

The Impact of Future Changes in Agricultural Land Distribution on Emissions of Air Pollutants

Koga Yamazaki

Department of Environmental Engineering, Graduate School of Engineering, KYOTO UNIVERSITY,
Japan

Author list (excluding presenting author)

Shinichiro Fujimori, Ken Oshiro

Abstract

In previous studies, emissions estimated by integrated assessment models (IAM) have been downscaled to grided data and input into earth system models (ESM), chemical transport model (CTM). The spatial distribution of emissions in the agricultural sector is invariant in the future and only changes in intensity are considered. However, other previous studies have shown that land cover can change significantly due to the socioeconomic and emission pathways. In this study, we first estimated future land cover using a land allocation model coupled with an IAM. Then, a nitrogen balance model coupled with an IAM, and the land allocation model was developed to estimate the nitrogen balance in cultivated land. A downscaling model was then developed that considered the land cover and nitrogen balance estimated thus far. It means that we developed a new downscaling method for air pollutant emissions from agricultural land to consider future land cover and nitrogen budgets. Finally the emissions downscaled by the new method (accounting for changes in land cover and nitrogen budget) and by the existing method were input to an atmospheric CTM to estimate pollutant concentrations. In the result, the maximum difference in concentration changes between the two methods between 2015 and 2100 was estimated to be 6.4 percentage points. However, the difference in concentration change is quite small, and it is concluded that the impact of land cover change on air pollution is small in our scenario. Future research should investigate the extent to which changes in land cover affect environmental problems other than air pollution through the spatial distribution of emission.

Early Career Scientist

YES, I am an early career scientist.