Cassava Leaf Protein Production Facility Proposal

Project Overview

Cassava (Manihot esculenta Crantz) is a staple crop in Nigeria, where it is widely cultivated for its starchy roots. However, the leaves, which are rich in protein, vitamins, and minerals, are often underutilized. This project proposes the establishment of a Cassava Leaf Protein (CLP) production facility in Nigeria to harness this abundant and sustainable resource. Nigeria's position as the world's largest cassava producer ensures a consistent and ample supply of raw material, making it an ideal location for this venture.

This project presents a compelling opportunity to leverage Nigeria's abundant cassava resources to produce a valuable protein concentrate. By establishing a cassava leaf protein production facility, we aim to address critical issues of food security and nutrition, while fostering economic development and sustainable agricultural practices in the region.

Project Objectives

To establish a sustainable and efficient system for extracting high-quality protein from cassava leaves, contributing to food security, improved nutrition, and economic empowerment in Nigeria.

1

Develop Extraction Process

Develop a scalable and cost-effective process for extracting protein concentrate from cassava leaves.

2

Produce Nutritious Supplement

Produce a highly nutritious and versatile protein supplement suitable for human consumption and animal feed.

3

Create Employment

Create employment opportunities and stimulate local economic growth in cassava-producing regions.

4

Promote Sustainability

Promote sustainable agricultural practices by valorizing an often-wasted agricultural by product.

5

Address Malnutrition

Contribute to addressing protein malnutrition in Nigeria and potentially other regions.

Why Nigeria?

Nigeria's status as the world's largest producer of cassava provides an unparalleled advantage for this project. The country's vast cassava farmlands guarantee a continuous and abundant supply of fresh cassava leaves, which are currently largely discarded or underutilized. This eliminates the need for extensive raw material sourcing and transport, significantly reducing operational costs and environmental impact. Furthermore, a significant portion of Nigeria's population faces nutritional deficiencies, particularly protein-energy malnutrition, making the local production of a high-quality protein source highly impactful.

Process description

Processing Steps (Part 1)

Raw Material Sourcing

Fresh, healthy cassava leaves will be sourced directly from local cassava farms. Partnerships with farmer cooperatives will ensure consistent supply and fair-trade practices. The process begins with sourcing fresh, healthy cassava leaves. These are ideally harvested from mature cassava plants, ensuring good protein content.

Washing and Sorting

Leaves will be thoroughly washed to remove dirt and impurities, followed by sorting to remove damaged or diseased leaves. Upon arrival at the processing facility, the leaves undergo meticulous washing and sorting. This crucial initial step removes dirt, dust, insects, and any damaged or diseased leaves, preventing contamination and ensuring a high-quality starting material. Clean leaves are essential for both food safety and the efficiency of subsequent processing steps.

Protein Extraction

The pulp will undergo a series of extraction steps, likely involving pressing or juicing to separate the protein-rich liquid from the fibrous residue. Following milling, the leaf pulp undergoes protein extraction. This typically involves mechanical pressing or juicing. The pulp is subjected to pressure, which separates the protein-rich liquid (the "leaf juice") from the fibrous residue. The liquid fraction contains the dissolved proteins, along with other soluble components. The fibrous residue, though lower in protein, can be further utilized as animal feed or organic fertilizer, promoting a circular economy.

Protein Coagulation

The extracted liquid will be treated (e.g., heat treatment, pH adjustment) to coagulate the protein. The extracted leaf juice, now rich in dissolved proteins, is then subjected to protein coagulation. This step causes the dissolved proteins to clump together and precipitate out of the solution. Common methods for coagulation include: Heat Treatment: Applying controlled heat denatures the proteins, causing them to aggregate. pH Adjustment: Altering the pH of the solution to the isoelectric point of the proteins reduces their solubility and promotes their precipitation.

The choice of method depends on the desired properties of the final protein and the efficiency of the process.

Processing Steps (Part 2)

Filtration/Centrifugation

The coagulated protein will be separated from the liquid phase through filtration or centrifugation. After coagulation, the precipitated protein needs to be separated from the remaining liquid. This is achieved through either filtration and centrifugation: Filtration: The mixture is passed through a filter medium that retains the solid protein particles while allowing the liquid to pass through. Centrifugation: The mixture is spun at high speeds, causing the denser protein particles to settle at the bottom of the centrifuge, while the lighter liquid remains on top.

Both methods effectively separate the protein curd from the "whey" or supernatant liquid.

Drying

The protein concentrate will be dried using appropriate methods (e.g., spray drying, freeze-drying, or oven drying) to produce a stable powder. The separated protein concentrate, which is still in a wet or paste-like form, undergoes drying to remove moisture and produces a stable, storable powder. Several drying methods can be employed, each with its advantages: Spray Drying: This method involves atomizing the liquid protein concentrate into a hot air stream, rapidly drying it into a fine powder. It's efficient for large-scale production. Freeze-Drying (Lyophilization): This is a gentler method that involves freezing the protein and then sublimating the ice under vacuum. It helps preserve the nutritional integrity and sensory qualities of the protein, but it is more energy intensive. Oven Drying: A simpler method where the protein is spread in thin layers and dried in an oven at controlled temperatures.

