



# Slow release fertilizer using biochar from hemp cores by granulation process for sustainable agriculture.

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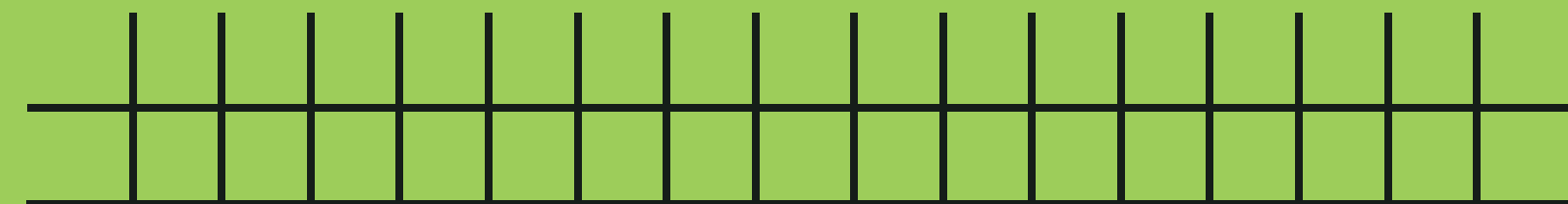
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# 01. SOURCE OF IMPORTANCE

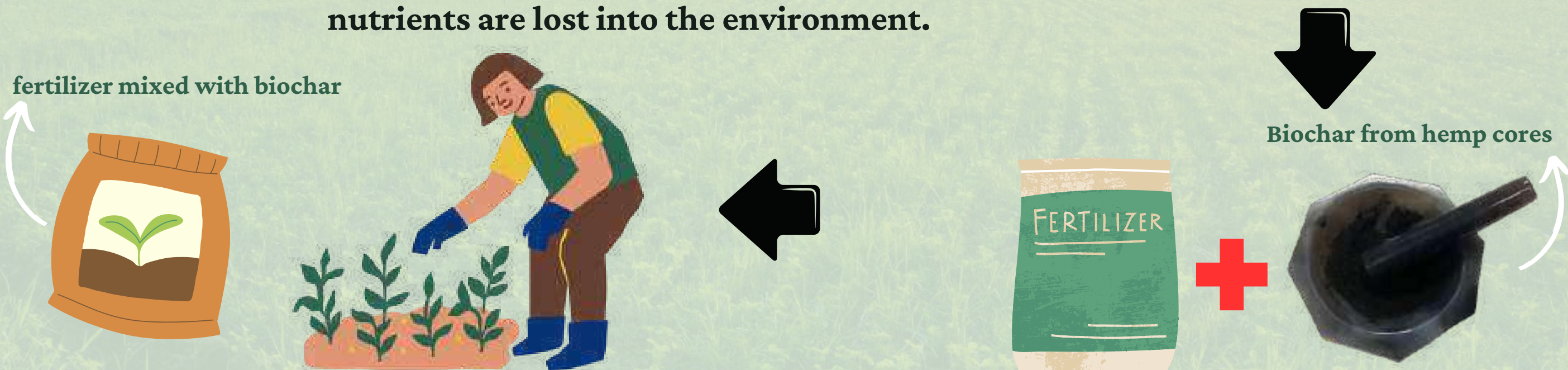


Farmers use a lot of fertilizer to grow their crops.

Fertilizers release nutrients too quickly and when it rains, a large amount of nutrients are lost into the environment.

causing farmers to use more fertilizers, It pollutes the soil and the environment.

**Keyword:**  
Hemp cores  
Biochar  
Granulation  
Torrefaction  
Slow release



Reduce the cost of farmers and do not pollute the soil and the environment.

in order for the fertilizer to release nutrients more slowly, allowing plants to absorb nutrients for longer.

- **To create fertilizers that have a nutrient release rate slower than conventional fertilizers.**
- **To reduce the loss of nutrients to the environment.**
- **For ease of use**



## UPSTREAM

Farmers who plant  
hemps.



