

EGU23-3139, updated on 22 Feb 2024
<https://doi.org/10.5194/egusphere-egu23-3139>
EGU General Assembly 2023
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Future climatic suitability of cocoa agroforestry systems with common fruit trees in Cameroon

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Climate change is projected to become limiting for cocoa production which can increase drastically the pressure on forest land as cocoa is already now a major driver for deforestation in Cameroon. Therefore, a comprehensive understanding of climate risks that are associated to cocoa production and change in suitability is key for future resilient land use planning. The nature based solution agroforestry is a common and promising strategy in the face of climate change impacts on cocoa production due to the reduction of heat stress by providing shade and its various co-benefits, as for instance the diversification of income. Crop suitability models are used in assessing the impact of climate change on season-long crop production potential and provide important information for projections of production rates. In this study, we developed an approach to assess the vulnerability of cocoa production in agroforestry systems under climate change considering common fruit tree species (*Dacryodes edulis* and *Mangifera indica*) in cocoa plantations in Cameroon. We simulated first the general suitability for cocoa under current and projected climate change and then compared the suitability under an emulated agroforestry system. We considered various climatic parameters such as monthly temperature, mean monthly precipitation, number of hot nights and days, (consecutive) dry months as well as further soil parameters such as pH. Farmers and expert's opinion were considered through interviews and focus groups to complete and improve data availability on further socio-economic factors that might affect future suitability and productivity within agroforestry systems. We modelled future climate projections with Global Climate Models covering the time period 2015-2100 under the two climate change scenarios SSP1-RCP2.6 and SSP3-RCP7.0. Our results show an important shift of suitable areas and considerable decrease of suitability especially for the fruit trees which should be considered in adaptation planning to ensure future viable production.