Ithaka Institute for Carbon Strategies

Multiplying Forest Garden Systems Financed by CO2-subscription Schemes

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Introduction: Carbon Farming

Reduced emissions need to be complemented with a copious sequestration of atmospheric carbon. (Toensmeier 2016) Carbon farming, the biomass- based sequestration throughout the agricultural sector, is the currently most feasable, safe and multifunctional appoarch to significant *Carbon Dioxide Removal* (CDR). Large Scale afforestation projects are pursued, but to gain relevant impacts, the global 1.5 billion smallholder farmers need to be includet. Ithaka is developing a conceptual framework to include smalholders into carbonfarming activities (Here: Utilization of Agroforestry Systems) and carbon trading scemes - overcoming the obstacles of initial financing, monitoring and value creation. A 2015 implemented pilot project, involving 200 farmer families, rehabilitates abandon farmland in the mid-mountain region of Nepal under labour extensive, treebased cultivation, is showing promising results in regard to sequestration along with provision of other ecosystem services and rural income oppurtunities.

1 Methods: CO_2 Subscription Schemes

Initial financing and income during first unproductive years is the main insentive providet to smallholders to implement tree basesd production systems. Ithaka developed a CO_2 subscription system in wich solely private emitters can purchase certificates at a set price of 35€/t CO_2 to offset their individual emissions. This money is then invested in treeplanting activities, sequestering the equivalent amount of carbon and a per-tree payment to the farmer during the first 3 years after implementation to provide income during the first unproductive years. A personalised online platform for certificate trading will enable easy management and a personal and longterm link between emitter and farmer

Sequestration
Forest garden Nepal
850 mixed trees
11.5 ton CO_2 per year

400 Euro/ year

11.5 t Co_2 *35€/t

Emission
40 people in Nepal =
1 person in Germany
11.5 ton CO_2 per year

4 Tree-based Value Chains

After the three year period of catalytic carbon- finance, the agronomic system needs to sustain itself. Therefore beside a diverse mix of species used for subsistance farming also high value tree cash- crops were included into the system. The current valuechain developement, including appropiate processing, CBA and market assesment is focussing on:

Morus ruba → ***Silk Production***

Magnolia champaca → ***Parfume Industrie***

Cinamomum tamala → ***Essential Oil,***
(destilled with heat recovery during biocahr production)

Financing

Value Creation

Sequestration

Monitoring

Result:

50.000 Trees

Were planted under this conceptual framework in the projects pilot area in Nepal.

Sequestering **700 Tons CO_2eq** annually.

2 Biochar-based Fertilizer and Pyrogenic Carbon Capture

Additional to treebiomass- and soilcarbon, which is predicted to increase by 0.15% annualy, pyrogenic carbon is a key component of the system. Biochar, produced via Flamecurtain-Pyrolysis (Cornelissen 2016), utilizing invasive plants and wasteproducts as feedstock, is first charged with nutrients and than used as a soil amedment in all plantings. Under the given soilconditions this biochar-based fertilization showed significant increases in yield and growthrate, while simultaneously building up an additional, stabel (MRT >1000y) carbon pool. *Pyrogenic Carbon Capture and Storage* (PyCCS) represents a promising and multifunctional *Negative Emission Tecnologie* (NET).

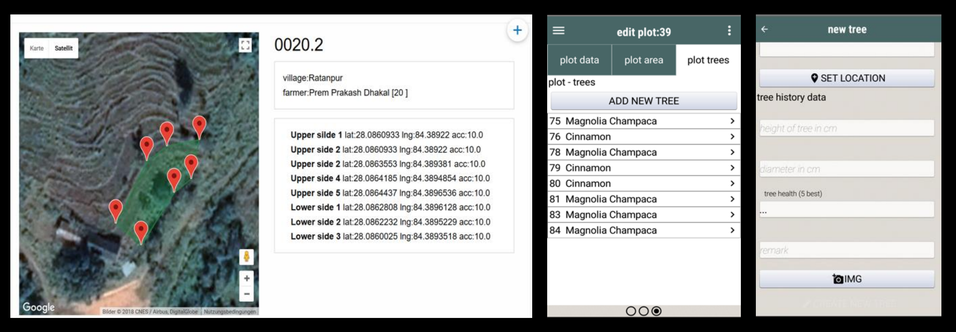
Open Access Paper:

BIOGEOCHEMICAL POTENTIAL OF BIOMASS PYROLYSIS SYSTEMS FOR LIMITING GLOBAL WARMING TO 1.5°C

BIOCHAR-BASED FERTILIZATION WITH LIQUID NUTRIENT ENRICHMENT: 21 FIELD TRIALS COVERING 13 CROP SPECIES IN NEPAL

3 Smartphone-based in-situ GIS for Monitoring

Ithaka is developing and testing an open access smartphone application capable of collecting all relevant parameters, to enable automatic calculation of the land based carbonstocks. Options to collect GPS coordinates of the plots limits for area determination, volumetric and species data regarding tree components and input options for soil organic matter values (Priviously obtained by LOI or reference values) provide all relevant data for a dynamic database. The Applications functionality and simple structure enables good usability - providing the option to outsource prior complex monitoring and calculation tasks to students or farmers themselves, moving towards a participatory monitoring approach.



The Ithaka Institute:

The Ithaka Institute is an international open source network for carbon strategies. It is a non-profit research foundation with the Headquarter in Europe having independent offices in the USA, Nepal and Australia. In the last decade, Ithaka became a leading research collaboration for carbon sequestration and cycling through agronomic methods. The Institute is known for its expertise in production, post-production treatment and use of biochar. Ithaka established the European Biochar Certificate and developed numerous biochar based products. We are engaged in several food security, soil fertility and reforestation projects in Eastern Asia.

Learn More:

The Ithaka Institute | The Biochar Journal | The Forestgarden Project

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