Sustainable bioeconomy using ecological industrial biorefinary design for food, feed and fuel from wastes: System innovation and techno economic analysis using process simulation tools

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Gestão Tecnologia de Inovação para Produção de bioenergia e Micro algas: Biossistema integrado de Producão limpas

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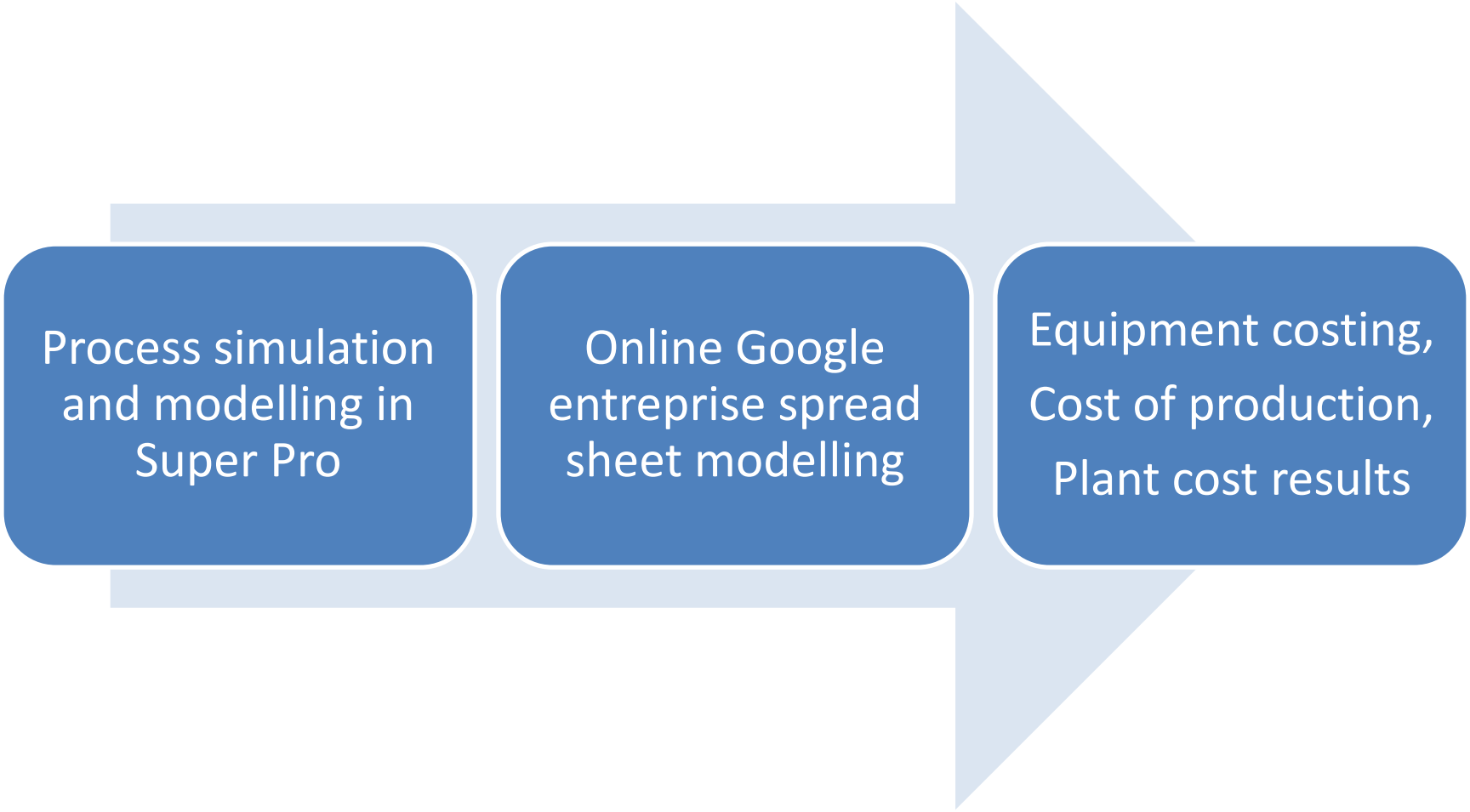
Approach


Process simulation and modelling in Super Pro
Online Google entreprise spread sheet modelling
Equipment costing,
Cost of production,
Plant cost results

S OCIAL

Support agricultural professions
Support Sufficiency Economy

T ECHNICAL

Domestic technology available
R&D on Biofuel and Bioenergy

E CONOMICS

Reduce impacts from high oil price
Stabilize agricultural commodity price

E NVIRONMENT

Reduce air pollution in large cities
Mitigate greenhouse gas emission

P OLICY

Support Kyoto Protocol
Reduce dependence on Political unstable countries and imports

Introduction

The desire to minimize or eliminate the causes and effects of this are the main goals of clean technology. With its adoption, there will be changes in the environment, however, these impacts begin to be reviewed, aiming at minimization and / or disposal.

