LCB FERTILIZERS PRIVATE LIMITED

Proposal on large scale manufacturing unit for LCB Fertilizers

1. Executive summary:

LCB Fertilizers Private Limited proposes the establishment of a large-scale manufacturing unit for the localized production of crop-specific, single-use biofertilizers derived from organic biomass such as cow dung and fermented organic manure. These formulations cater to a wide variety of crops including wheat, paddy, sugarcane, pulses, spices, fruits, and vegetables

The innovation combines biotechnology, nanotechnology, and chemical engineering to create a synergistic formulation of beneficial microorganisms, green-synthesized nanoparticles, superabsorbent polymers (SAPs), and engineered bioreactors. Experiments conducted by LCB Fertilizers have demonstrated the effective conversion of biodegradable industrial waste into nutrient-rich biofertilizers, using 18 microbial strains across eight optimized combinations under controlled fermentation conditions. The resulting products deliver a 21% reduction in overall farming costs, a 15–35% increase in yield, and a 33% decrease in irrigation requirements due to SAP technology derived from lignocellulosic biomass. Additional benefits include improved soil microbial populations, higher C/N ratios, enhanced root development, and better water retention. These products have been tested and certified by the Indian Council of Agricultural Research (ICAR) for their efficacy in promoting natural farming.

The company is also actively collaborating with institutions such as Tata Trusts, the Gates Foundation, TRIF, and Pradan, and has initiated international exports following product certification by the Government of Tanzania. A formal MoU with ICAR further supports LCB's work in field-level paddy straw (parali) degradation through microbial and nanotechnology applications.

2. Objectives:

- To utilize low-nutrient biomass, such as agricultural waste and cow dung, as a carrier medium for developing advanced, crop-specific microbial consortia through integrated biotechnological, nanotechnological, and chemical engineering approaches.

- To reduce overall farming expenditure by 20% to 25%, while enhancing crop yields by 15% to 35%, and improving critical soil health indicators such as microbial population, carbon-to-nitrogen (C/N) ratio, and humus content.

- To significantly minimize groundwater consumption by at least 33% in the first crop cycle through the application of super absorbent polymer (SAP) developed from agricultural biomass like parali, capable of absorbing water up to 268 times its own weight.

- To promote sustainable, organic agriculture by manufacturing and supplying 100% organic fertilizers that eliminate the need for chemical inputs, thereby reducing toxic residues in both soil and agricultural produce.

- To generate localized employment opportunities by engaging a minimum of 5 skilled and over 25 unskilled labourers per unit, with a targeted inclusion of at least 35% women, thus supporting inclusive rural economic development and women's empowerment.

3. Background and Motivation:

Indian agriculture is currently facing severe ecological and economic challenges due to the widespread and prolonged use of chemical fertilizers. These synthetic inputs not only contribute to the emission of harmful gases linked to an estimated 11,000 deaths annually but also degrade soil health by disrupting pH balance and drastically reducing the population of beneficial microorganisms. As a result, nearly 85% of India's groundwater is consumed for agricultural purposes, leading to critical water stress.

Moreover, over 80% of applied chemical fertilizers remain unabsorbed by crops, eventually leaching into the soil and entering the food chain, thereby posing serious health risks. the large-scale manufacturing unit model proposed by LCB Fertilizers offers sustainable alternative. By producing natural, crop-specific biofertilizers at the large level, these units address the root causes of soil degradation, reduce groundwater dependence, and significantly lower input costs for farmers.

4. Conventional solutions:

Chemical Fertilizers: Widely used products such as Urea, DAP, NPK, and Zinc Sulphur provide essential macronutrients to crops and are typically applied at multiple stages of the farming cycle. While effective in the short term, their long-term use contributes to soil degradation by altering pH levels, reducing organic matter, and diminishing humus content. This degradation leads to a decline in natural soil fertility, requiring increased quantities of chemical inputs and irrigation, thereby escalating overall farming expenditure.

