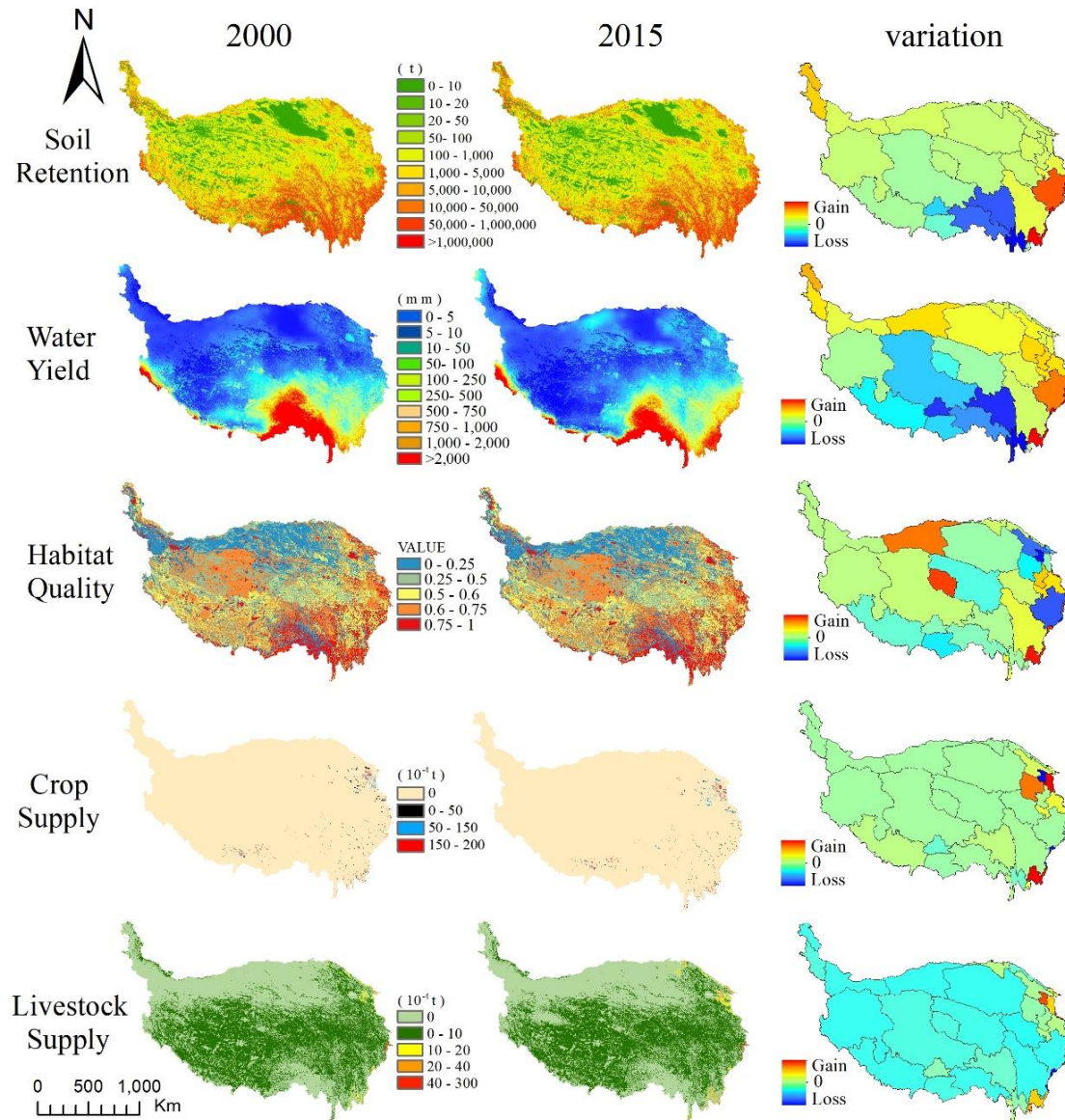


Introduction



The Qinghai-Tibetan Plateau (QTP) is a “sensor” and “sensitive area” for climate change in Asia and even the northern hemisphere, and its soil ecosystem services are vital components to all aspects of life in the region and support ecosystem functions and services. Understanding the distribution of regional ecosystem services, the relationship among ecosystem services and the influencing factors is an important prerequisite for the protection and optimization of the ecosystem on the QTP.

Results



First, we evaluated the spatio-temporal distribution and relationships of multiple services including soil retention (SR), water yield (WY), habitat quality (HQ), crop supply (CS) and livestock supply (LS).

Soil Retention, Water Yield and Habitat Quality significantly decreased from the southeast to the northwest.

The spatial heterogeneity of Crop Supply and Livestock Supply is large

Results

Table correlation coefficients between ES

	2000	2005	2010	2015
Soil Retention -Water Yield	0.469**	0.435**	0.467**	0.469**
Soil Retention- Habitat Quality	0.250**	0.235**	0.223**	0.217**
Water Yield - Habitat Quality	0.226**	0.193**	0.165**	0.128**
Livestock Supply - Soil Retention	0.191**	0.172**	0.148**	0.143**
Livestock Supply - Habitat Quality	0.153**	0.153**	0.155**	0.154**
Livestock Supply - Water Yield	0.123**	0.116**	0.047**	-0.026**
Crop Supply - Water Yield	0.062**	0.061**	0.066**	0.069**
Crop Supply - Soil Retention	0.023*	0.019	0.019	0.021*
Crop Supply - Habitat Quality	-0.064**	-0.066**	-0.066**	-0.066**
Crop Supply - Livestock Supply	-0.069**	-0.068**	-0.068**	-0.067**

(**And *were significantly correlated at level 0.01 (double-tailed) and 0.05 (double-tailed), respectively. Correlation analysis of the pairwise relationships between ES divided into high correlation 0.4–1.0, moderate correlation 0.2–0.4, weak correlation 0.0–0.2).

Soil Retention, Water Yield and Habitat Quality are mainly identified as synergies, Crop Supply - Habitat Quality and Crop Supply - Livestock Supply are manifested as trade-offs.



Results

Besides, we explored the influences of temperature, elevation, population density, land use and land cover on the relationship of ecosystem services. We found that geophysical factors (temperature, elevation) impacted on the distribution of CS, and the trade-off and synergistic dynamics of WY-HQ; LULC influences the distribution of ecosystem services, and hence the relationships among them; while population size changes increased trade-offs between WY-HQ and CS-HQ. The figure below shows the impact of elevation on ecosystem service relationships.

