DRAFT

Carbon Sequestration by and for North-South Slopes; Symbiosis of Biochar and Rock Dust Applications

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Cultivated soil for extensive agriculture is enriched by organics from crop residues from previous harvests (1). Semiarid marginal land that has not yet been cultivated might lack carbon and therefore the new arable land created by the N-S slopes could become a substantial carbon sink.

There are two potential processes for capturing carbon from the atmosphere and using it for soil amendment. One could be biochar (2) that is produced by an exothermic pyrolysis process (3) using biomass feedstock such as wood, wheat straw, corn husks and residual waste products from crop processing.

Pyrolysis is a depleted-oxygen combustion process. The final product is a charcoal where the carbon content of the biomass is sequestered for hundreds or even thousands of years (4).

Besides biochar, the pyrolysis process emits volatile gases that require elimination. The volatile gases are removed by a secondary combustion chamber to produce electric power as a by-product (5). This thermal power generation rejects heat (Second Law) that also can be used for a variety of applications. Including drying of the biomass for more efficient biochar production or drying of food crops provided by the cultivation.

The biomass for the pyrolysis process are woodchip and crop residues. Besides equipment capital cost, the bottleneck for biochar world-wide expansion for extensive agriculture is the availability of biomass resources. It is hereby proposed that a portion of the new arable land created by the North-South slopes

Figure 1: A portion of the new arable land will be used for cultivation of fast-growing trees

would be used for the cultivation of fast-growing, low-canopy trees and fast-growing vegetations such as poplar or cottonwood that capture carbon from the atmosphere, via photosynthesis (7). Biochar modular pyrolysis systems could operate in the vicinity of the new arable fields to save on storage and transportation.

A collaborator for our biochar program is Biochar Solutions LTD that provides system design and optimization.

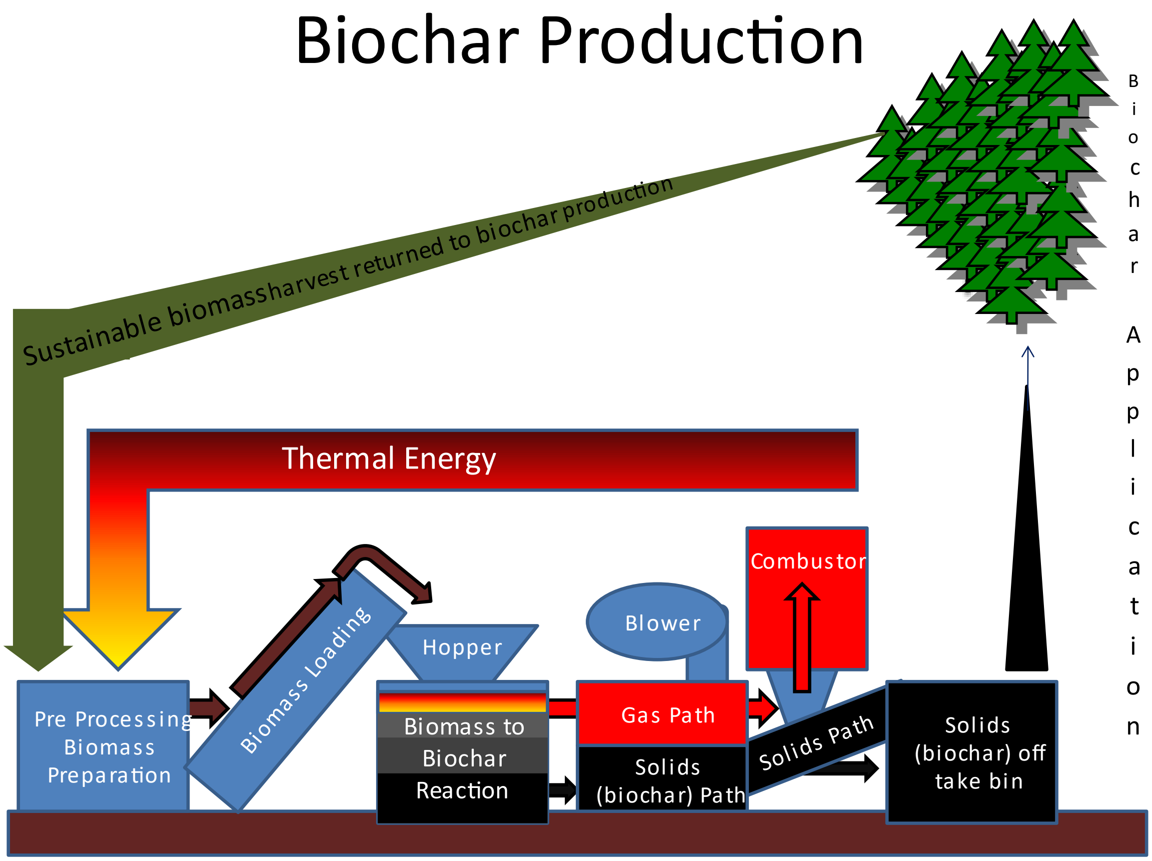

Figure 2: Biochar Solutions' block diagram

A second promising carbon sequestration process and application on the new semiarid arable land is the use of carbon enriched rock dust (Beerling, 8).

The application of carbon enriched rock dust on fields to enrich the soil with organics requires machinery for rock crushing and pulverization. The carbon source for the rock dust could be from the emission of the pyrolysis process, carbon sequestered directly from the atmosphere and/or carbon that is sequestered from powerplant and shipped to combined biochar and rock dust systems. The rock dust machinery requires, in turn substantial electric power for the rock crusher and also heat for conditioning the rock feedstock (click) and (click)

Figure 3: A biochar application project in Pitkin County Colorado

Carbon sequestration via biochar production in exothermic reactions by feedstocks cultivated on a portion of the new arable land created by the north-south slopes. Biochar also contributes to enhanced soil moisture and improved soil physical properties. These soils improvements allow for the revegetation of lands. The chars when incorporated into soils will increase the biomass carrying capacity of the lands thus further increasing the carbon sequestered in this project.

We hereby propose using the exothermic pyrolysis biochar system in combination with the rock crushing system. The electric power and heat by-products from the pyrolysis process will be used as a productive input into the rock crushing machinery. This symbiotic arrangement is a prime example of industrial ecology (circular economy) where the waste of one process becomes a productive input to another.

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