## MIDSTREAM

Fertilizer production  
industry



## DOWNSTREAM

Farmers who grow  
perennial crops

## Initial variables

### 1. Ratio Fertilizer & Biomass

- 100:0 75:25 25:75 0:100

### 2. Binder

- non binder
- Chitosan
- Cellulose

### 3. Oven Temperature

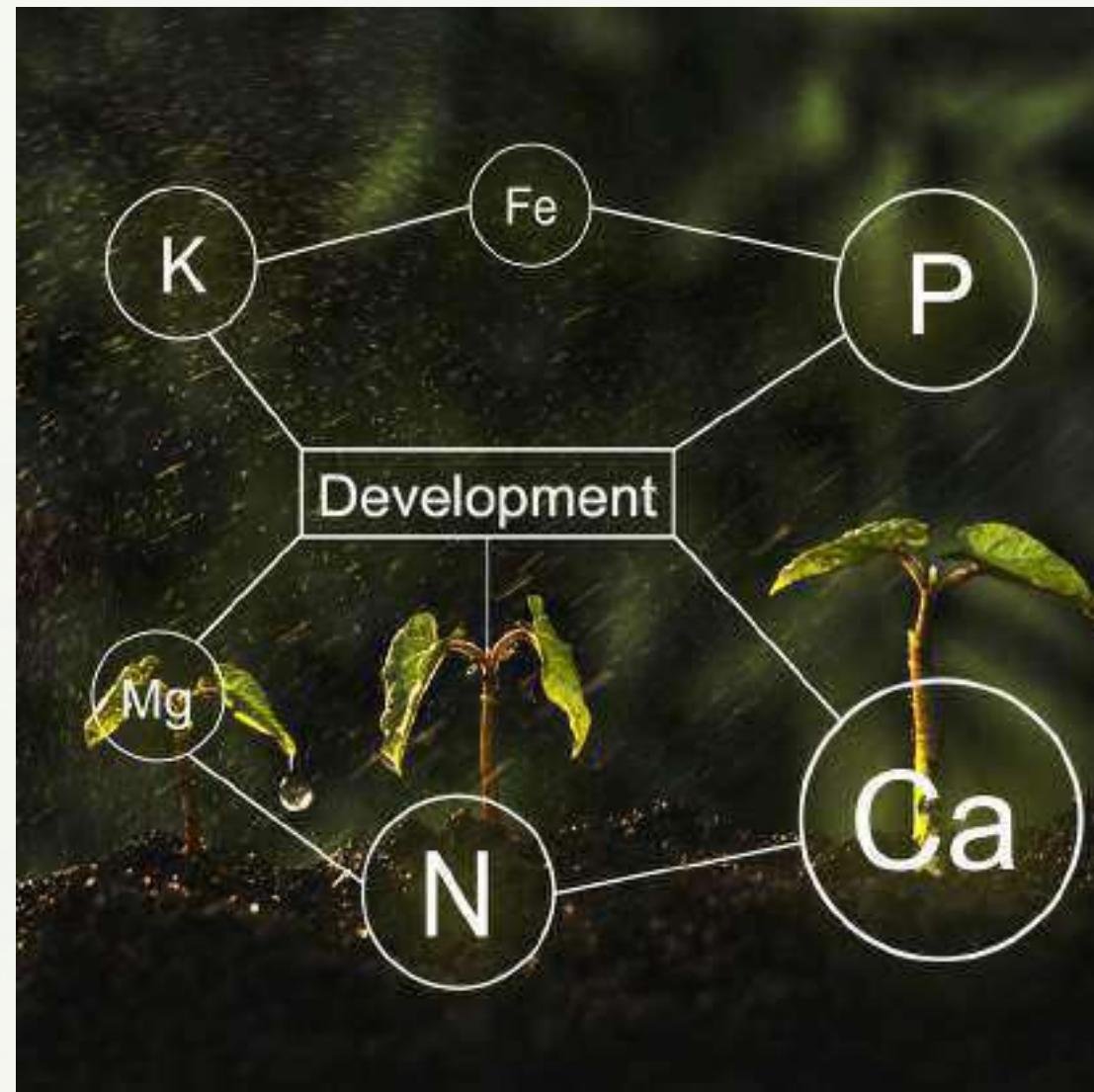


## Dependent variables

- **FTIR Analysis**
- **Surface Area and Porosity**
- **Characterization**
- **N, P, and K Release**

## Control variables

- **Pressure**
- **Biomass type**
- **Total volume**
- **Fertilizer type**



**Fertilizers mixed with biochar slow down the nutrient release rate of minerals, making the plants take longer to absorb, slow down the minerals into environment**

