1. **Title Slide: Let's Remineralize!**

Remineralize the Earth (RTE) is a nonprofit organization based in Northampton Massachusetts, with a global mission: Remineralization utilizes finely ground rock dust and sea-based minerals to restore soils and forests, produce higher yields and more nutritious food, and store carbon in soils to stabilize the climate. This experiment has been created by RTE with the aim of raising awareness about the benefits of soil remineralization.

2. **Soil Remineralize: The Basics**

To start we have a short video on the basics of soil remineralization. By using soil remineralization, we can quickly imitate the way the Earth creates soils over millennia through these natural processes. These natural processes occur when glaciers crush rocks in their path to create loess, which then blows across the globe to benefit agriculture. Similarly, Volcanoes also release many minerals from within the Earth when they erupt. In the same way, alluvial deposits contain minerals, and when rock weathers these minerals are released into soils.

3. **Why Soil Remineralization?**

Soil remineralization helps grow nutrient-dense foods and enhances soil fertility and crop yields. It also reduces agricultural pollution by decreasing our dependence on chemical fertilizers and pesticides. Remineralization helps capture carbon in soils.

4. **Enhance Soil Fertility, Yields, and Nutrient Density**

First, we will dive into the ways in which soil remineralization enhances soil fertility, yields, and the nutrient density of crops.

5. **John Hamaker - Early Trials with Corn (1976-1977)**

John Hamaker's early trials with corn in Michigan showed dramatic results. The corn nubbins on the right were planted without rock dust while the ones on the left were planted with rock dust. As you can see, the ones on the left showed better results in the first year of application. The corn on the far left showed the increased growth after the application from the year before, with no additional inputs.

The glacial rock dust produced 65 bushels of corn per acre, compared to 25 bushels per acre from other local farms using conventional fertilizers. No irrigation was used!

6. **Example: *Acacia Mangium* Panama**

Another study with rock dust was carried out at a quarry in Panama where fast-growing Acacia trees were planted. For the experimental group, rock dust from the quarry was blown onto one area of the Acacia tree. The control group did not receive any rock dust. Let's take a look at the results of this study.

7. **Example: *Acacia Mangium* Panama Results**

After five years, the trees in the experimental group that had received rock dust fared very well. There was an eight-fold increase in biomass, a 2.17 increase in height, and the trees that grew with basalt had 4 times the survival rate of the control. Most of the trees in the control group were not able to survive. This chart depicts the biomass per kilogram of tree in the local soil, transition zone, and the area that grew with basalt quarry rock powder.

8. **Example: *Acacia Mangium* Panama Results**

This first chart illustrates a lot of very important results from the Panama study. Notably, there was an almost 7 times increase in biomass, and a very strong increase in elements like phosphorus, iron, zinc, etc. which all aid in plant growth.

The graph on the right shows the increase in earthworm activity with the basalt group, whereas the plots only using biochar or acting as the control saw significantly decreased earthworm activity.

9. **Example: *Acacia Mangium* Panama Results**

These six charts show the impact of magnesium, manganese, organic matter percentage, pH, phosphorus, and potassium and their relation to fertility in all three

areas, as well as the presence of basalt increasing the amount of each of these also aided in growth.

10. Example: *Acacia Mangium* Panama Results

These charts show the impact of the increased levels of zinc, aluminum, tree height, copper, calcium, and iron and their relation to increased fertility due to basalt.

11. Reduce Agricultural Pollution

Now we will look into the ways in which soil remineralization reduces agricultural pollution and takes us out of the conventional paradigm for industrial agriculture. This points us in the direction of regenerative agriculture and what it means to go beyond organic.

12. The Problem with NPK Fertilizers (Nitrogen, Phosphorus, Potassium)

NPK fertilizers lead to soil erosion and loss of organic matter in topsoil, creating barren soils. Right now 30% of what would be arable lands are now barren. We may only have 60-100 harvests left if we continue on this trajectory.

60% of soil ends up in rivers, streams, and lakes, contaminating waterways through the excess Nitrogen runoff from fertilizers. The following video explores this process.

Industrialized agriculture grows foods that are depleted of up to 70 minerals and trace elements because of the focus on three chemicals - NPK. Notably, most crops have substantially decreased levels of calcium, iron, and vitamins A and C, as well as just a general dramatic loss in most minerals and nutrients. This greatly affects our health and healthcare because our foods are missing vital nutrients.

13. Pesticides, Herbicides, and Fungicides

The use of pesticides, herbicides, and fungicides allows toxic chemicals to build up in food chains and accumulate in habitats and environments.

The conventional pesticides, herbicides, and fungicides that we use disrupt the natural balance of our soils and ecosystem. We can restore balance through regenerative agriculture.

14. Using Rock Dust Instead of Chemicals

Rock dust naturally releases over 70 minerals and trace elements into soils. As basalt weathers, it releases vital plant nutrients like calcium, potassium, and magnesium. These benefit plant health and improve pH.

This release of minerals and trace elements creates biological balance in soils and increases soil fertility.

Rock dust also serves to naturally deter insects, weeds, and fungi in a way that does not disrupt the natural order of ecosystems.

Bees, for instance, thrive in a habitat where regenerative agriculture is practiced.

15. **Carbon Sequestration: Putting carbon back in the ground where it belongs!**

And finally, we will be discussing the ways in which soil remineralization aids in carbon sequestration to put carbon where it belongs - back in the ground.

16. **Carbon Dioxide and Climate Change**

Greenhouse gases, like CO2, build up in the atmosphere to trap infrared light from the sun to increase the average temperatures everywhere on the planet. This is most dramatic in the polar regions and at the mid-latitude and causes an increase in storms. Burning fossil fuels exacerbates and hastens greenhouse warming. This makes it crucial to get the CO2 back into our soils and in the ground.

17. **The Basics of Carbon Cycling**

Photosynthesis is key to the carbon cycle of the atmosphere. Trees and plants take carbon dioxide from the air and store it as carbon in soils. Healthy forests and plants

store carbon and decaying forests and plants release CO2 into the atmosphere, causing more warming.

18. Enhanced Rock Weathering (ERW)

Enhanced rock weathering speeds up the natural process by adding rock dust to soils. The finer the rock dust the more surface area can be covered, and the faster the chemical reaction of weathering takes place.

Enhanced rock weathering can sequester .5-2 billion tonnes of carbon dioxide out of the atmosphere each year. This is equivalent to the combined emissions of Germany and Japan. The U.S. alone released 5.3 billion tonnes of carbon dioxide into the atmosphere in 2018.

19. Enhanced Rock Weathering (ERW)

Currently, the world's biggest polluters are China, India, and the US.

ERW is an incredibly promising solution, as extensive croplands and forests can store carbon. These chemical reactions can occur faster in warmer weather due to the faster kinetics. ERW does not compete or take over land used for growing food. It also does not need more freshwater.

20. How Much of an Impact?

The following video explains the En-Roads Simulator and the impact of different environmental actions on climate change.

21. Additional Resources

And finally, these are some more sources that guided this presentation for any additional research/questions.