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A cultivated planet in 2010 – Part 2: The global gridded agricultural-production maps

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Abstract. Data on global agricultural production are usually available as statistics at administrative units, which does not give any diversity and spatial patterns; thus they are less informative for subsequent spatially explicit agricultural and environmental analyses. In the second part of the two-paper series, we introduce SPAM2010 – the latest global spatially explicit datasets on agricultural production circa 2010 – and elaborate on the improvement of the SPAM (Spatial Production Allocation Model) dataset family since 2000. SPAM2010 adds further methodological and data enhancements to the available crop downscaling modeling, which mainly include the update of base year, the extension of crop list, and the expansion of subnational administrative-unit coverage. Specifically, it not only applies the latest global synergy cropland layer (see Lu et al., submitted to the current journal) and other relevant data but also expands the estimates of crop area, yield, and production from 20 to 42 major crops under four farming systems across a global 5 arcmin grid. All the SPAM maps are freely available at the MapSPAM website (http://mapspam.info/, last access: 11 December 2020), which not only acts as a tool for validating and improving the performance of the SPAM maps by collecting feedback from users but is also a platform providing archived global agricultural-production maps for better targeting the Sustainable Development Goals. In particular, SPAM2010 can be downloaded via an open-data repository (DOI: https://doi.org/10.7910/DVN/PRFF8V; IFPRI, 2019).

1 Introduction

Civilization is founded on the agricultural use of land (Fu and Liu, 2019), which remains as important today as it was 10 000 years ago (Lev-Yadun et al., 2000). Agricultural land, which refers to the land area that is arable, under permanent crops, and under permanent meadows and pastures according to the Food and Agriculture Organization of United Nations (FAO), is currently 4.9 billion ha in 2019. This is 37.6 % of the earth's terrestrial surface – the largest use of land on the planet. Historically, the agricultural use of land has transformed ecosystem patterns and processes across most of the terrestrial biosphere (Ellis et al., 2013). The way we use agricultural land will significantly determine whether we are able to solve the multiple challenges embodied in the 17 Sustainable Development Goals (SDGs), e.g., feeding the world's growing population, mitigating climate change, and halting biodiversity loss (FAO, 2018; Ehrensperger et al., 2019). As the fundamental connection between people and the planet, the spatiotemporal characteristics of agricultural land is im-