Downscaling a global agricultural land use model to country level for national SSP analysis

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The Shared Socioeconomic Pathways (SSPs) has been part of latest scenario framework developed by the climate change research society in the recent decade, serving the integrated analysis of future climate impacts, vulnerabilities, adaptation, and mitigation, in which the agriculture, food system and land use are important components. Multiple integrated assessment models (IAMs) have been used for the quantitative projections of future agriculture, food system and land use in the global scale. However, the tool and application of IAMs to the quantification of SSPs on regional or national level is limited. Meanwhile, there are growing needs for the quantification of SSPs on regional or national level for a more detailed understanding of agriculture, food, and land use, and their interactions with other nexus, such as energy, water, and biodiversity. One obstacle for such application is the coarse spatial resolution of global IAMs for land use module. This study aims to apply the Asian-Pacific Integrated Model/Platform for Land-Use and Environmental Model (AIM/PLUM) for the quantification of agriculture, food system, and land use in Japan under its national-specific SSPs narratives. To achieve this, a regional land use model, AIM/PLUM-Japan, was developed, by improving the spatial resolution to 0.05˚ (targeting 1km) from global model of 0.5˚. We combined the statistical production area data and spatial land use data to produce a refined base crop map. Agricultural land use could be downscaled to 0.05˚ resolution and gridded agricultural land use information could be generated using this model. Aside from providing quantitative land use information for Japan's SSPs, this study also contributes to the IAMs and SSPs societies by testing the applicability and feasibility of global IAMs, especially land use models, to the regional or national extension. For example, regional (national) SSPs quantifications for other regions could be easily implemented by a similar paradigm using AIM/PLUM.

Keywords: downscaling, land use, national SSP