**A study on future land use change in Hokkaido, Japan, by remote sensing and scenario-based simulation**

(リモートセンシングおよびシナリオシミュレーションによる北海道の将来の土地利用変化に関する研究）

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# ABSTRACT

As the second large island in Japan, Hokkaido provides precious land resources for the Japanese people. Meanwhile, as the food base of Japan, Hokkaido, with the gradual decrease of the agricultural population and more intensive agricultural practice, features its arable land use distribution is changing year by year, which has also caused changes of whole land use pattern of the entire Hokkaido. To realize the sustainable use of land resources in Hokkaido, past and future changes in land use patterns are necessary to be investigated, and creative land use planning suggestions should be given on this basis. This study uses remote sensing and GIS technology to analyze the temporal and spatial changes of land use in Hokkaido in the past 19 years. The types of land use include cultivated land, forest, waterbody, construction, grassland, and others, by using the satellite images of the Landsat images in 2000, 2010, and 2019 to achieve this goal to make classification. The overall accuracy of the classification exceeded 88%. In addition, I used the coupled Markov-FLUS model to simulate and analyze the land use changes in three different scenarios in Hokkaido in the next 20 years, and selected seven land use change factors: DEM, slope, population density (PD), distance to railway (DTRAIL), distance to road (DTROAD), organic carbon in topsoil (TOC), and bulk density in topsoil (TBD). The simulation accuracy was close to 70%. The results of land use classification show that the cultivated land in Hokkaido has decreased by 7.3% from 2000 to 2019, of which about 607.5 $km^2$ has been converted to grassland. The result of driving force analysis shows that TOC and TBD are positively correlated with the distribution of cultivated land, while population density is negatively correlated with it. Scenario-based situational analysis shows that the cultivated land in Hokkaido will drop by about 25% in 2040 under the natural development scenario, while the cultivated land area in Hokkaido will remain basically unchanged, but the forest land will be reduced by 239.0 $km^2$ in the cultivated land protection scenario. In forest protection scenario, the area of Hokkaido's forest land will increase by 1580.8 $km^2$ but cultivated land will still follow the changing trend under natural development scenario. It is believed that the findings reveal that the concentration of population in cities is not conducive to the protection of cultivated land in Hokkaido. The forest land in Hokkaido has been well protected in the past and will be protected well in the next 20 years. However, in land use planning for future, Hokkaido government and enterprises should pay more attention to the development of agriculture, protect the fertile soil, and limit the expansion of grazing grassland.