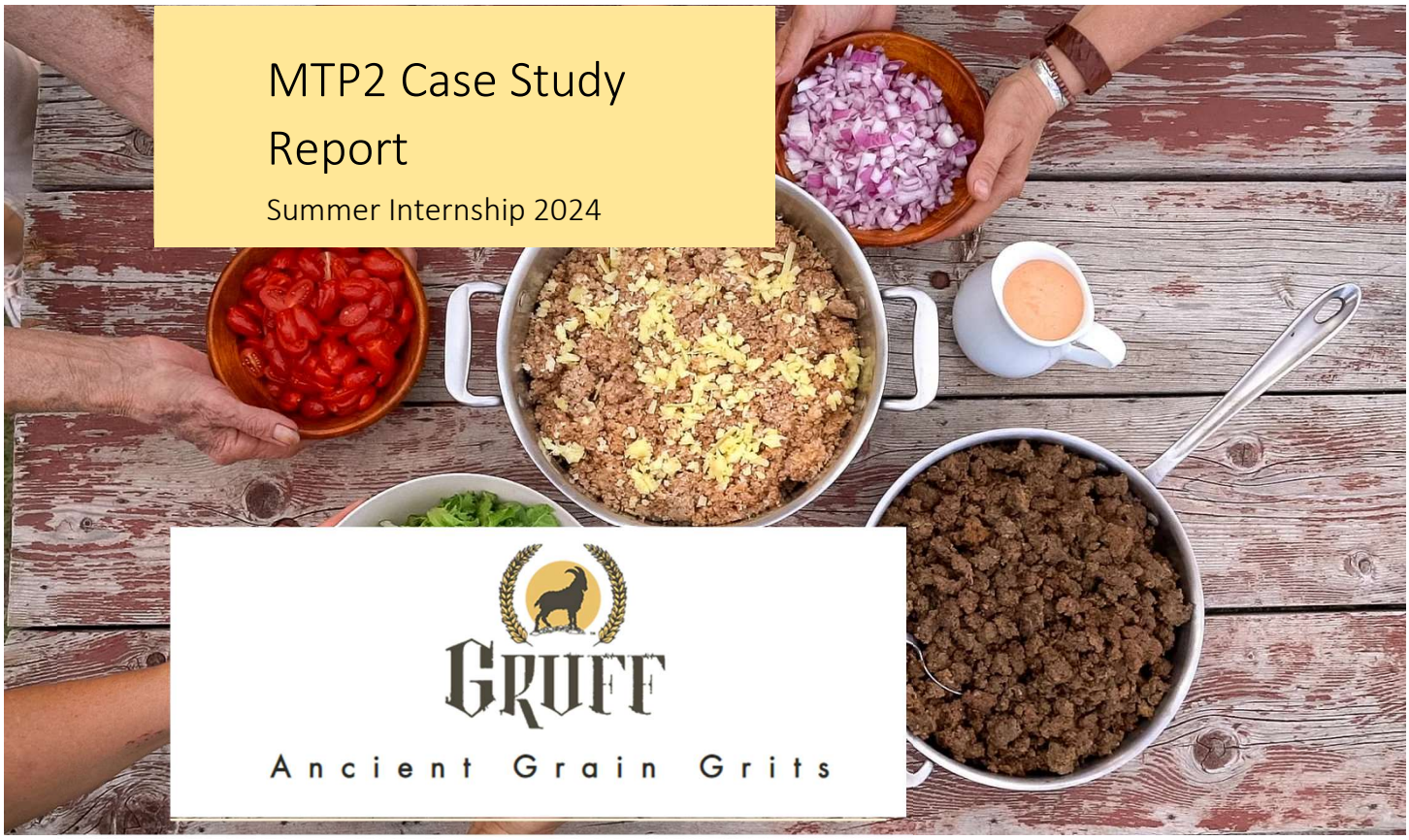

Project Background:

Gruff Grains, LLC. is a regenerative organic certified (ROC) grain company whose farm is nested below the idyllic Bears Paw Mountains in Havre, Montana. The owners, Jody and Crystal Manuel, are fueled by a passion to provide people with nourishing food rather than maximizing crop outputs of questionable quality. Their journey of transition toward sustainable and environmentally friendly farming techniques began in the early 2000's, when the devastating health effects of conventional, pesticide-rich farming took a toll on their family. Today, they have achieved ROC certification and are thriving witnesses of the success and benefits of regenerative organic farming.

