Cocoa in Numbers – from data to knowledge

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In an interdisciplinary project funded by the School of of Life Sciences and Facility Management strategic program Agro-Food-Business, a database was developed with the overall aim of generating insights into different dimension of the cocoa value network and achieving greater transparency within it.

For this reason, data from life cycle assessment, social analysis, agronomy, post-harvest processing sensory and chemical constituent analysis was gathered and linked with the existing regulatory requirements within the cocoa value network, providing a new starting point to redefine cocoa quality, safety, and sustainability. Nowadays, consumers of cocoa and chocolate products are not only interested in safe, high-quality products, but also in products which are produced using environmentally friendly methods and under fair social conditions. The demand and, consequently, the necessity, for more transparency in all parts of the value chain is ever growing, ultimately benefitting all stakeholders involved. Among other things, existing databases already cover agronomical aspects, genetic information, or sensory data separately. The idea of combining the diverse data by applying state-of-the-art non-relational graph database techniques offers the potential for modeling the value chain all at once.

Objectives

We intend to generate a database that gives an insight into agronomical, ecological, economic, regulatory, and social aspects, as well as into food quality and safety markers throughout the whole cocoa value chain – from tree to bar – readily accessible for all stakeholders.

Methodology

For the setup of the database, model experiments were conducted at the SysCom research station of Research Institute of Organic Agriculture (FiBL) in Sara Ana, Bolivia. For this project cocoa beans deriving from defined cultivation systems were fermented and dried under standardized conditions. Data was collected on agronomic factors, influencing factors of post-harvest processing, chemical constitution, sensory characteristics, environmental impact, social aspects, and regulatory requirements at all stages of the cocoa value chain. The structure of the graph database was set up based on the collected data, the taken samples, their tested attributes and their place in the coca value chain. Furthermore, an intuitive interface allowing all stakeholders to easily explore and query the database was designed.

Results and outlook

The collected data allowed for successful modeling of relationships between certain parameters analysed in the different dimensions of the cocoa value network. Furthermore, the graph database model allowed for the establishment of complex correlations and predictions concerning quality within cocoa value chain networks, thus becoming a promising future tool to achieve greater transparency in the cocoa value chain. It could further help producers to disclose their product qualities for sales promoting activities, and be a useful tool for consumers to choose products with desired quality and safety requirements if the corresponding data can be acquired through new project partners. ■
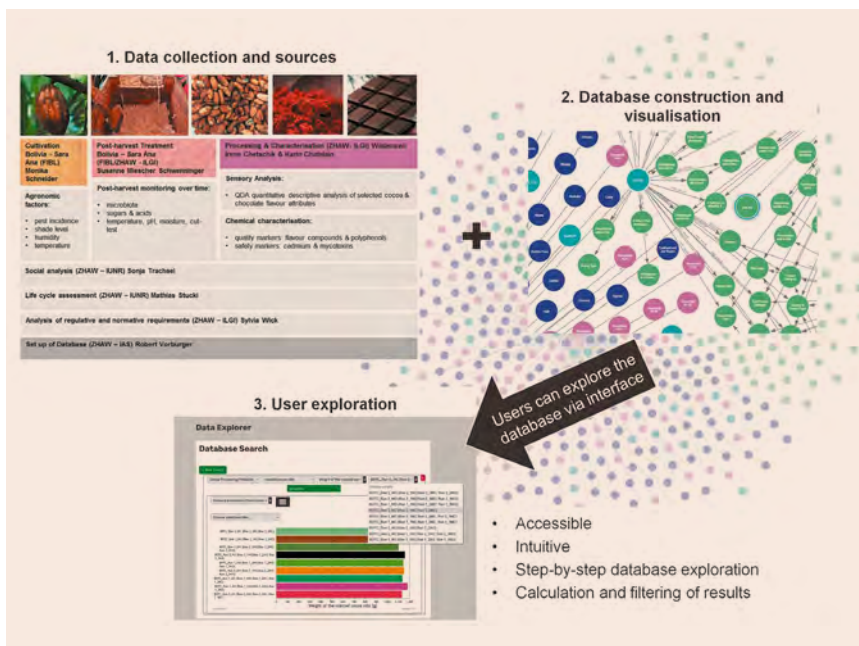

Fig.: Setup of the Cocoa in Numbers database

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