8. Biochar security & productivity

In comparison with other carbon negative approaches, soil carbon sequestration (SCS), including restoration of degraded land, conservation agriculture and agroforestry, can generate financial benefits through increased productivity.

However, soil carbon sinks can saturate in as little as ten years and, more importantly, the carbon stored is not secure and can be released if poor agricultural management practices return.

In contrast, when carbon in the uniquely stable form of biochar is applied as a conditioner for low quality, marginal soils it can be stored for centuries. This practice was used in ancient Amazonia thousands of years ago, leaving black soils (*terra preta*) that have survived to today.

Biochar is therefore a secure method of carbon sequestration, taking CO_2 out of the atmosphere - using natural photosynthesis - and storing it for the centuries needed to return the atmospheric CO_2 concentration to a safer level.

Biochar is the charcoal by-product of biomass pyrolysis, the thermal decomposition (in the absence of oxygen) of organic material. Biochar soil conditioning reduces nutrient leaching and helps plants take up minerals that are in short supply in lower quality soils.

Conditioning soils with biochar also assists crops in dry environments by aiding water retention. This is of vital importance with the increasing frequency of extreme heatwaves and droughts through accelerating global heating. As well as boosting productivity, biochar can therefore aid crop security and the additional soil carbon sequestration resulting from the crops themselves.

Traditional charcoal kilns need sufficiently large pieces of wood to allow gas flow but slow-growing wood fuel supplies cannot be expanded fast enough to meet the massive scale demanded in the short time required. Simple biochar kilns for forestry or agricultural residues are also inefficient in energy conversion and can create air, land and water pollution.

Advanced pyrolysers (and gasifiers with limited air/oxygen input) though can produce biochar as well as biofuels and/or renewable electricity and heat. Pyrolysis is also more efficient and cleaner than direct biomass combustion for power production.

Pyrolysis electricity generating projects additionally supply reliable, continuous power complementing intermittent and variable renewable energy systems (e.g. wind and solar photovoltaics).

Community projects can therefore provide climate mitigation through biochar carbon sequestration and renewable electricity/heat generation, as well as climate adaptation through protecting energy/food crops and supplying air conditioning and water purification.

To learn more about the ***virtuous cascade*** and gigatonne programme development, potential community projects in tropical/equatorial countries and investors should please contact the Carbon Negative Initiative.