In this field, through the research work carried out previously, we have good results, namely:

1. Computational Modeling of processes and clean technology;
2. Otimization and Simulation of Processes and Costs;
3. Computacional Simulation Stochastic modeling and Risk Analysis.
4. Business model for clean technology integrated fuel and food in

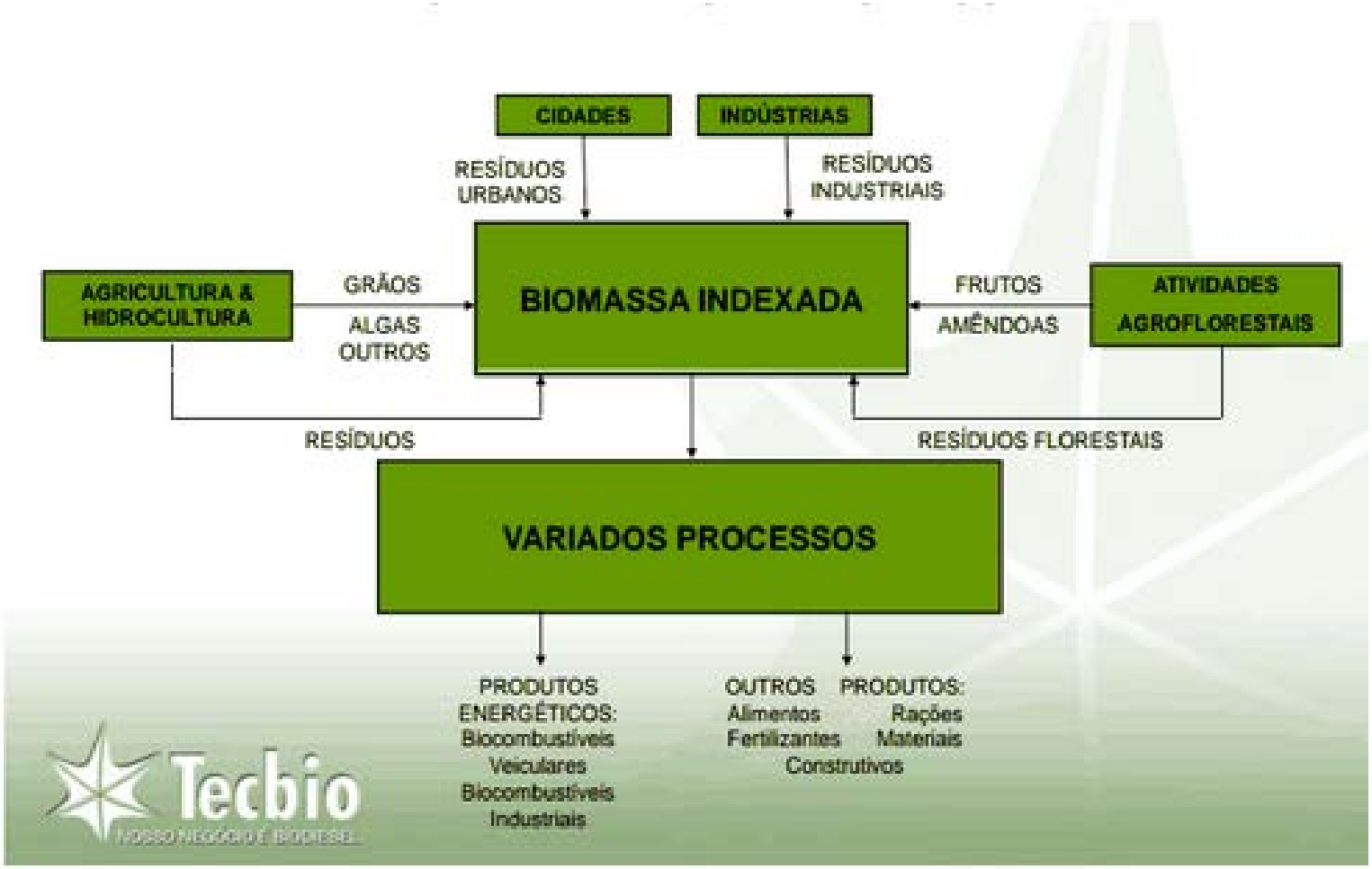
Concepts and methods

Case study was made with the anaerobic process, aerobic micro algae production , production of biodiesel from micro alge in several stages and recycle of reactor output are found to be very useful to produce biofertilizer ,bio-methane charcoal,bio electrical energy with recycle of water ,CO2 and microbial biomass.

