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Impact of land quality on land productivity trends in Hungary

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A study was performed to assess the trends of productivity on land with different land quality to derive land performance indicators. “Performance” of the productivity in this context means the local productivity in a given period as compared to the range of productivity levels measured from land units with similar properties within the whole area of the assessment (Ivits and Cherlet 2016, Sims 2017). Land quality is indicated by the potential productivity of agricultural land in Hungary. In this study we used actual biomass productivity indicators based on EEA (2020) and land productivity indicators based on Tóth et al (2018). The Plant Phenology Index (PPI) as proposed by Jin and Eklundh (2014) was used to define trends in actual productivity of terrestrial vegetation for the whole agricultural land of Hungary. The 100 m resolution national spatial dataset of land productivity (Tóth et al. 2018) is based on biophysical land properties, i.e. soil, terrain and climatic properties. The study covered the whole grassland and cropland areas of Hungary and concerned the period of 17 years between 2000 and 2016, inclusive. The procedure to identify performance, which takes biophysical land quality information into account corresponds to the Good Practice Guidelines of CSIRO/UNCCD (Sims et al. 2017). The land quality (land capability) map was used to assess the Performance of land units in comparison to the potential of lands with similar properties.

Our study reveals that declining vegetation production is equally experienced in all capability classes of croplands, affecting 0.7-2% of the land areas of the capability classes, marginal, average, good and very good. On the other hand increased production is seen in higher shares of marginal land (15% of marginal croplands and 14% of marginal grasslands) and on that of average capability (9,5% and 17.7% in croplands and grasslands respectively), while increasing productivity is limited to 2,6-6,1% of good quality land. This significant difference between the areal extent of low and high quality land where productivity increase is measured suggests that differences in natural fertility of soil is offset by improving climatic conditions. Management factors may play a less important role, as forest and grassland areas – which are less intensively managed in Hungary – show a general trend of increasing productivity in around 20 % of their total area too. Increasing productivity is less widespread on more productive land, which can be explained by the favourable soil properties including good water management, which can secure high production also in years with less precipitation. Similar argumentation can hold also for good quality grasslands.

The current study, taking also a soil-based indicator into account is a step to a direction for including meaningful biophysical indicators to degradation assessment.

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