1. **PROJECT REFERENCE NUMBER:**

   46S_BE_2641

2. **TITLE OF THE PROJECT:**

   LIQUID NANO-CLAY: TRANSFORMING SOIL INTO FARMING

   " AN ENGINEERED SOIL"

3. **NAME OF THE COLLEGE & DEPARTMENT:**

   BAPUJI INSTITUTE OF ENGINEERING AND TECHNOLOGY, DAVANAGERE-577004

   DEPARTMENT OF MECHANICAL ENGINEERING

4. **NAME OF THE STUDENTS:**

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6. **KEYWORDS:**

   - NANOTECHNOLOGY
   - SOIL IMPROVEMENT
   - WATER RETENTION
   - NUTRIENT ABSORPTION
   - SOIL FERTILITY
   - MOISTURE MANAGEMENT
   - SUSTAINABLE AGRICULTURE
   - AGRICULTURAL INNOVATION

7. INTRODUCTION / BACKGROUND:

- Every day the soil is losing its nutrients and microbes, the soil contains many families of microbes, which directly or indirectly add nutrients to it in fact it's the matter that every engineer should think about It.
- Automation in the food and agriculture has brought out the use of chemical fertilizers which have destroyed the life giving and sustaining soil is the major problem in the industry
- This industrialization of the basic need of humans have created havoc in the production of the food.
- The soil is about to die both literally and figuratively, this is the problem we are facing in the food and agriculture industry, the sole aim of industrially produced fertilizers is to produce more and more food/grains its doesn't care about the quality of the food or the soil.
- We in this project aim to change the thought in which we have taken the soil for granted and to give back the care that the mother earth has been giving us.
- In this project we are trying to fight the challenges of providing quality food and taking care of the soil.

8. OBJECTIVES:

- Enhance soil structure: The objective of using liquid nano-clay is to improve soil structure by increasing its aggregation and stability, thereby reducing compaction and improving water infiltration and root penetration.
- Increase nutrient retention: Liquid nano-clay aims to enhance the soil's ability to retain essential nutrients such as nitrogen, phosphorus, and potassium, reducing nutrient leaching and increasing their availability to plants.
- Improve water holding capacity: The objective is to enhance the soil's water holding capacity through the application of liquid nano-clay, reducing water runoff and improving water availability for plant roots during dry periods.
- Enhance plant growth and yield: The primary goal of transforming soil into an engineered soil using liquid nano-clay is to promote optimal plant growth and increase

crop yields by providing a favorable environment for root development, nutrient uptake, and water availability.

- Reduce irrigation requirements: By improving water holding capacity and reducing water runoff, liquid nano-clay aims to minimize irrigation needs, leading to water conservation and potentially reducing irrigation costs for farmers.

9. METHODOLOGY:

- Soil Analysis: Conduct a comprehensive soil analysis to assess the current soil conditions, including pH, nutrient levels, organic matter content, and physical properties such as texture and compaction..
- Liquid Nano-Clay Preparation: Acquire commercially available liquid nano-clay, which consists of clay particles with a size range of nanometers suspended in water or another carrier liquid. Follow the manufacturer's instructions for dilution ratios and mixing procedures to ensure proper preparation of the liquid nano-clay solution.
- Soil Application: Select an appropriate method for applying the liquid nano-clay to the soil. Common methods include spraying, surface application, or incorporation through irrigation systems.Ensure uniform application of the liquid nano-clay across the target area, considering the soil analysis results and the specific requirements of the crops or plants to be cultivated.
- Soil Incorporation and Mixing: Use appropriate equipment, such as tillage implements or irrigation systems, to incorporate the liquid nano-clay into the soil profile effectively. Employ methods that promote thorough mixing and distribution of the liquid nano-clay throughout the root zone, ensuring maximum contact between the clay particles and soil particles.
- Post-Treatment Activities: Implement proper irrigation and drainage practices to maintain optimal soil moisture levels and prevent waterlogging or excessive drying. Monitor the soil regularly to assess its response to the liquid nano-clay treatment. Conduct follow-up soil tests to track changes in nutrient levels, pH, and other relevant parameters. Adjust fertilization practices based on the enhanced nutrient retention capabilities of the engineered soil. Maintain a record of observations, including plant growth, yield, and any notable improvements or challenges associated with the liquid nano-clay treatment.

- Continuous Monitoring and Management: a. Continuously monitor soil conditions, including moisture levels, nutrient availability, and plant health, to make timely adjustments and optimize farming practices. b. Incorporate soil amendments, organic matter, and other recommended inputs as necessary to sustain the benefits of the liquid nano-clay treatment in the long term.

10. RESULTS AND CONCLUSIONS:

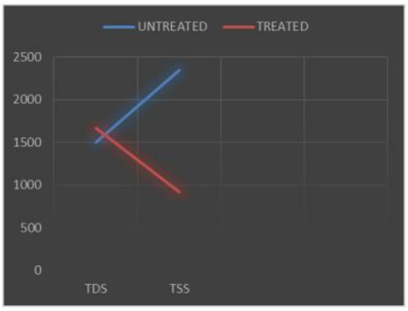
- Liquid Nano-Clay (LNC) has shown promising results for agriculture-based applications. Here are some key findings from the search results:
- LNC can improve soil quality by retaining water, which reduces the amount of water needed for crop cultivation
- LNC can transform sandy deserts into fertile farmland, making it a potential solution for combating desertification
- LNC can increase crop yields and reduce costs
- LNC can be applied on-site and is scalable, making it a practical solution for arid or semi-arid areas
- The process of mixing clay and water to create LNC is relatively quick, taking only seven hours to transform poor-quality sandy soils into high-yield agricultural land.
- LNC can be used in reforestation and other applications beyond agriculture and food production.
- In conclusion, Liquid Nano-Clay has the potential to revolutionize agriculture in arid or semi-arid areas by improving soil quality, increasing crop yields, and reducing water consumption. It could also be a solution for combating desertification and increasing food security in many countries.

11. SCOPE FOR THE FUTURE WORK:

- Further research on the optimal proportions of clay and water needed to create LNC for different types of soil.
- Investigating the long-term effects of LNC on soil quality, crop yields, and environmental impact.

- Developing mobile factories that can produce LNC on-site, making it more accessible and scalable for farmers in arid or semi-arid areas.
- Exploring the potential of LNC for reforestation and other applications beyond agriculture and food production.
- Conducting comparative studies between LNC and other soil improvement methods to determine the most effective and sustainable approach.
- Investigating the potential of LNC to mitigate climate change by reducing water consumption and increasing carbon sequestration in soil.
- Developing guidelines and best practices for the application of LNC in different types of soil and crops.
- Investigating the economic feasibility of using LNC for large-scale agriculture projects, including cost-benefit analyses and market research.

1.Total Dissolved Solids (TDS)



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