INTRODUCTION

The current socioeconomic conflicts and inequities are accompanied by situations of famine and malnutrition. Food needs to be satisfied about which any initiative of public or private origin or through non-profit organizations can help alleviate these pressing problems. In the midst of this panorama, a non-governmental, non-profit initiative is proposed to raise funds through donations for the construction and implementation of a project for the production of foods with high nutritional value, very low cost and production rates. Production exceeding 4.8 tons of protein-rich food per month.

The solution proposed is based on algae, a super food that multiplies four to five times the amount of protein to be obtained per hectare compared to soy (Figure 2). Under favorable growing conditions the growth rate of Alga lemna minor can double its weight in a matter of a couple of days, added to its very high digestibility coefficient has made it a super food, an alternative to protein sources. Conventional ones like beef, with protein percentages close to 30% of its weight. To implement the proposed production, a surface water pond is required in an area of ½ hectare, infrastructure that allows the growth of algae, inputs for its production, equipment for the analysis of water quality that guarantees biosafety conditions for food and machinery and equipment for processing and packaging, thus resulting in a product fit for human consumption, which can be donated to NGOs and organizations that seek to alleviate the food needs of the most vulnerable population.

Through a collaborative financing mechanism (Crowfuding) we seek to establish an NGO-Non-Profit Entity which includes all the goods to be acquired, the equipment, the purchase of supplies and the hiring of qualified labor to operate the project; For this, it is essential to establish a company (legal entity) in Colombia that allows a part of the produced product to be marketed and thus reinvest funds in the NGO and have the money necessary for its operation. An administration through a board of directors and open data is proposed that allows donors to know what the resources are intended for and who benefits this program. With your help we can begin the first stage of the project with an approximate cost of USD$52.852.

Figure 0. Render of the proposed infrastructure for algae farming.

CHAPTER 1. THE PROBLEM OF WORLD HUNGER

In 2015, world leaders adopted a set of global objectives as part of a new sustainable development agenda. Within these objectives, one of the most notable given the world situation is objective 2, known as "zero hunger." This objective seeks to end hunger, guarantee food security, improve nutrition and promote sustainable agriculture. (UN, 2015). Despite global efforts, it is estimated that in 2022, 45 million children under the age of 5 were suffering from acute malnutrition, 148 million were stunted and 37 million were overweight. To achieve the nutrition goals by 2030, a fundamental change in trajectory is necessary.

In 2011, the FAO estimated that about a third of the food produced in the world was lost or wasted each year.

While many people take access to food for granted, more than 820 million people in the world are hungry, showing that food is not guaranteed for everyone. Large amounts of edible and healthy foods are thrown away in homes and food establishments, thus contributing to the problem of food waste (FAO, 2011). A nutrient-poor diet can weaken the immune system by promoting the production of free radicals and reactive species, overcoming the body's antioxidant capacity. This process is associated with the development of chronic diseases such as obesity, heart diseases, diabetes, neurodegenerative disorders, and cancer (Barbosa, Bressan, Zulet, & Martínez, 2008).

To achieve zero hunger by 2030, urgent coordinated action and policy solutions that address entrenched inequalities, transform food systems, invest in sustainable agricultural practices, and reduce and mitigate the impact of conflict and the pandemic on nutrition are imperative. and in world food security.

CHAPTER 2. FORMULATING A SOLUTION

Algae Lemna Minor

Description

Currently, developing nations face practical challenges to provide basic services to their population, such as: sources of drinking water, balanced sources of food, and basic health services. In these countries, demographic growth rates are higher, this demands increasingly more sources of resources and new strategies to address these problems supported by a technological component.

Governments and supranational entities invest huge amounts of their budget in school feeding programs and in programs aimed at vulnerable populations, they seek to cover the main nutritional needs of the population and in the midst of this panorama, seaweed appears to be one of the most attractive sources. modern food, as they present competitive advantages over other conventional alternatives mainly thanks to their rapid growth rate.

