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Adapting to climate change for food security through supplementary irrigation and changing sowing dates in the Rift Valley dry lands of Ethiopia

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Abstract

Studies on climate impacts and related adaptation strategies are increasingly becoming important to counteract the negative effects of climate change. In Ethiopia, climate change is likely to affect crop yields negatively. However, quantitative evidence is lacking about the ability of farm level adaptation options to offset negative impacts on food security. The MarkSimGCM weather generator was used to generate projected daily rainfall and temperature data originally taken from ECHAM5 general circulation model and ensemble mean of six models under A2 (high) and B1 (low) emission scenarios. We validated the FAO AquaCrop model and subsequently used it to predict maize yields and explore three adaptations options. Increasing plant density has the least effect on maize yield so that the density that is currently used by 'good' farmers (30,000) is recommended. The optimum level of supplemental irrigation (SI), in combination with this plant density, is application of SI when the percentage of soil water depletion reached 75% of the maximum available water in the root zone. In the future, dry spells during the Belg season increase and this has a negative effect on maize production. The predicted lower maize production due to the changing rainfall is only partly compensated by the expected increase in CO_2 concentration. The shifting of sowing period of maize from the current Belg season (mostly April or May) to the first month of Kiremt season (June) can offset the predicted yield reduction caused by climate change. SI has a marginal effect in good rainfall years but using 94-111 mm of SI can avoid total crop failure in drought years. Hence, SI is an interesting option to improve food security in the Rift Valley dry lands of Ethiopia.

Key words: Adaptation; Climate change; Central Rift Valley; Dry spell; Supplemental irrigation.

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