Agricultural Irrigation Management Model Based on FLUS and Aquacrop under Climate Change

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Introduction

Sustainable agricultural development

- The impact of spatial and temporal changes in agricultural land use patterns is a major factor affecting agricultural development.
- Agricultural water supply and demand contradictions are prominent, threatening world food security.
- The scale of agricultural operations is on an ever-increasing trend, presenting new challenges to the integration and intensive utilization of agricultural land.
- Spatial and temporal variability of changes in agricultural land use patterns and crop growth at future regional scales.

Aim

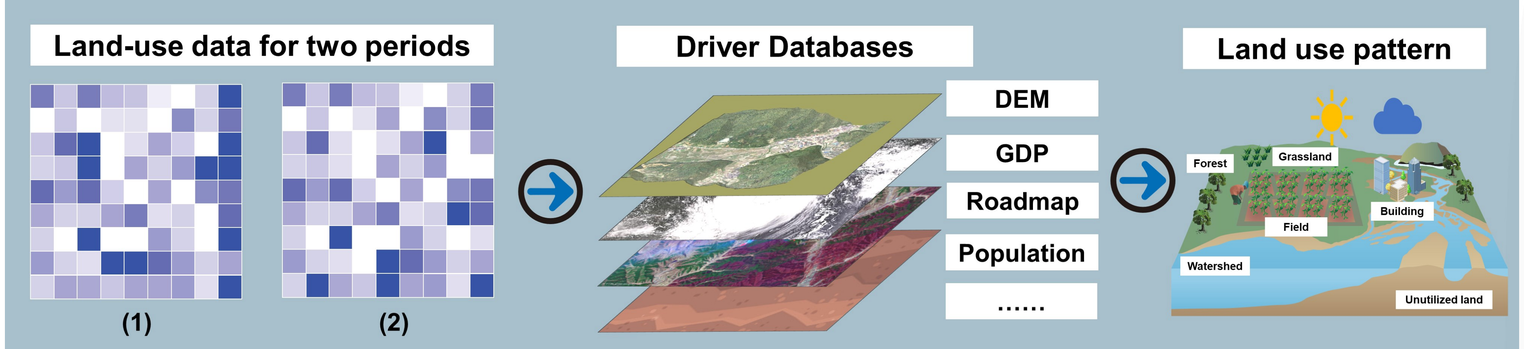
Integration of crop models with simulation models for the development of refined agricultural irrigation systems and management strategies to improve regional agricultural water use efficiency under changing scenarios

Methods

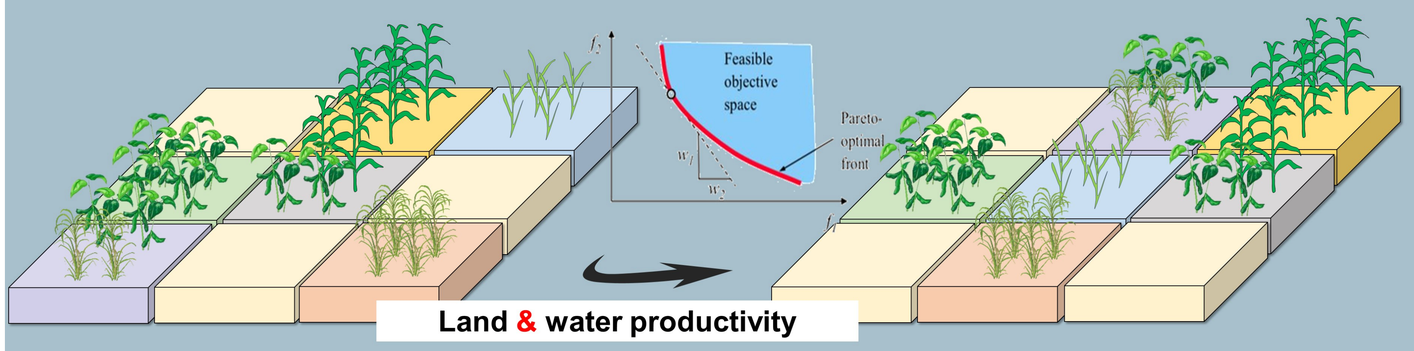
Regional agricultural soil and water resources management