Studies have shown that there are varieties of algae that multiply the amount of protein obtained per hectare four to five times compared to soybeans (Figure 2). Under favorable growing conditions, the growth rates of Algae lemna minor can double its weight in a matter of a couple of days. Added to its very good digestibility coefficient, it has made it a superfood, an alternative to sources of conventional proteins like beef, with protein percentages close to 30% of its weight.

Colombia, having a privileged location in the equatorial zone, enormous amounts of sunshine throughout the year, abundant water sources and a connectivity network to transport inputs and finished products for distribution, meets the necessary requirements to carry out an implementation. cultivation of algae of this type.

Figure 2. Lemna minor algae

A series of blades generate a continuous flow that allows their oxygenation and constant circulation. In this type of accommodation, the depth of the circulation channels does not exceed 40cm because the light hits approximately up to this depth. Crop arrangements on half a hectare under this configuration have been observed that can produce 4.8 dry tons of food per month, requiring the sensing of environmental conditions and verification of water parameters such as: temperature, nitrates, dissolved O2, conductivity, water pH, coliform bacteria, among others. It was observed that in accommodations of 2000 m3 of water, 8 tons of wet biomass were obtained per month, which once dehydrated, represented 4.8 tons of Lemna minor flour.

The qualities of Lemna such as having more than 30% protein, being gluten-free, having antioxidant compounds and its high biodigestibility show its extraordinary potential as a nutritional supplement.

Although more detailed studies and technical industrial processes must be developed after cultivation in order to improve the taste qualities and final presentation of the product, the raw material has abundant studies for its technical production that guarantees the viability of the project.

This project seeks to produce meat substitute products based on pre-processed seaweed that share many of the same qualities in terms of taste, smell and texture as its peers. To do this, the algae are accompanied by a series of additives that improve their presentation and nutritional qualities, this is the case of heme, the basis of hemoglobin, a fundamental component in the sensitive qualities perceived in beef. The production of heme is one of the research fields with the greatest investment projection within the modern laboratory meat production industry. There are multiple biotechnological studies in the development of genetically modified yeasts that allow the fermentation of plant concentrates, resulting in heme. with properties very similar to that coming from beef blood, the main direct source of heme with a competitively lower cost.

The main approach of the project is to have:

- Production area like the one proposed 5000 m2 (½ hectare)
- Adaptation of infrastructure (channels, recirculation blade system, optional aerators)
- Equipment to control optimal conditions of growth and water quality.
- Equipment for raw material processing (mixers, crushers).
- Laboratory equipment for the respective studies in biotechnology to improve the organoleptic conditions of the final product.
- Equipment for packaging and labeling the final product (packers, vacuum equipment, intermediate cooling chain, mixers).

Standard methods are used for the analysis of wastewater and raw effluent (Standard Methods, 1980). The analyzes include measurements of electrical conductivity (EC) of the water, reaction (pH), concentration of oxygen, ammonia, nitrate, COD, BOD5 and suspended matter.

The previous stages allow us to conclude with a finished product that will be donated to foundations and NGOs that seek to alleviate the nutritional deficiencies of the most needy people. For this, it is essential to have your support. Studies show that for the production of 4.8 tons of flour lemna / month Data such as a table of costs, amortization, maintenance and operating costs over time are described below.

AMINOÁCIDOS	%
Arginina	5,99
Histidina	2,23
Isoleucina	5,52
Leucina	9,10
Lisina	6,15
Metionina	1,54
Fenilalanina	5,49
Treonina	5,05
Triptófano	1,30

Fuente: (Dejanai, 1993)

(a)

Nutritional values of the provided test meals.[a]