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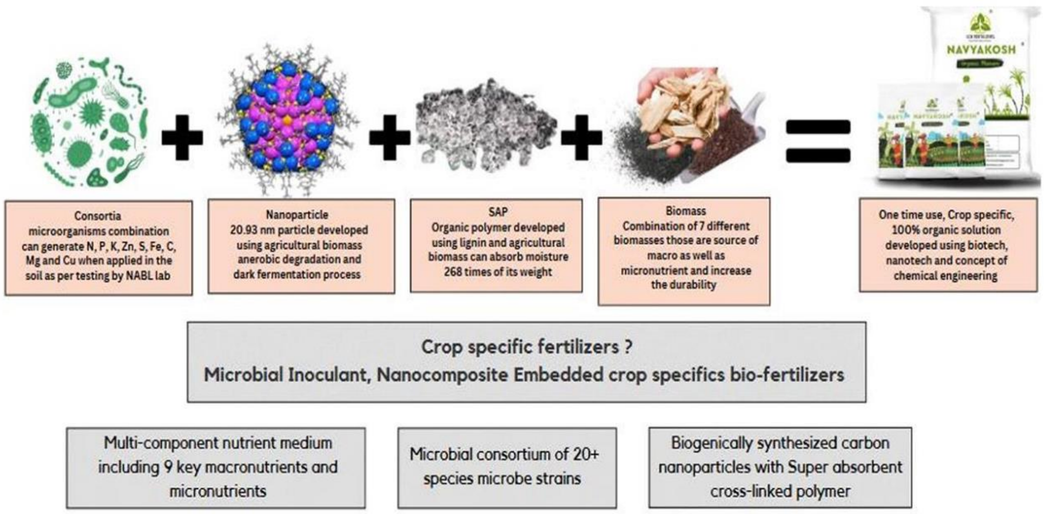
Organic Manure: Inputs like vermicompost and farmyard manure improve soil texture and contribute to humus content. However, they are generally insufficient as standalone nutrient sources due to the large volumes required to meet crop needs. As a result, farmers often supplement them with chemical fertilizers to achieve desired yields, compromising the sustainability and purity of organic farming systems.

Biofertilizers: Microbial-based inputs such as mycorrhiza, Azotobacter, and Rhizobia are available in the market to promote plant nutrient uptake. Despite their benefits, these products are often expensive and need to be used alongside both organic manures and chemical fertilizers to produce average yields. This layered input requirement adds complexity and cost, making biofertilizer use economically unviable for many small and marginal farmers.

The application of chemical fertilizers can diminish soil fertility by affecting its pH, resulting in a reduced microorganism count. This, in turn, leads to heightened demand for fertilizers, ongoing irrigation requirements, and suboptimal crop yields.

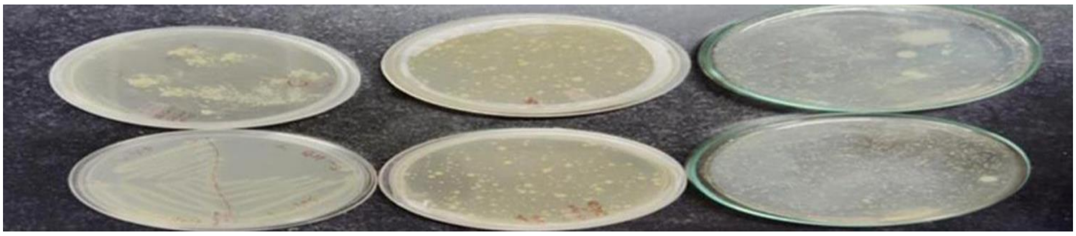


5. Novelty:

We typically categorize our technology into three distinct domains: biotechnology, nanotechnology, and engineering concepts. This classification allows us to develop a range of agricultural products that are one- time use, crop-specific, and entirely organic, tailored to the specific needs of plants and prevailing climatic conditions.

