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Yield and Biomass Gap Analysis of Maize in Ethiopia-A Case Study of Oromia Region

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Abstract

Yields and biomass of crops must increase substantially over the coming decades to keep pace with food demand driven by increasing population and income growth. Agricultural productivity growth in sub-Saharan Africa over the past four decades averaged only 2.4 % compared with 4 % in the rest of the developing world. Ultimately global food production capacity will be limited by the amount of land and water resources available and suitable for crop production. Therefore future increases in production will mainly depend on closing the yield gaps or increasing the genetic potential of crops. Crop responses to changing temperature and incident radiation are visible in the potential yield, but even more in the simulated amount of potential aboveground biomass per crop. This variable expresses the result of biomass accumulation during the entire growing season, while the crop yield is accumulated during the second half of the growing season mainly. The biomass and yield gap was estimated for maize (*Zea mays* L) in three sites namely Jimma, Bako and Yayu in the Oromia region of Ethiopia which constitutes major maize production areas in Ethiopia. Potential and actual yields and biomass were estimated based on simulation runs with the SIMPLACE modelling framework and compared to yield statistics. The simulations were run at 38 × 38 km grid cells and yield was calculated for each simulation grid for the period of 11 years (2000–2011) and aggregated from the simulation grid to the district level for comparing them with the statistics. There were no spatial pattern in the average simulated yield and biomass gaps across the districts and there were no significant differences in the magnitude of these gaps. Yields gaps were mainly due to nutrient limitations because average farmer's N application rates to maize in this region are <math> < 20 \text{ kg N ha}^{-1} \text{ yr}^{-1}</math>.

Keywords: Biomass gap, Ethiopia, food security, maize