	Soft cheese	Green peas	Mankai
Protein (g)	39.7	39.3	39.3
Fat (g)	35.3	21.0	58.2
Carbohydrates (g)	11.0	118.2	92.0
Energy (kcal)	520.2	820.4	1055.3
Dietary fibers (g)	15.7	52.4	39.4
Vitamin B12 (μg)	1.16	0.00	2.81
Essential amino acids			
Methionine (g)	0.73	0.45	0.6
Histidine (g)	0.88	0.59	0.61
Phenylalanine (g)	1.56	1.11	1.59
Threonine (g)	1.35	1.13	1.24
Lysine (g)	2.52	1.76	2.12
Tryptophan (g)	0.45	0.21	0.63
Leucine (g)	3.01	1.79	2.51
Isoleucine (g)	1.59	1.08	1.33
Valine (g)	2.02	1.30	1.70

(b)

Figure 4. Table of nutrients and percentages of amino acids for Lemna Minor from two different sources.

COMPONENTES	Schneider, 2004	Kalita, 2007	El-Shafai, 2004	Castillo, 1993
Humedad	-	8,8	-	-
Carbohidratos	-	42,0	-	-
Proteina bruta	33,8	28,0	41,0	25,53
Materia orgánica	-	75,0	-	-
Cenizas	15,9	25,0	16,2	32,98
Fibra bruta	-	10,0	9,4	11,36
Extracto etéreo	3,2	5,0	4,4	0,36

Figure. 5. Lemna Minor components.

CHAPTER 3. COST CHARTS (COP)

MACHINERY AND EQUIPMENT	Quantity	Price	Total	Image
Hammer Mill (5HP)	1	$6’800.000	$6’800.000	
Vertical spiral mixer for solid and powdery products (300 Kg)	1	$12’000.000	$12’000.000	
Helical transport screw in stainless steel	3	$5’200.000	$15’600.000	
Storage silos 8 m3	1	$9.750.000	$9.750.000	
Galvanized sheet storage containers for bulk material, 3000 kg	3	$2’000.000	$6’000.000	
Yupack High Quality Vacuum Packaging Machine with CE Certificate	1	$7’560.000	$7’560.000	
Refrigerated Use Stainless Steel Commercial Countertop	3	$3’000.000	$9’000.000	
500KG Industrial Floor Scale - Badecol	1	$476.000	$476.000	

8 in 1 Multi Parameter Water Quality Analyzer Monitoring pH Do Turbidity Cod Toc Residual Chlorine - Shanghai Boqu Instrument Co., Ltd.	1 parameter sensor,including temparature/PH/conductivity/dissolved oxygen/turbidity/BOD/COD/ammonia nitrogen/nitrate/colour/chloride/depth,etc.	$ 15’996.000	$ 15’996.000	
500 liters stainless steel storage tanks customized stainless steel food container	1	$2’000.000	$2’000.000	
Agroindustrial Tank in Geomembrane of 80,000L	1	$3’400.000	$3’400.000	
Adaptation system for the irrigation system and Ejector Water Pump for Rainwater Drainage 2 Hp, Calpeda	1	$3’634.000	$3’634.000	
TOTAL				86’216.000

Table 1. Table of machinery and equipment to purchase (COP)

SUPPLIES	QUANTITY	UNIT PRICE	TOTAL
Galvanized enclosure tube 1 1/2" x 1.5mm x 6m Z180	32	$89.900	$2’876.800
Expanded mesh 24 gauge (1.20*15 mt)	30	$316.000	$9’480.000
High-density polyethylene HDPE geomembrane (7*90 mt)	7	$7’239.103	$50’673.722
Geomembrane tie-downs	702	$300	$210.600
30W 15RPM gear motor ref. 4IK30NG-AF+4GN120K	1	$448.300	$448.300
Recirculation Blade System (acrylic blades, arms, shaft and coverings)	1	$2’918.684	$2’918.684
Electrical distribution panel, electrical protections, pipes and wiring (30m)	1	$500.000	$500.000
Civil works (fixing enclosing tubes, perimeter welding, labor, land leveling and storage shed)	1	$25’000.000	$25.000.000
Electric installation	1|	$700.000	$700.000
TOTAL			92’808.106