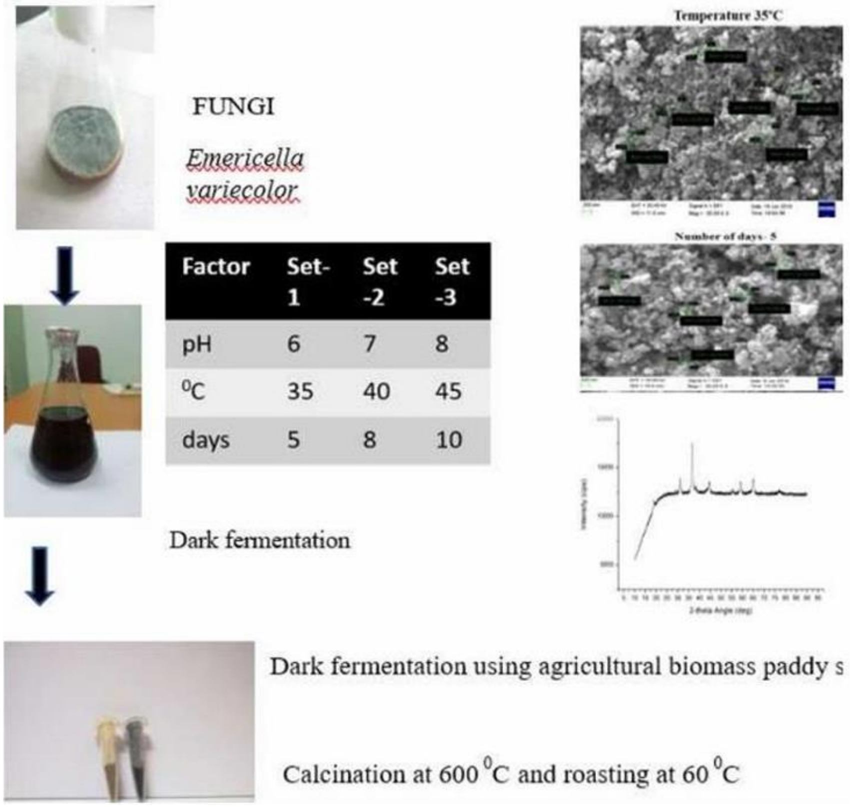
- **Biotechnology Part**

In this process, we isolate and combine 18 different types of microorganisms responsible for producing nine distinct factors essential for plant growth. These factors encompass Nitrogen, Phosphorus, Potash, Zinc, Carbon, Sulphur, Iron, and more, ensuring a comprehensive nutrient supply throughout the crop cycle from the initial application. To achieve this, we isolate microorganisms from diverse sources, including forests, agricultural lands, ponds, and industrial settings, with the goal of creating a consortium capable of delivering the necessary nutrition to plants. These microbes not only fulfil the plant's nutrient requirements but also contribute to soil health enhancement by increasing organic matter content. Furthermore, we formulate combinations of eight different types of biomasses, in which we use biomass as a major raw material along with this we also use some quantity of cow dung, slurry from Bio-CBG, jaggery, and alcohol industries, waste from dairy and rice mills, agricultural residues, and agricultural products. These biomass sources serve as nutrient and micronutrient reservoirs and act as suitable carriers for microorganisms. Our research extends to extensive field trials conducted in various regions of India. These trials evaluate the impact of our formulations on different crops. Additionally, we have monitored the year-to-year increase in organic matter within the soil, and our findings indicate a substantial 42% increase, underscoring the positive effects of our approach.



- **Nanotechnology**

In this segment, we have organically synthesized nanoparticles designed to provide an expanded surface area for microorganisms. These nanoparticles offer several additional advantages, including enhancing the thermophilic properties of microorganisms up to 78 degrees Celsius. They also facilitate the decomposition of available biomass, leading to increased organic matter content and ultimately contributing to the augmentation of microorganism populations. To achieve this, we conducted comprehensive experiments focusing on five critical factors: pH levels, temperature conditions, the number of fermentation days, the type of fermentation, and, finally, calcination or roasting. Our systematic experimentation yielded optimal results.



