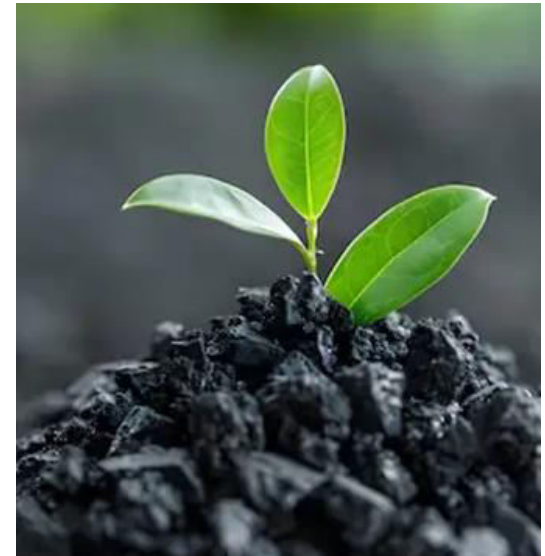


Organic Plant-Based Protein and BioChar from Bana Grass



December 2025

How it Started

- This project started as a fuel project October 2021, when we had noticed the steep price increase of Fossil Coal.
- We decided very early that grass was the only sensible feed stock.
- Started looking at Miscanthus and Napier grass but after continued research we found a grass developed in Thailand in the early 2000 called Super Napier or Pakchong 1. This grass is a cross hybrid between ordinary Napier grass (*Pennisetum purpureum*) and Pearl millet (*Pennisetum glaucum*).
- Have a look at this Aga Khan Foundation Sponsored video clip on Bana grass:
<https://akflearninghub.org/instructional-video/video/agriculture-and-food-security/bana-grass/>
- In January 2023 we found out that exactly the same hybrid was developed in South Africa in the 1950's, It is called Bana Grass; The name Bana is derived from the acronym "ba" in Babala (Pearl Millet) and "na" from Napier. Bana grass has spread to most parts of the sub-tropical climate areas of the world.

Protein from Grass

- In September 2022 we ran across a presentation from Aarhus University describing how the agriculture sector decided to replace the importation of organic soya protein with protein extracted from Lucerne and Clover grass farmed in Denmark.
- We looked for chemical analysis of the Bana Grass and found it contains between 16-19% of crude protein, depending on time of harvest – 45-60 days after last cutting. However when the Danish can do maximum 2 t of protein per ha and year we can do >10!
- There are several very large scale grass to fuel projects in the world but, so far, we are the only ones first extracting the liquid and separating the protein from the liquid in a centrifuge, which will take out the corrosivity. This is important if you want to use the biomass to fuel a boiler. However in our case our focus is to make biochar to be used a carbon sink in a farming scenario.

Microwave Assisted Liquid Extraction

- Pressing out liquid from Bana grass is quite difficult. If you use a batch press you are lucky if you can take out 50% of the liquid. Hence, we have introduced a technology we call: Microwave Assisted Liquid Extraction (MALE) – A revolutionising plant extraction with unmatched efficiency.
- Superior Extraction Efficiency: Our MALE process uses advanced microwave technology to rupture all cell membranes, significantly increasing the liquid extraction rate from around 50% to over 90%.

Pellets & BioChar

- One issue with fuel from grass is the corrosivity and high levels of ash content. However, those issues are eliminated when you take out the liquid before producing the fuel from the press cake. What is left in our press cake is only Cellulose, Hemicellulose and Lignin
- However our focus is to produce BioChar and mix it into the soil. Not only is this a Carbon Sink (Carbon Credits @ USD 200/t) but also offers both fertiliser and water retention
- The company <https://www.wastex.io/> suggests biochar has resulted in a 95% increase in yield for its partner corn farmers in the Philippines and Indonesia, while reducing fertiliser use by 50%.

The Market for Plant-Based Protein

- The present price for Soya Bean Protein in Africa is USD 4-600/t
- Our Protein will be Organically farmed with a much higher value. However, the market for Organic Protein in Africa is very limited or non existing, so we will ship some to OECD countries. In Dubai for example the price is $\pm$ USD 1500/t
- However, we are committed to supply the African feed industry to replace imported Soya Bean Protein, which they are busy doing in Denmark
- And tonnage wise, the market for protein is endless!