Which are integrated to internal Combustion and fuel cell for combined cold ,heat and Existing biogas and biodiesel from micro algae technologies has potential for practical application combined with hydro pyrolysis,as well as green hydrorobiodiesel to make fuel electrical energy towards sustainable local development.

Concepts and methods

1. Selected Paths and Methods for generating energy from biomass wastes;
2. Pyrolysis: The thermo conversion for biofuel (syngas) and energy production;
3. Anaerobic biodigestion: The bioconversion for biofuel (biogas) and energy(pyrogas , bioethanol and Biodeisel)
4. Collaborative Process Flow Sheet development;
5. Material Balance and Process Yield;
6. Process Economics Parameters and Costs Estimation.
7. Optmization of technology
8. Optimization business managment modle


CIDADES
INDÚSTRIAS
RESÍDUOS URBANOS
RESÍDUOS INDUSTRIAIS
AGRICULTURA & HIDROCULTURA
GRÃOS
ALGAS
OUTROS
BIOMASSA INDEXADA
FRUTOS
AMÊNDOAS
ATIVIDADES AGROFLORESTAIS
RESÍDUOS
RESÍDUOS FLORESTAIS
VARIADOS PROCESSOS
PRODUTOS ENERGÉTICOS: Biocombustíveis Veiculares Biocombustíveis Industriais
OUTROS PRODUTOS: Alimentos Rações Fertilizantes Materiais Construtivos
Tecbio

PROJETOS DE APROVEITAMENTO DA BIOMASSA INDEXADA

Do Programa Globalizado de Aproveitamento da Biomassa várias Tecnologias estão Prontas para Uso e outras em Desenvolvimento

PROCESSOS DE CONVERSÃO:

- **PRODUÇÃO DE BIODIESEL:** TECNOLOGIA 100% DESENVOLVIDA
- **PRODUÇÃO DE BIOQUEROSENE:** EM TESTES PARA HOMOLOGAÇÃO
- **PRODUÇÃO DE CARVÃO VEGETAL:** TECNOLOGIA DISPONÍVEL DE TERCEIROS
- **PRODUÇÃO DE BIOCOQUE:** TECNOLOGIA 100% DESENVOLVIDA
- **PRODUÇÃO DE BIOGÁS VEICULAR:** TECNOLOGIA DISPONÍVEL DE TERCEIROS
- **PRODUÇÃO DE BIOHIDROCARBONETOS:** TECNOLOGIA EM DESENVOLVIMENTO

PRODUTOS EQUIVALENTES DO PETRÓLEO:

Gasolina Renovável

Querosene Renovável

Óleo Diesel Renovável

Óleo Industrial Renovável

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NOSSO NEGÓCIO É BIODIESEL

BIOCOMBUSTÍVEIS ALTERNATIVOS AOS COMBUSTÍVEIS FÓSSEIS

COMBUSTÍVEIS FÓSSEIS:

