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Developing an online platform with key quality metrics for cocoa beans to enhance direct trade in Costa Rica

**Master's Thesis by Nathalie Walker**  
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**Bern University of Applied Sciences - BFH**  
School of Agricultural, Forest and Food Sciences HAFL

MSc in Life Sciences – Agricultural Science

## Abstract

The global supply chain of cocoa has come under fire in recent years linked to issues such as poor transparency and traceability in cocoa supply chains and the inherent issue of income inequality between chocolate producers and cocoa farmers due to prices being too low (Opatz, 2020). Heightened customer awareness and an increased demand for fair and sustainable chocolate has led to an increase of bean-to-bar chocolate producers and benefitted the market segment of fine or flavour cocoa. However, although the sector is growing, the niche market is currently suffering from a massive oversupply of fine or flavour cocoa. Therefore, more innovative business solutions are needed to help smallholders cultivating high quality and premium cocoa access markets and find buyers for their beans.

In 2018, the Ministry of Agriculture and Livestock in Costa Rica introduced a new National Cocoa Plan with a 10-year scope and new strategies to consolidate and develop the country's cocoa value chain. As a producer of recognized high-quality fine or flavour beans, the Costa Rican cocoa bean market is expected to offer untapped potential in the sense of cocoa beans with interesting and desired flavour profiles and aroma notes meeting key quality standards for export, but lacking buyers. The complexity of the value chain requires an understanding of the ideas, opinions and goals of different key stakeholders. Scientific and academic research offers interesting and established methods to test cocoa beans on their quality, while digitization offers tools to connect stakeholders, consolidate the supply chain and increase transparency, traceability and market access.

In the course of this study, data was collected from literature, academic researchers and actors in the industry in order to develop a set of key metrics to assess cocoa bean quality. Further, methods from literature were tested to measure these metrics and adapted to become more simple, fast and efficient. Smallholders and processors throughout the country were interviewed and results from the interviews integrated into a comprehensive analysis of the current value chain in Costa Rica. In the course of the biochemical tests, 18 different samples from cocoa bean lots from different regions were measured.

Results showed high quality performance for all samples tested, indicating that biochemical aspects of cocoa bean quality could be assessed in a reliable manner with the methods provided and adapted. Further, flavour profiles of the beans could potentially be pre-assessed and identified by using new promising technologies, such as GC/MS headspace. Interview results showed that smallholders struggle to access markets and often lack not only a connection to their buyers, but also the right knowledge on different subjects such as the importance of quality control in post-harvesting practices. An online platform was established to help farmers find potential buyers and vice versa. To guarantee maximum quality control in the processes of fermenting and drying cocoa beans, results from this study conclude that it is not recommended to try and further break down the chain by bringing these steps closer to the smallholder, but rather use established systems with a few larger processors buying unprocessed cocoa beans from smallholders and forming groups based on location resembling cooperatives. In order to ensure the sustainability of such a system, prices must be fair, and all involved smallholders documented to ensure traceability of origin. Some companies have started working with integrated digital payment systems which trace payments directly back to the smallholders.

This study illustrates the often-neglected struggle of smallholders of fine or flavour cocoa beans to find buyers and suggested a platform to promote quality-based, direct sourcing. While research, industry and NGOs often focus on improving existing unsustainable aspects of the cocoa value chain, it is important to look at the market segment of fine or flavour cocoa as well, where many sustainable and resilient cocoa producers already exist. By linking the efforts of research institutions, policy makers and actors from the industry, cooperation between multiple stakeholders is enhanced.