Farming

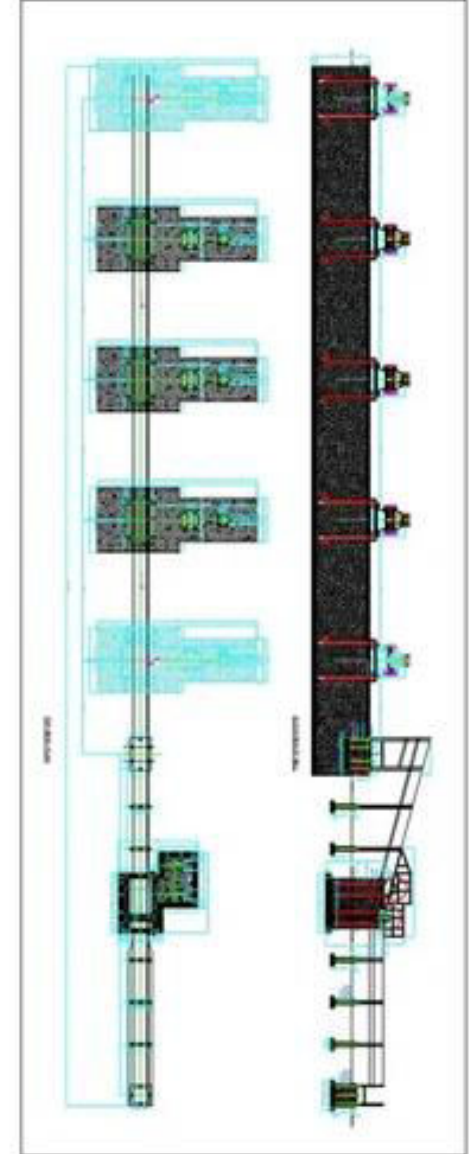
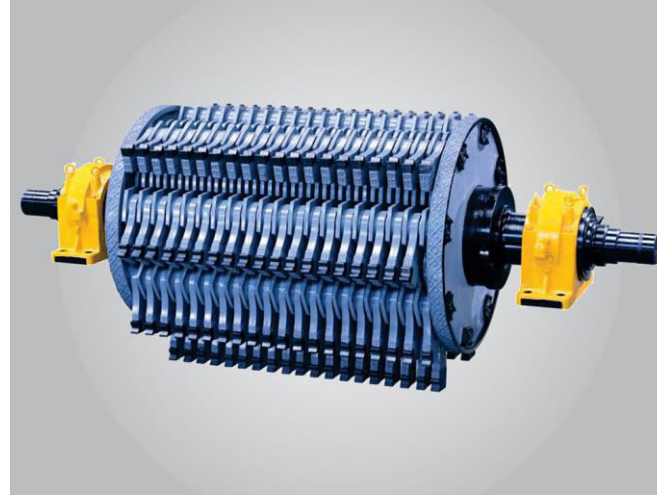
- With drip irrigation Bana grass should produce 350 t of wet matter and 75t of dry matter. At a 18% crude protein content each ha should produce 10+t of protein per year
- See enclosed Propagation and Farming guidelines.

Processing

- First the liquid is extracted in the following steps:
 - Mechanical Fractionation
 - Microwave Assisted Liquid Extraction
 - Liquid Extraction
- Secondly the protein is separated from the liquid – Precipitation and Protein Separation
- Thirdly the Press Cake is used to make Biochar.

Sugar Cane Shredder – 1000 TCD/day

- After plants are harvested at 60 days of age, the stems need to be shredded by a Sugar Cane Shredder



Microwave Assisted Liquid Extraction



Benefits:

Increased Yield: From around 50% to over 90% extraction rate.

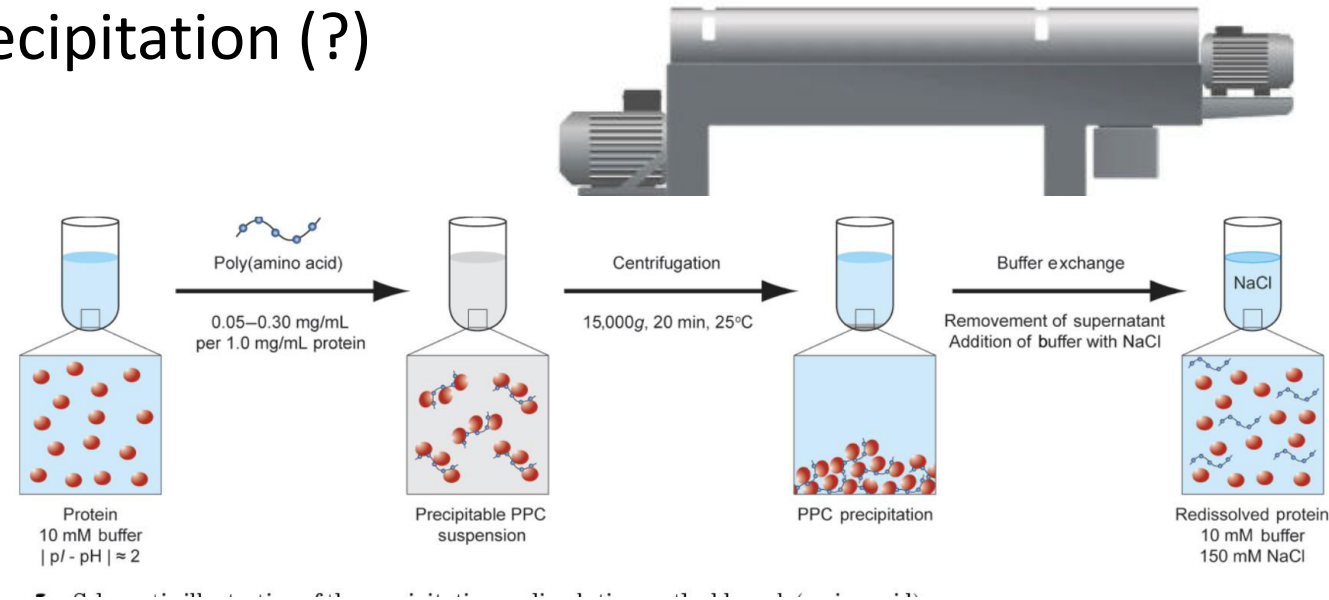
Liquid Extraction

- The Belt press typically has more capacity per CAPEX but less extraction rate (%) than a batch press
- However, applying Microwave treatment gives the Belt press higher extraction rate and higher production rate.



Conditioning and Decanting

- Thermal Coagulation or Acid Precipitation (?)



- Decanting



BioChar Production



Pyrolysis is the thermal decomposition of materials through heating in the absence of oxygen. It's a thermochemical process that breaks down organic matter into simpler substances, producing a combination of gases, liquids (bio-oil), and a solid residue (BioChar).

For more information, please contact:

Lorette Diedericks lorette@gpsolutions.co.za **+27 71 861 8674**

Tomas Persson tomas@gpsolutions.co.za **+27 81 485 0949**