Treatment of residuals from coffee production in Costa Rica.

Organic Waste- and Resources Management in the context of NAMA Café de Costa Rica.

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Introductive summary

Costa Rica has set itself the goal of becoming carbon neutral by 2021. To reach its ambitious climate targets, the country has put in place extensive strategies and action plans, including Nationally Appropriate Mitigation Actions (NAMAs) in a range of different sectors.

Coffee production is an integral part of the nation's history and identity, and the sector is very well structured. Costa Rica is now seeking to become one of the first countries in the world to promote climate-smart coffee cultivation. In view of the high production costs and the level of global competition, the economic sustainability of this endeavour will depend on superior quality, improved resource and cost efficiency, increased product differentiation and access to new markets. Coffee production causes currently emissions of ca. 1.02 kg of CO2e / kg of green coffee (Ruiz, 2017).

German Agency for International Cooperation (GIZ) established a NAMA support project: Low-carbon coffee Costa Rica. Within this framework, the actual activities are carried out.

Approach:

The treatment of residuals from coffee production is investigated and optimized. Emissions from current status quo is calculated, measured and balanced. New treatment variants are evaluated and implemented in practise. Reduction of climate relevant emissions is calculated within the pilot region and fort he whole country as well.

Three technical solutions are elaborated in order to reduce climate relevant emissions: aerobic treatment - low tech, aerobic treatment - more sophisticated technology, anaerobic treatment with production of biogas. Biogas production will contribute additional benefit regarding GHG emissions as the produced biogas will substitute fossil fuels and organic material will be degraded. Remaining digestate can either serve as liquid fertilizer or after an additional aerobic treatment as compost. This will substitute fertilizer and can therefore add an additional relieve an climate relevant emissions by substitution of industrial fertilizers. GHG-emissions are measured at three locations by using two methods:

1) On-site measurements using a simple technique to directly quantify methane, ammonia or nitrous oxide in the gas flow of the composting plant (or modified treatment techniques) at low emissions. Therefore short term detection tubes ("Dräger-Tubes® e.g.) are used.

2) Continuous Gas Component Measurements (FTIR): A portable FTIR-Spectrometer, Type GAMET DX-4000 is used. FTIR stands for Fourier Transform Infrared, the preferred method of infrared spectroscopy. In infrared spectroscopy, IR radiation is passed through a sample of gaseous molecules. Some of this radiation is transmitted through while the rest is absorbed by the sample, producing an infrared spectrum, or "molecular fingerprint". Because each molecular structure has a unique combination of atoms, each produces a unique infrared spectrum. From this, identification (Qualitative analysis) and analysis (Quantitative measurement) of the gas compounds is possible.

The scientific innovation and relevance can be seen in the FTIR-technology and the new conceptual and holistic approach for managing residuals from coffee production in a sustainable manner. Measures, results and extrapolations are presented in during the oral presentation.