Factor	Set-1	Set -2	Set -3
pH	6	7	8
^{0}C	35	40	45
days	5	8	10

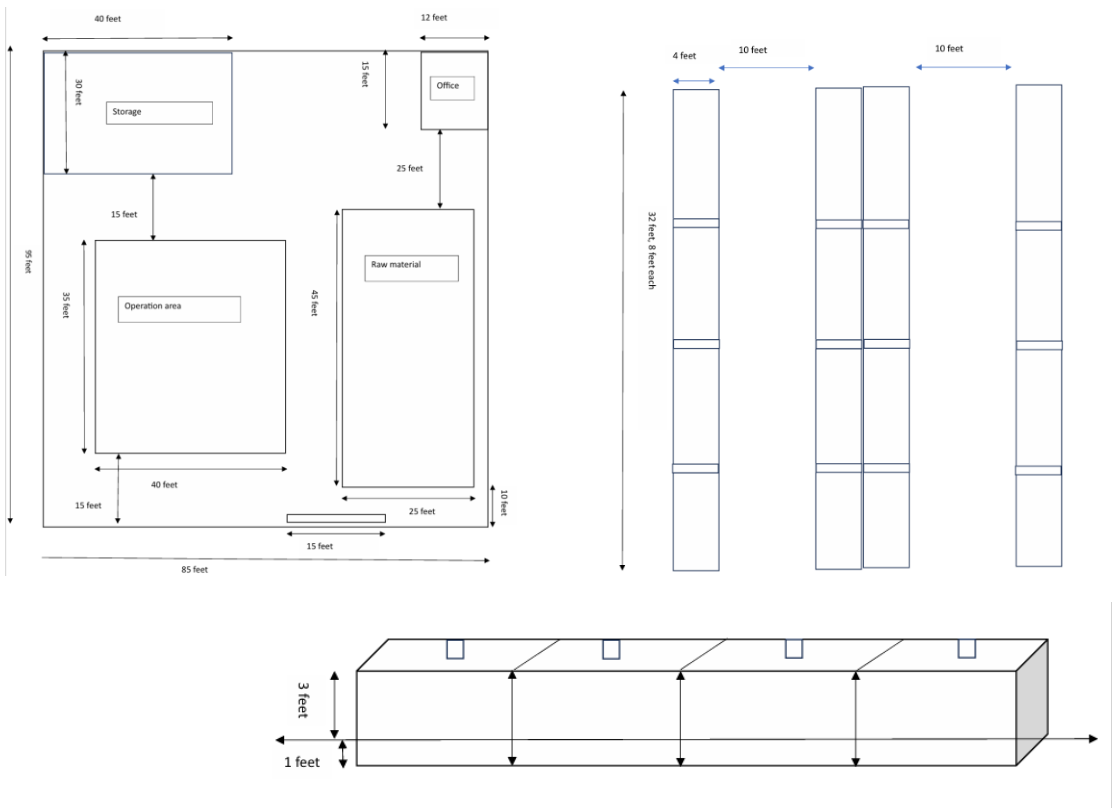
- **Chemical engineering**

To expedite the manufacturing process of our crop-specific biofertilizers and insecticides, we have undertaken the development of low-cost customized fermenter tanks. These bioreactors are designed to allow precise control over various climatic conditions, including temperature, humidity, pH levels, and agitation, facilitating anaerobic solid-state fermentation. Additionally, we are actively working on the creation of an organic superabsorbent polymer or hydrogel. This polymer exhibits the remarkable ability to absorb water molecules up to 268 times its weight, releasing water slowly into the soil over a period of one month. Furthermore, due to its organic nature, these polymers naturally degrade. Their incorporation not only addresses irrigation concerns but also alleviates plant stress factors such as relative electrical conductivity, proline levels, MDA (Malondialdehyde) content, hydrogen peroxide, and POD (Peroxidase) activity. By combining these innovations and applying them to seeds, we aim to resolve multiple farming challenges while providing the benefits of each component in a unified solution.

Our research has demonstrated that this approach can lead to yield increases ranging from 15% to 40% across different crops. It also substantially reduces irrigation demands by at least 33%, decreases farmers' investments by 45%, and minimizes the effort required, as it is a one-time application that obviates the need for additional fertilizers and micronutrients throughout the crop cycle. Furthermore, our solution reduces the crop duration by 5-8%, as confirmed through comparative analyses with chemical fertilizers.

