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**Water management practices and adaptation to climate  
change – microclimatic data and cocoa farmers perceptions  
in Alto Beni, Bolivia**

Master's thesis in the Faculty of Agricultural Sciences

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## **Abstract**

Climatic changes, including extreme hydrological events such as drought and floods are threatening cocoa cultivation worldwide, thus putting food security and human welfare at risk. Cocoa is mainly managed by smallholder farmers in the tropics, and it constitutes a main source of income. This study addressed how cocoa farmers perceive the changes in the climate, how they manage water and how they adapt their farming practices to climate change in Alto Beni, Bolivia, where cocoa production is a main activity.

Interviews were used to collect data from cocoa farmers. In addition, since interdisciplinary research in the context of climate change is crucial, results of this study are supplemented by an evaluation of climatic data (temperature and precipitations) and microclimatic data for the estimation of evapotranspiration rates (ET), a water use indicator. Microclimatic measurements were taken during the period of the interviews at a long-term trial of cocoa production systems that established in the region in 2008 within the Syscom project (<https://systems-comparison.fibl.org/project-sites/bolivia.html>). Climatic data of the last decade were gathered from the meteorological station located at the same trial.

The climate is perceived as very irregular in terms of meteorological patterns, pointing out extremely high temperatures and drops. Extreme hydrological events that occurred during the last decade have been disclosed by farmers. This information has been supported by the gathered climatic data. Identified adaptive measures to water-related climate change include practices such as the use of soil cover vegetation, mulching, shade trees pruning and irrigation, as well as the use of weather forecast tools. Farmers believe that the way they manage their land influences water management. Gathered microclimatic data backup well-known effects of practices such as shade trees management on ET that should be considered by local farmers. Our results display that some climate-change adaptations are less adopted due to lack of technical information about the innovation and its benefits, inappropriate weather forecast information, lack of financial resources and insufficient specialized labor.

Research for water management in Alto Beni has not been addressed until now by the scientific community. In a climate changing scenario and in a region with emerging adaptations related to water availability such as irrigation, the combination of disciplines will help to avoid bad practices and to make innovations suitable for all stakeholders. Our supplementation of qualitative results with microclimatic and climatic measurements provides examples on how future research could tackle water-related climate change adaptations of cocoa farming in the region.

## **Keywords**

Cocoa; Farmers' perceptions; Water management: Adaptation to climate change; Bolivia