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Identification of Suitable Tea Growing Areas in Malawi under Climate Change Scenarios

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Abstract

Food security in Malawi is extremely vulnerable to climate change; a situation which is exacerbated by widespread poverty. Variation in climate and weather events such as precipitation, droughts and floods impact the growth rate and quality of the tea plant. In this study we discuss possible climate change impacts on the tea production of Malawi. In recent years a shift has been observed in the climatic conditions of the country. From 1960 to 2003 the average temperature increased by 0.9°C and a higher number of hot days and nights were recorded. These changes may have a strong impact on the tea plant in terms of growth and quality and therefore on the tea production. It is projected that precipitation rates in the future are defined by a strong heterogeneity and more frequent extreme weather events are expected such as heavy rainfalls or droughts. Using global change models (GCM) we assessed climate change impacts and projected risks to tea production in Malawi. Suitability types for tea production were defined by RandomForest (RF) classification using a combination of spatial climate data from WorldClim and a database of occurrences of tea production. Malawian experts evaluated and verified tea occurrence data for model input and confirmed the validity of the resulting model for current conditions. The validated models were then extrapolated on climate data for the periods 2020 to 2049 and 2040 to 2069 in an intermediate emissions scenario for 19 GCMs. The models estimate an overall loss of suitable area for tea in the future. We focused on the districts Mulanje, Thyolo and Nkhata Bay. Only Mulanje is able to cope with the climate change. Thyolo, as well as Nkhata Bay, will experience a drastic reduction of suitable area. As a conclusion, it is highly recommended to implement adaptation strategies in the districts most effected by climate change.

Keywords: Climate change, impacts, Malawi, random forest, suitability, tea