Monetizing CO2

Algae
Terrestrial Sequestration
The China Connection

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Time is short and there is no Planet B

What to do about CO2?

• “Quit” fossil energy – not happening any time soon
• Ramp up CCS – the greatest myth of the “climate debate”
• Monetize CO2 – Wow! Is that even possible?
• What is Terrestrial Carbon Sequestration?
• What’s up with China?

The algae biofertilizer CO₂ mitigation pathway that is available today is all natural and literally as old as dirt.
“On Saturday, January 12, air pollution levels in Beijing broke records: PM 2.5 – the fine particles that gets lodged in the lungs — spiked to 886 while the Air Quality Index (AQI) climbed to 755.”

- Black carbon “soot”
- Tail pipe emissions
- Industrial emissions
- Desert dust
- Nitrous Oxides

**PM 2.5**

2530 % above US short term exposure standard

5900 % above US long term exposure standard

“These readings are based on the US Embassy’s air monitor in Beijing, since Chinese monitors stop recording at 500.”
Cyanobacteria – Blue Green Algae
As Old as Dirt

- Have internal mechanisms of both algae and bacteria
- Use photosynthesis to split water into oxygen and hydrogen
- Use hydrogen and an enzyme to split carbon dioxide into oxygen and carbon
- Heterocysts fix elemental nitrogen to ammonia nitrogen
Power Plant, Fuel, Chemical, and other CO2 Emitting Industries

Captured CO2 emissions

Power, nutrient waste streams, and waste heat

Local Algae Prospecting and Culturing

inoculation

Algae Cultivation and Harvesting

harvested algae

TerraSync Formulation and Production

TerraSync Live Algae Application

Reduced N compounds to surface water runoff

Reduced N compounds to groundwater

TerraSync Farmland Application

Nitrogen Fixed for Plant Growth Replacing Conventional Fertilizer

Carbon Sequestered in Soil (Terrestrial Sequestration)

Reduced Emission of Nitrogen Oxides

CO2 from Atmosphere

Nitrogen from Atmosphere
• Yellowstone Wheat is shown growing in Crow Reservation soil without any fertilizer (control) and two normal applications of standard fertilizer, and Strain 16 nitrogen fixing cyanobacteria (blue-green algae) at eqv. standard nitrogen application rate
• Strain 16 was selected from algae cultivation trials funded by DOE under Accelergy supervision

• Root development, (control on left – Strain 16 biofertilizer on right) is indicative of overall healthy plant development
Camelina Seed Oil Energy Crop

- Camelina seed oil crop is used in crop rotation with wheat every third year
- Left without fertilizer
- Right with Strain 16 cyanobacteria biofertilizer applied at the standard nitrogen fertilizer application rate
TerraSync in China

Salty Soil

• 7% of arable land affected
• 1.5% annual increase
• China is within 10% of Food Security arable land “Redline”
• Chongming Biofertilizer Project
  • Accelergy, SARI-CAS, Jientec
  • CO₂ from high temp biomass to fuel program

Desertification

• Loosing 1M acres farmland per year to desertification (eroding Redline 2.5%/yr.)
• Dust storms reach N America
• Elion Desert Restoration Food Crops Project
  • Accelergy, Elion Corp, CAS
  • CO₂ from Coal to Chemicals
Shanghai Advanced Research Institute

Chongming Qianwei Eco-Farm

Algae Biofertilizer for Salty Soil Restoration
27 local strains isolated for consideration
Field Test—Lettuce Green Romaine
Elion Desert Drought Resistant Science & Technology Park

Research Greenhouses

Plant Cell Culture and Algae Laboratory
Wheat

\[(\text{NH}_4)_2\text{HPO}_4\]  Control  Strain 1611
Higher nutrient diversity, bioavailability and density give plants:

Faster, stronger growth and development:
- 50% higher germination rate.
- 12% faster growth to maturity.
- 30% higher yield; 40% larger produce.
- 30% better color, taste, texture, aroma.
- 17:1 blind taste test preference.

Source: Two years of field trials with Del Monte.
So, what does it all mean

- CO₂ Emissions can be used to grow algae
- Algae Biofertilizer can be used to grow crops
- Algae Biofertilizer can replace conventional nitrogen fertilizer
- Each ton of CO₂ used to grow algae biofertilizer off-sets 2 to 4 tons of CO₂-e from the production of conventional nitrogen fertilizer
- Additional CO₂-e off-set comes from substantially reduced nitrous oxide off gas from farming
- Live algae on and in the soil pump atmospheric carbon into the soil
- Over time, on a net basis, 10 to 50 times the carbon emissions consumed to initially grow the algae is stored in the soil long term
- On many areas of the planet agricultural and other soils have been severely depleted of carbon – a large carbon sink is available
- CO₂ emissions can be utilized today to make money
See what you could have if we started Monetizing CO2 Today!

Thanks
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