Food and Agriculture Organization of the United Nations

Global Symposium on Soil Organic Carbon

Rome March 21-23 2017

REGENERATIVE DEVELOPMENT TO REVERSE CLIMATE CHANGE: QUANTITY AND QUALITY OF SOIL CARBON SEQUESTRATION CONTROL RATES OF CO2 AND CLIMATE STABILIZATION AT SAFE LEVELS

Dr. Thomas Goreau

Coordinator, Soil Carbon Alliance

37 Pleasant Street, Cambridge MA 02139 USA

goreau@bestweb.net

ABSTRACT

The Regenerative Development to Reverse Climate Change Strategy of the Commonwealth Secretariat (52 countries with 2.5 billion people) aims to greatly increase global carbon sinks in soil and vegetation to solve the climate change problem for future generations. Since we have already lost about half the carbon in the Earth's living biomass, and about half the carbon in soils that have been converted to farming and grazing, restoring these natural CO2 sinks ("Geotherapy") can absorb excess fossil fuel

carbon at the lowest cost. The rate at which this can be done depends on the quantity and quality (in terms of lifetime) of carbon sequestration, and the target. The “safe” CO2 target in terms of global temperature and sea level changes is identified as preindustrial CO2 levels from nearly a million years of Antarctic Ice Core, fossil coral, and deep sea sediment climate records. IPCC model projections are not used because they seriously under-estimate long term impacts due to use of the wrong time horizons for calculating impacts. The oceans cannot serve as a major sink without turning them into dead zones stinking of hydrogen sulfide and devoid of life above bacteria. Current state-of-the-art of carbon farming and soil sequestration can draw down the dangerous CO2 excess in decades or centuries if implemented immediately, but delay in doing so will require increased lifetimes of soil carbon storage in order to do the job. To meet global Geotherapy goals of restoring planetary life support systems to health, increased soil carbon storage is needed in every terrestrial habitat and ecosystem, but increases in soil carbon lifetime will also be essential. Two critical leverage points can greatly increase soil carbon lifetime: biochar and marine wetlands. If properly made and applied, Biochar can be applied to any soil, is resistant to decomposition, and lasts centuries, millennia, or even millions of years in the soil, while retaining soil water and nutrients for plants and increasing soil fertility, and providing carbon-negative renewable biomass energy. Wetland soils have about half of global soil carbon, with highest carbon content of all soils because lack of oxygen severely inhibits decomposition. Marine wetland soils (salt marsh, sea grass, mangroves) occupy less than 1% of the earth surface, but hold about a half of wetland carbon and a quarter of global soil carbon (more than the atmosphere or biosphere), and account for about half the carbon deposition in the ocean. Newly developed methods now allow rapid regeneration of marine wetland soils and carbon storage, which will be one of the most effective soil carbon sinks for the cost and area required, while providing valuable benefits for shore protection and fisheries habitat. Using known and proven regenerative methods could prevent runaway climate change within decades if governments are serious about funding rapid action. Failure to do so means runaway climate change (the equilibrium temperature and sea level for TODAY’S CO2 concentration of 400 parts per million is around +17 degrees C and +23 meters higher than today’s levels) that will last for millions of years before they go away as the dangerous excess carbon from fossil fuels is gradually buried in marine sediments. Such runaway climate change will guarantee extinction of coral reef ecosystems, which are already are at their upper limit, have mostly died from high temperature in recent years, and can take no more warming, while causing billions of refugees to flee flooded islands and coasts. Those changes are what fossil fuel “business as usual” inevitably commits the world to unless regenerative development is systematically and urgently applied to reverse climate change.