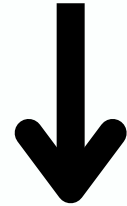


## “ GRANULATION FERTILIZER ”

- ✓ EASY TO TRANSPORT
- ✓ REDUCE THE LOSS OF NUTRIENTS TO THE ENVIRONMENT
- ✓ SUSTAINABLE AGRICULTURE



Hemp

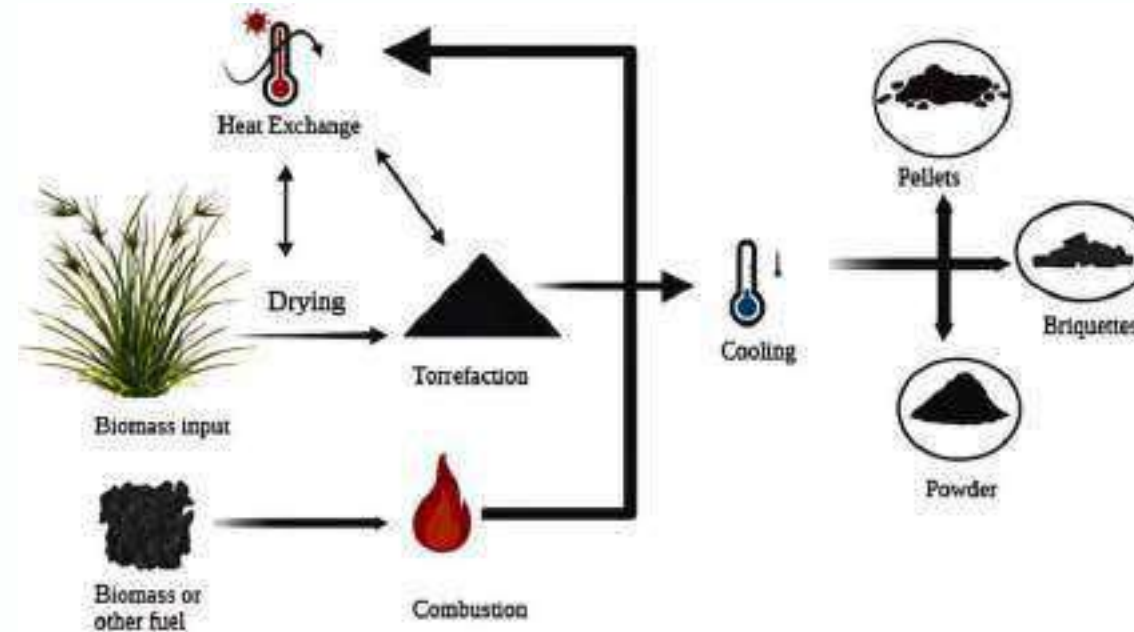


Hemp cores



Biomass from hemp

- Crush the hemp cores and put them in an oven to remove moisture.



Biochar manufacturing scheme using the torrefaction method  
(A sustainable approach to improve soil health,2023).



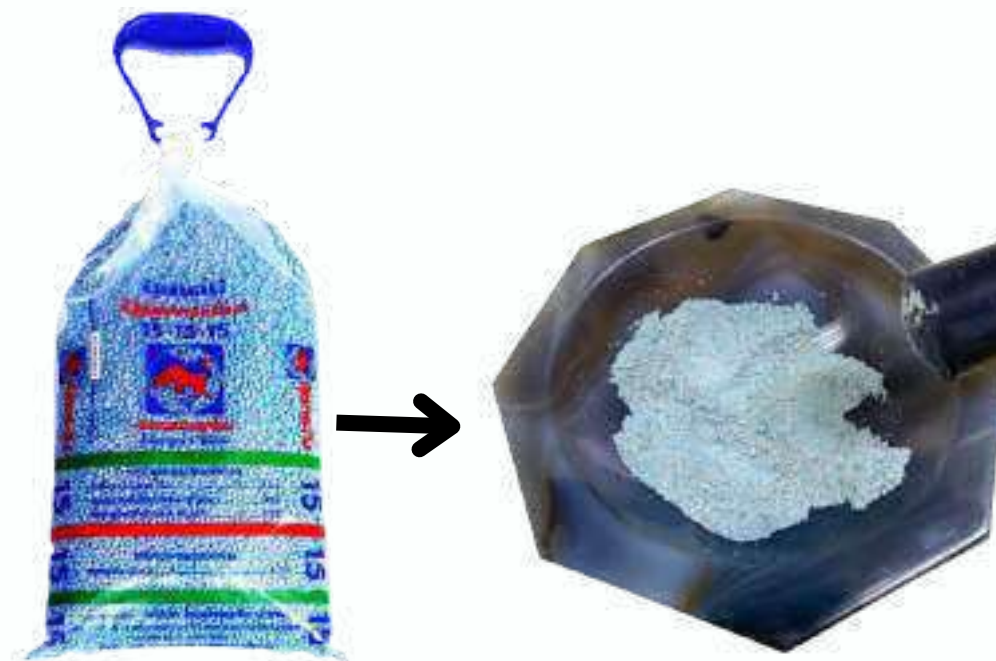
- Burning biomass with tube furnace with torrefaction process