6. Capax cost for setting 100 ton per month production unit:

SN NO.	PARAMETERS	QUANTITY	UTILIZATION FROM PLANT
1.	Land	15000 sq feet	Available at site
2.	Godown having closed shade (3000 sq feet)	1	Available at site
3	Raw material area with open space (3000 sq feet)	1	Available at site
4.	Bio Incubator	1	₹85,000
5.	Cemented fermenter tank (2 ton each) (8 feet* 4 feet* 4 feet)	16	Available at site
6.	Sensors and controller	16	₹2,40,000
7.	Basic manual equipment's	1 Set	Available at site
8.	pH meter	1	₹10000
9.	Humidity meter	1	₹10000
10.	CC tv camera	1	₹25000
11.	**TOTAL**		₹3,70,000



LAYOUT

7. LCB Fertilizers has tailored our innovations to develop the following:

- Super Absorbent Polymer: Developed using lignin and acrylic acid, this polymer exhibits an impressive water- holding capacity of 268 times its weight. It can retain water for a minimum of 35 days from the day of irrigation.

- Nobel Enzymes: These enzymes are pH-independent and aid in the degradation of biomass. They contribute to the enhancement of microorganism populations, humus content, organic matter, and carbon levels in the soil.

- Green-Synthesized Nanoparticles: These nanoparticles are synthesized using eco-friendly methods and confer thermophilic properties to microorganisms, allowing them to thrive at temperatures of up to 78 degrees Celsius. They also promote biomass degradation in the soil.

- Anaerobic Bioreactor: Our anaerobic bioreactor creates artificial climatic conditions for microorganisms and maintains suitable temperatures even during exothermic reactions in the fertilizer development process.

8. Commercialization model:

To drive the large-scale adoption of sustainable farming across India, we have designed a four-step commercialization model anchored in community participation, environmental sustainability, and rural upliftment. The first step involves establishing trust and scientific validation by distributing free samples of our organic inputs for comparative field trials across multiple districts. These trials, conducted in partnership with Krishi Vigyan Kendra's (KVKs), agricultural universities, and progressive farmers, aim to demonstrate the ability of our organic solutions to enhance soil fertility, crop yields, and pest resistance without relying on chemical inputs. Upon observing positive outcomes, the second step centres on building grassroots capacity through farmer training sessions, Kisan Chaupals, and village-level workshops, with a special focus on empowering women and self-help groups. These initiatives not only promote sustainable cultivation techniques but also foster local employment. In the third phase, we focus on last-mile delivery by establishing a decentralized rural distribution system. This includes the creation of village-level organic resource centres or bio-input outlets managed by local entrepreneurs, FPOs, and rural youth, ensuring easy accessibility of organic products to farmers. The final step emphasizes localized production through small-scale, community-run manufacturing units set up in collaboration with agro-industries and sugar mills. These units will utilize agricultural by-products such as bagasse, cow dung, and crop residues for the eco-friendly, chemical-free production of organic biofertilizers and bio-insecticides. Each unit will generate employment for over 200 skilled and unskilled workers, with a strong focus on women's participation and leadership. Altogether, this inclusive model supports the transition to organic agriculture while enabling self-reliant rural economies, ecological restoration, and sustainable community development.

9. Benefits:

a) Environmental Benefits:

- Incorporating SAP (Super Absorbent Polymer), active microorganisms, humas content enhancement in organic matter of the soil result minimization in requirement of ground water in agriculture. The polymer which is being developed can absorb water up to 268 times of its weight along with another factor it reduces the total irrigation demand by 33% by the help of water retention technique.

- Our products contain microbes that increase soil organic matter from 32% to 74% within one year.

- The microbial content in our fertilizers facilitates the degradation of harmful chemicals accumulated in the soil.

- Our products are entirely organic, causing no harmful impact on the soil.

b) Social Benefits:

- We will provide employment to over 500 direct and 2000 indirect skilled and unskilled labourers, with a dedicated focus on empowering women in various parts of India.

- Currently, we employ 28 individuals, including 9 women and one co-founder. Our goal is to further promote women's empowerment in society.

- We collaborate with various organizations, including FPOs, NGOs, SHGs, and more, to expand our reach and promote our products. This collaboration contributes to the economic empowerment of these community-based organizations due to higher margins and savings when using our products.

c) Economic Benefits:

- We will develop a consortium of 22 different crop-specific microorganisms, eliminating the need for other nutrient-based fertilizers.

