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## A Multi-attribute Model of Smallholder Resilience: Covid-19 Impacts on Cocoa Farmers in Ecuador and Uganda

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### Abstract

The concept of resilience has gained substantial relevance in a world rocked by the COVID-19 pandemic and governments' heterogeneous responses. Nevertheless, there exists a lack of consensus on how resilience is defined and measured in a comprehensive and meaningful way. We propose a new indicator-based, actor-orientated evaluation model to operationalize the concept at the farm and community level according to the three resilience capacities of Absorption, Adaption, and Transformation. The approach consists of a multi-attribute utility model using 32 resilience indicators organised into a hierarchical, qualitative decision tree, implemented in the DEXi Multi-Attribute Decision Making model. The utility function weights of qualitative attribute combinations were developed and verified by a group of experts from research and practice. We illustrate the model using a selection of relevant indicators from our extensive sustainability data set collected with the SMART Farm Tool from 395 smallholder cocoa farms in Ecuador and Uganda. The data was collected just prior to the COVID-19 outbreak and used to develop a baseline evaluation of resilience capacities for each farm. The evaluation model is calibrated using literature data on the likely impacts of the pandemic combined with sensitivity testing and scenario evaluation. A planned second step of empirical validation is described to compare the predicted resilience capacities of the model with information on actual impacts of the pandemic for each farm. This will provide a unique opportunity to verify and validate the model in a real world setting, which is very rare in the field of applied resilience research. We hypothesise that cocoa farms with high performance in the resilience capacity evaluation were able to cope better with the effects of the COVID-19 pandemic than cocoa farms with low resilience capacity performance.

**Keywords:** Cocoa, COVID-19, DEXi, Multi-attribute model, resilience, Resilience capacities