In this project, Anna Binion and Katie Elliott help to develop innovative grain blend recipes, uncover chemical and nutritional advantages, and research relevant data in the field of regenerative farming to boost this environmentally powerful movement in agriculture and provide compelling insights for its promotion by future farmers and consumers alike.

Acknowledgements:

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Project Overview

Chemical Testing

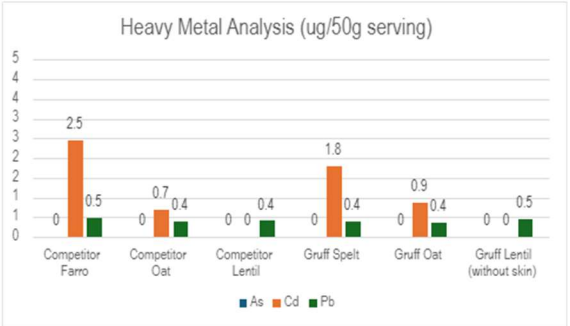
Chemical testing was utilized to determine the presence and amount of heavy metal contaminants in the grains. These data were compared to competitor grains as well as the respective reference values enumerated in CA proposition 65.

Method

The grains were dehulled, ground into a coarse powder, and mechanically dried. Once all moisture had been removed, the powder was ashed at 500C for twelve hours. The intense heat volatilized all atomic species in the sample except metals and oxalates, leaving a mineral-rich ash. This ash was dissolved in nitric acid and filtered, and the filtrate was tested using inductively coupled plasma mass spectrometry (ICP-MS).

Findings

Of the grains shown below, 50 g servings were determined not to exceed Prop 65 value of 10.0, 4.1, and 0.5 ug of arsenic, cadmium, and lead, respectively. Each value indicating "0" corresponds to no detection of that metal. Minerals were also tested, with Gruff generally having a slightly higher content than competitors.



Goal

The Rising Issue

Since 2014, over 200 billion tons of soil have been lost globally, averaging around 26 tons per person. This significant loss is compounded by conventional farming practices, which have led to a 30-75% reduction in original soil organic carbon levels. Agriculture itself contributes approximately 10% of annual global emissions, while the broader food system, including fertilizer and pesticide production, processing, transportation, and waste management, accounts for over 30% (Moyer, 2022).

Regenerative Organic Farming

Regenerative agricultural practices present a promising solution to these challenges. Implementing these practices could sequester more carbon dioxide than current human emissions. Techniques such as diversifying crop rotations, planting cover crops, reducing tillage, and using natural fertilizers can enhance soil carbon storage and improve soil health. Notably, regenerative practices can sequester up to eight times more carbon than cover crops alone, potentially offsetting up to 32% of annual CO2 emissions (Moyer, 2022).

What is next

Furthermore, soil organic matter plays a crucial role in plant growth and ecosystem services by mediating water retention, reducing erosion, and supporting biodiversity. By adopting regenerative agriculture on a global scale, we could significantly mitigate climate change impacts and enhance soil sustainability, underscoring the urgent need for these transformative practices. To fully realize these benefits, there is a critical need for further research to optimize and refine regenerative techniques, as well as for comprehensive education for both producers and consumers. Increasing awareness and understanding of these practices will help drive broader adoption and innovation, ensuring that regenerative agriculture can meet its potential in addressing global environmental challenges and fostering long-term agricultural resilience.

California Office of Environmental Health Hazard Assessment. (2019). *Proposition 65*. Ca.gov.
Moyer, J., Smith, A., Rui, Y., Hayden, J., (2022) *Regenerative organic agriculture and the Soil Carbon Solution*. Rodale Institute.