Table 2. Geotank Infrastructure

SUPPLIES	QUANTITY	UNIT PRICE	TOTAL
Galvanized enclosure pipe 2" x 1.5mm x 6m Z180	2	$115.900	$231.800
Galvanized Enclosure Pipe 1/2 pg x 1.5mm x 6m	12	$32.900	$394.800

E-6013 Electric Welding 1 Kg Diameter 5/32 Inch - Truper	3	$27.900	$83.700
Motor-reducer couplings – Axle	1	$50.000	$50.000
Axle – Bearing Coupling	3	$50.000	$150.000
Ucp205-16 Cgt 1 Pedestal Bearing For 1 Inch Axle	3	$32.000	$96.000
Civil works (engine support bases, pillow blocks and intermediate supports)	1	$300.000	$300.000
Circulation blades in thermoformed polypropylene (materials and manufacturing)	24	$57.599	$1’382.384
Hardware and anchors	1	$50.000	$50.000
axle support	12	$15.000	$180.000
TOTAL			$2’918.684

Tabla 2.1 Sistema de aspas

SUPPLIES	QUANTITY	UNIT-PRICE	TOTAL
Telephone	2	$400.000	$800.000
Computing equipment	2	$1’200.000	$2’400.000
20lb ABC Multipurpose Fire Extinguisher	2	$109.900	$219.800
L-shaped Desk 74X17X113 Carala Black	2	$269.900	$539.800
Stationery	1	$200.000	$200.000
Isóceles Speaker Chair Without Arms Black Cloth	4	$135.900	$543.600
Metal File Cabinet With 22 Caliber Key	1	$240.000	$240.000
Pantum P2502W Wireless Mono Laser Printer	1	$396.000	$396.000
TOTAL			5’339.200

Table 3. Table of location, furniture and fixtures

SUPPLIES	QUANTITY	UNIT-PRICE	TOTAL
Triple 15 Nutrimon NPK 15% 50Kg (60gr/m3/month-week)	2,1168->3	$135.600	$406.800
Dolomite Lime Agricultural Agricultural Substrate Amendment X 50kg (400gr/m3/month)	14,112->15	$49.900	$750.000
pH Buffer Calibration Solution 2 Pack: pH 4.00 and pH 7.00 — 1 Quart (900 mL) - Biopharm	1	$84.000	$84.000
Hemo	In Study		
			$1’240.800

Table 4. Inputs and indirect costs table

DETAILS	QUANTITY	UNIT-PRICE	TOTAL
Plant operator (Labor work)	5	$1’462.000	$7’310.000
Administrative (Labor work)	1	$2’000.000	$2’000.000
Accountant (Labor Work)	1	$400.000	$400.000
Private Security (1 shift)	1	$1’500.000	$1’500.000
TOTAL			$11’210.000

Table 5. Administrative and operating costs table

CONCEPT	QUANTITY	UNIT-PRICE	TOTAL
Notarial Deeds and Expenses	1	$50.000	$50.000
Permissions and Licenses	1	$15.000	$15.000
Accounting Book Registration	1	$18.000	$18.000
Sanitary Registry	1	$12.000	$12.000
Commercial Registry	2	$112.000	$224.000
Detail engineering studies (civil, environmental, biotechnology, mechanical)	1	$10’000.000	$10’000.000
TOTAL			$10’319.000

Table 6. Preoperative expenses table

DETAILS	TOTAL
Machinery and equipment to acquire	$86’216.000
Geotank Infrastructure	$92’808.106
Location, furniture and fixtures cost	$5’339.200
Input and indirect costs (month)	$1’240.800
Administration and operating costs (month)	$11’210.000
Pre-operational costs	$10’319.000
TOTAL	207’133.106

Table 7. Summary table of initial investment

DETAILS	TOTAL
Input and indirect costs (month)	$1’240.800
Administration and operating costs (month)	$11’210.000
TOTAL	$12.450.800

Table 8. Summary table of monthly costs