- Our products consistently increase crop yields by 15-35% across various crops and locations.

- Farmers using our products have experienced reduced farming investments ranging from 5% to 48%, depending on the crop and location.

- Our solutions have reduced irrigation demand by 33%, conserving water resources.

- Our products reduce the requirement for human effort and continuous manpower involvement in farming activities.

10. Revolutionizing Agriculture: From biodegradable Waste to World-Changing Fertilizers

The transformation of biomass, into high-nutrient, crop-specific fertilizers marks a pivotal shift in sustainable agriculture. Traditionally, biomass has been used primarily as a fuel source or disposed of as waste, offering limited benefits to the agricultural cycle. In contrast, our new approach converts biomass into an advanced biofertilizer that significantly enhances soil health, reduces water consumption, and boosts crop yields. This revolutionary transformation not only addresses waste management but also introduces an innovative solution to the global agricultural challenges of soil depletion and resource scarcity.

Traditional biomass Use case

- Limited Utility: In the conventional model, biomass was mainly used as a manure with very low nutrient value.

- Environmental Strain: Traditional disposal methods added environmental stress due to inefficient waste management and the lack of soil enrichment properties.

- Missed Agricultural Potential: Farmers continued to rely heavily on chemical fertilizers, which degrade soil health over time, leading to lower microbial populations, decreased organic matter, and increased dependence on irrigation.

New Model: biomass-Based Fertilizer

- Nutrient-Rich Fertilizer: Using advanced biotechnological processes, biomass is now transformed into a nutrient-dense fertilizer enriched with essential microorganisms, nanoparticles, and superabsorbent polymers. This new fertilizer provides a full spectrum of nutrients like Nitrogen, Phosphorus, Potassium, and micronutrients, ensuring comprehensive plant nutrition throughout the crop cycle.

- Water Efficiency: The new formulation incorporates superabsorbent polymers that can hold up to 268 times their weight in water, reducing irrigation needs by up to 33%. This is a critical advantage, especially in water-scarce regions.

- Soil Health & Yield Improvement: With the introduction of microbial consortia and organic matter, the new biomass-based fertilizer significantly improves soil structure, enhances root development, and increases yields by 15-35%. Over time, this approach builds healthier soil ecosystems, reducing the long-term dependency on chemical inputs.

Comparative Analysis:

Metric	Traditional biomass Use	New biomass-Based Fertilizer
Utility	Low nutrient organic manure or waste	High-value fertilizer enhancing crop growth
Environmental Impact	Disposal adds environmental stress	Reduces waste, enhances soil health, and minimizes chemical inputs
Nutrient Contribution	None	Provides full nutrient profile essential for different crops
Water Usage	High due to traditional irrigation methods	Up to 33% reduction in water consumption
Crop Increase Yield	Dependent on chemical fertilizers (degrading soil over time)	Yield increases by 15-35% due to enhanced microbial activity
Soil Health	Degrades over time with chemical use	Improved organic matter, C/N ratio, and microorganism populations
Sustainability	Limited sustainability benefits	Promotes organic, sustainable farming practices

By replacing the old, inefficient use of biomass with this innovative process, we are enabling farmers to achieve greater yields, use fewer resources, and promote long-term soil health, revolutionizing the way agriculture is practiced globally. The new biomass-based fertilizer reduces water requirements by up to 33%, highlighting the impact of superabsorbent polymers on sustainable irrigation. The average yield improvements (in percentage) across different agricultural farms using traditional chemical fertilizers versus those using the new biomass-based fertilizers, showing a significant 15-35% increase in crop yields. The potential of this breakthrough to reshape global agricultural practices is immense. By turning waste into wealth, we are contributing to a sustainable future where both the environment and the farmers can thrive.

Conclusion:

The establishment of the large-scale Manufacturing Unit for LCB Fertilizers marks a significant step toward sustainable and inclusive agricultural advancement. By leveraging innovative biotechnology, crop-specific microbial formulations, and eco-friendly production methods, the unit will enable low-cost, and high-impact fertilizer solutions for farmers. This initiative not only reduces dependency on chemical inputs but also revitalizes soil health, enhances crop productivity, and lowers input costs.

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