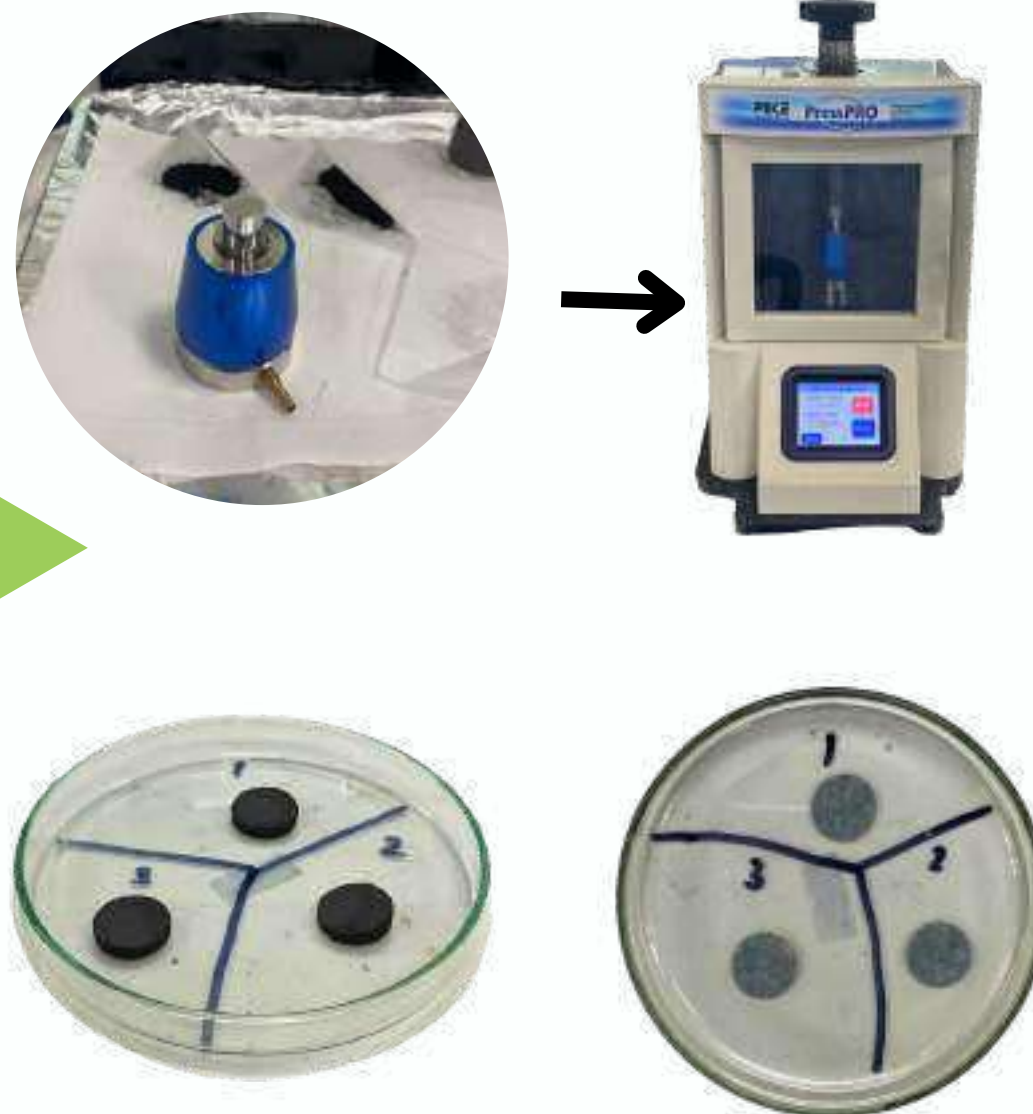
The torrefaction biochar has 33.56 %yield.



Grind biochar with mortar.



Grind commercial chemical fertilizers with mortar.



Pressurized material is formed using a PressPRO Programmable Hydraulic Press.



fertilizer using biochar by granulation. Take it to check the characteristics and properties as follows.

- FTIR Analysis
- Surface Area and Porosity
- Characterization
- N, P, and K Release

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- Waliyu Adedeji Oyebode and Helen Olayinka Ogunsuyi. (2021). Impact of torrefaction process temperature on the energy content and chemical composition of stool tree (*Alstonia congenisis* Engl) woody biomass. *The Journal of Current Research in Green and Sustainable Chemistry*, 4, 100115.





# THANK YOU

FOR YOUR KIND ATTENTION

