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## Maize Yield in Africa Can Be Tripled by Implementation of Agronomic Innovations

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### Abstract

Agronomic innovations are required to address the food security issues in Africa. However, testing of the performance of the agronomic innovations, in particular at large scales, often needs remarkable investments. Crop models are suitable tools to quantify the impact of agronomic practices on cropping systems and to identify the most promising areas for their promotion and implementation. Here we quantify the effects of combinations of agronomic innovations including changes in (a) dose and timing of nitrogen application, (b) sowing date, (c) new cultivars and (d) deficit irrigation on maize cropping systems in Ghana, Malawi and Nigeria based on 30 years (1980–2010) of climate, soil and management information obtained from global datasets at  $0.50 \times 0.50$  spatial resolution. The crop model SIMPLACE<LINTUL5,HEAT,RE-TRANSLOCATION> was used in this study and tested against FAO statistics to evaluate the model performance. The model results showed that the combined innovations could improve the range of maize yield from 1.0–1.5 t ha<sup>-1</sup> to 2.5–5.0 t ha<sup>-1</sup> over the study period and the three countries. The magnitude of the yield improvement is country and year specific. For instance, the deficit irrigation showed a larger contribution of yield improvement in dry regions and dry years in Nigeria. The largest maize yield improvements were obtained in the combined innovations rather than sole innovations in particular for the introduction of new cultivars. The yield potential of the new cultivars was significantly higher in combination with more nitrogen and water. We conclude that it is essential to implement combined innovation packages to fill the gap between attainable and current yield in Africa.

**Keywords:** Africa, Agronomic innovations, Crop model, Maize