

FROM DIRT TO DOLLARS

Unearthing the science
of sustainable investment



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WHY AND HOW DO WE TALK ABOUT CARBON?



WHY

- Measure climate impact
- Financial instrument to enable markets and incentivize action

HOW

- Grain works in the voluntary carbon market (VCM), as opposed to the regulatory/compliance market
 - Offsetting - groups develop projects to certify credits through recognized Standards/Registries and then sell them to 3rd parties
 - Insetting/Scope 3 - when companies finance and/or implement their own interventions in their supply chain

ROBUST AND RISK-ADVERSE ACCOUNTING



- Voluntary Carbon Market Standards have general rules in place to ensure all projects meet minimum standards
 - Discourage bad actors
 - Ensure projects are standardized (to a degree)
- Without a Standards body, people could make whatever claims they want, without legitimacy or accuracy
- On top of the general rules, there are activity specific methodologies or protocols

DEMYSTIFYING BIOCHAR



- Standards with a Biochar Methodology/Protocol today:
 - Verra Verified Carbon Standard (VCS)
 - Climate Action Reserve (CAR)
 - Puro.Earth
- Biochar takes biogenic materials (things that grow or are produced by animals) that are heated at high temperatures in oxygen-limited settings
- This process creates stable carbon structures: carbon is sequestered/captured in biochar and can generate carbon credits

CALCULATING CARBON CREDITS FROM BIOCHAR



Some of the variables that go into biochar accounting:

- Permanence
 - Methodologies use more conservative defaults than research suggests; VCMs are also generally using a 100-year permeance period (i.e. how much carbon remains after 100 years) while most research suggests biochar persists long beyond that
- Carbon content of biochar
- Hydrogen to organic carbon ratio (H:C)
- Amount of biochar produced
- temperature of process
- Process type
- Moisture content
- Transportation distances
- Etc

WHAT CAN WE DO WITH BIOCHAR?



- Biochar can be applied to many uses
 - Soil application (shown to drastically increase production in degraded lands; Barrow 2012, Latawiec et al 2019, Kahn et al 2024, etc)
 - Addition to concrete and asphalt
 - Water filtration
 - Etc
- Burning is the only way to quickly/immediately release all of the biochar carbon
 - Not an eligible end use in the the methodologies (unless you are doing biofuels or similar, which is not a carbon removal)
 - Very low risk of “reversal” (unlike nature-based solutions like forestry or soil sequestration)
- Biochar and biochar credits are durable, defensible, and robust

QUICK METRICS



- Size of the opportunity to turn waste into biochar:

- ~184 million tons of biogenic waste in the US in 2018 (EPA)
- 184,000,000 tons = 166,922,000 metric tonnes
- 166.9 mil tonnes * 30% yield to biochar * 70% carbon content in biochar * 0.89 permanence factor * conversion between carbon and CO₂

= 114,391,647 tCO₂E/yr MAX POTENTIAL

- Average biochar credit price \$179 (World Economic Forum)
= \$20.476 BILLION
- Conservative credit price \$100 = **\$11.439 BILLION/yr POTENTIAL FROM CREDITS ALONE**

<https://www.weforum.org/agenda/2023/11/biochar-carbon-removals-jack-of-all-trades-for-immediate-climate-action/>

<https://www.epa.gov/facts-and-figures-about-materials-waste-and-recycling/national-overview-facts-and-figures-materials#NationalPicture>