- FLUS-based future multi-scenario farmland use forecast model is combined with the Aquacrop-GIS model for decision making and management of regional agricultural soil and water resources.
- The Aquacrop-GIS model is used to analyze the spatial heterogeneity of crops to different soil and climate conditions, water and nitrogen management measures, simulate and verify the response relationships of crop biological yield and irrigation water consumption under different cropping conditions.
- The FLUS model was implemented to simulate land use changes and future scenarios of farmland use driven by human activities and climatic conditions.

Future land use simulation

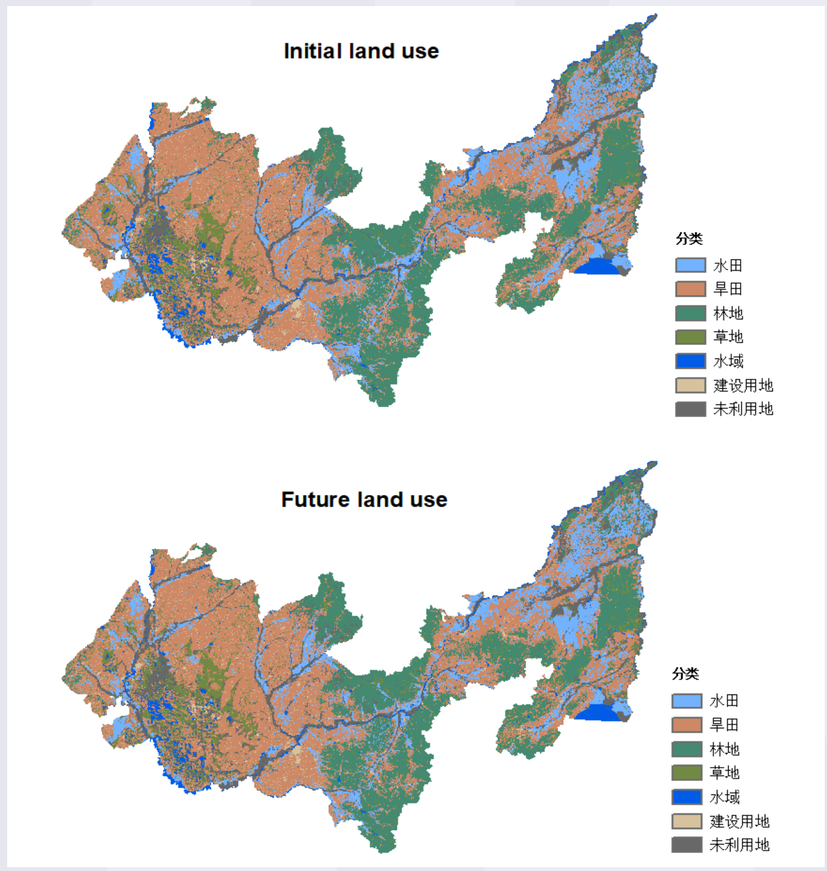


Aquacrop-GIS model



Results

- The natural development scenario shows a decrease of 0.2% in agricultural land and an , including farmland, forest land and grassland, and an increase of 2% in building land.
- The trend in the total agricultural area is decreasing, with a 4% decrease in paddy land and a 1% increase in arid land.
- The optimal crop yield was simulated from the FLUS simulation results of the soil water balance in the farmland.



Implications & Conclusions

- This study takes a typical agricultural area combined by the Songnun Plain and the Sanjiang Plain in northeast China as the study area and divides it into a 30m*30m spatial grid for simulation.
- This study focuses on regional large-scale agricultural land-use change as well as crop growth change, which is conducive to understanding the spatial variability of the study at the regional scale, and provides theoretical support for the further realization of agriculture, ecosystems and sustainable development.