The choice of drying method depends on the desired product quality, energy costs, and production scale.

Milling and Packaging

The dried protein will be milled into a fine powder and packaged in appropriate, food-grade materials. Finally, the dried protein, often in flake or granule form, is subjected to milling. This step grinds the dried protein into a fine, uniform powder, which is desirable for most applications. The powdered Cassava Leaf Protein is then meticulously packaged in appropriate, food-grade materials. This packaging protects the protein from moisture, light, and contaminants, ensuring its shelf stability and preserving its quality until it reaches the consumer.

Product Applications

Human Consumption

The CLP (Cassava Leaf Protein) can be incorporated into various food products such as fortified flour, ready-to-eat meals, snacks, and nutritional supplements.

Animal Feed

CLP can serve as a valuable protein source in livestock and poultry feed formulations, reducing reliance on more expensive imported protein meals.

Market Analysis

The demand for affordable and nutritious protein sources is high in Nigeria. The CLP will target:

Food Processors

Companies producing fortified foods, baked goods, and snack items.

Animal Feed Manufacturers

Poultry, aquaculture, and livestock feed producers.

Humanitarian Organizations

Programs addressing malnutrition and food insecurity.

Direct Consumers

Individuals seeking dietary supplements and healthier food options.

Project Timeline

1

Months 1-3

Site selection, and regulatory approvals.

2

Months 4-9

Facility design, equipment procurement, and construction.

3

Months 10-12

Installation of equipment, pilot production, and product testing.

4

Month 13 Onwards

Commercial production, marketing, and distribution.

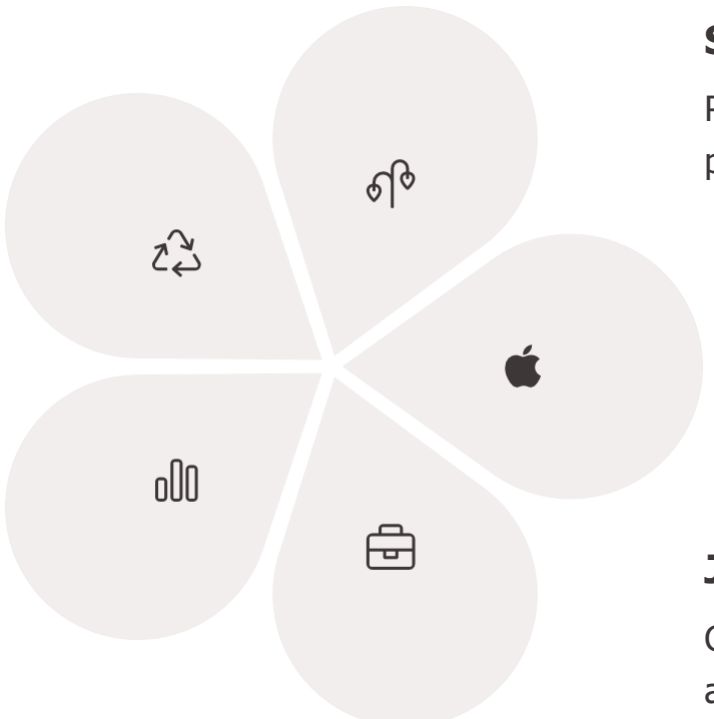
Environmental and Social Impact

Reduced Waste

Utilizes a previously underutilized agricultural byproduct, reducing waste.

Economic Growth

Contributes to the local economy and reduces reliance on imported protein.



Sustainable Agriculture

Promotes a more circular economy in Cassava production.

Improved Nutrition

Provides an affordable and accessible protein source to combat malnutrition.

Job Creation

Generates employment opportunities in rural areas.

Capacity of Production and Cost

$8M

Investment

With an investment of USD$ 8,000,000.00 (Eight million United States Dollars) it's possible to install a plant capable of producing 2,200 (two thousand and two hundred) tons per month of CLP.

2,200

Tons Per Month

It's included in this cost the equipment and machinery to transform the leaves into powder protein, hydrolyzed or isolated, sea freight and installation.

$25

Price Per Kilogram

The medium price on the international market for "Cassava Leaf Protein" can be estimated at USD$ 25.00 per kilogram, as final price.

$55M

Monthly Revenue

And as we are expecting to produce 2,200 tons per month (= 2,200,000 kilos per month), it represents an incoming of USD$ 55,000,000.00 (Fifty Five Million United States Dollars) per month.

Payment Terms

- The requested USD$7,00,000.00 shall be paid in advance against the respective Proforma Invoice, which will be duly filled with all bank details, and all equipment descriptions.
- The Cassava Leaf Protein Plant will be delivered from Brazil to Nigerian Port and then installed in Ebonyi and Abia/Imo States. Incoterms C.I.F. Nigerian Port.
- Capital of US$1,000,000.00 to start production.
- Total Investment required is US$8,000,000.00

Email:
aoconsult.mgn@gmail.com
Mobile:
+234-81-6744-9552
Fax
+1-267-508426

36 Awka Street, War College
Gwarimpa, FCT Nigeria

1249 Rue du Sussex #1026
Montreal, QC H3H 2A1 Canada.