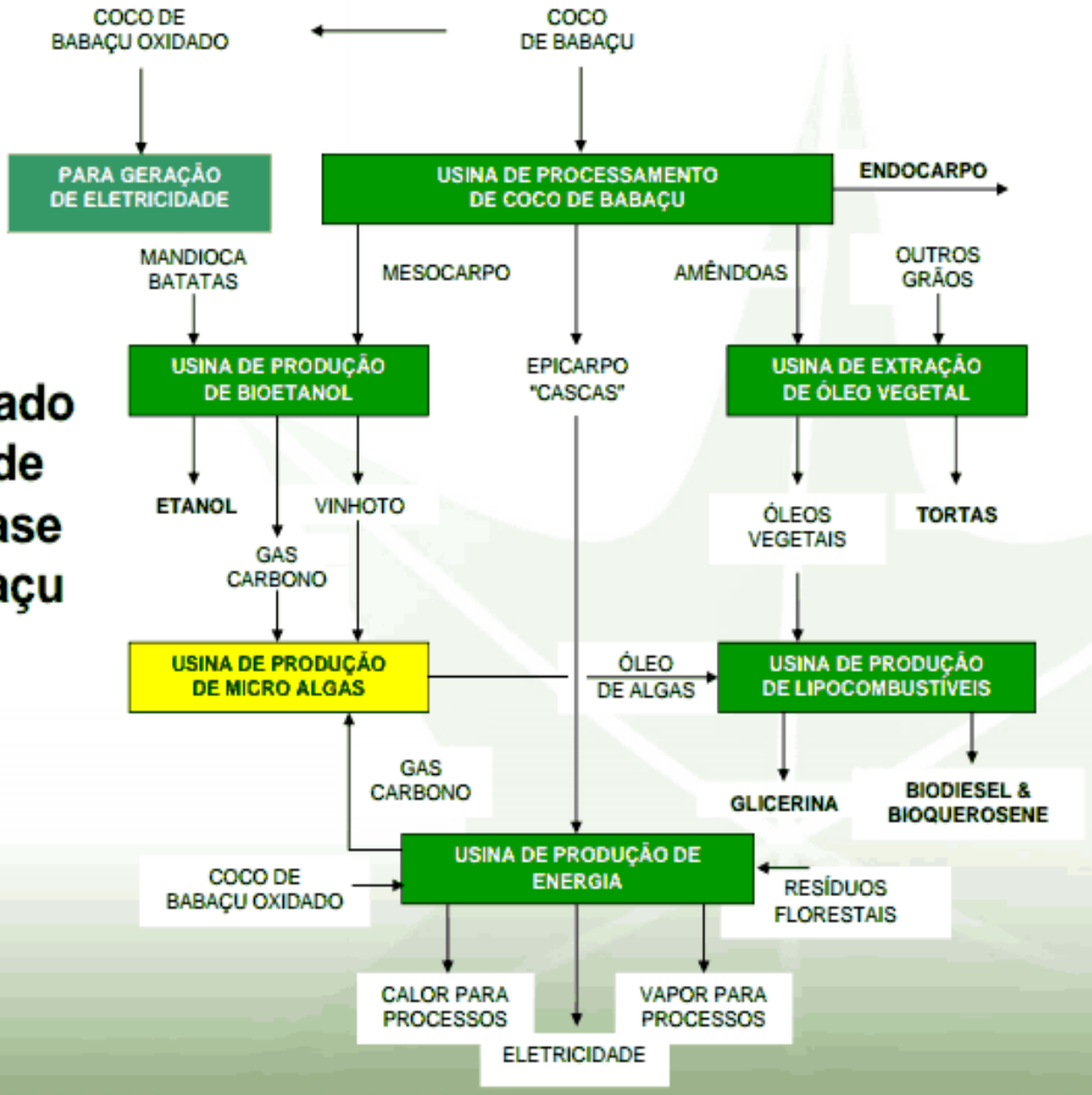
- Gás Natural
- GLP – Gás Liquefeito do Petróleo
- Gasolina
- Querosene
- Óleo Diesel
- Óleo Combustível Industrial
- Coque do Petróleo
- Carvão Mineral

BIOCOMBUSTÍVEIS:

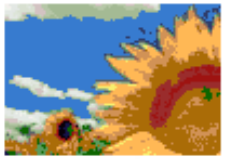
- Biogás e Gás Combustível Vegetal
- Biometano Liquefeito (Biogás Purificado e Engarrafado)
- Bioetanol e Gasolina Vegetal
- Bioquerosene e Querosene Vegetal
- Biodiesel e Diesel Vegetal
- Biomassa Bruta e Biocoque
- Biocoque (Resíduos Peletizados)
- Carvão Vegetal

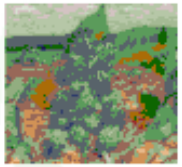
Tecbio
NOSSO NEGÓCIO É BIODIESEL

Sistema Maximizado para Produção de Energias com Base no Coco de Babaçu (SMPE)

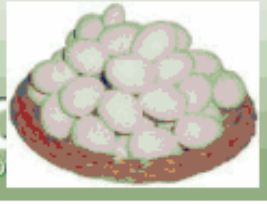


Tecbio
NOSSO NEGÓCIO É BIODIESEL





BIODIESEL INDUTOR DA PRODUÇÃO DE ALIMENTOS



ESTUDO DE CASO:

SOJA

GRÃOS DE SOJA:

Teor de Óleo: 18 – 20%

Processo de Extração: Extração por Solvente

Média de Óleo Extraído: 18%

1.000 kg de Grãos de Soja Produz: 180 kg de Óleo + 820 kg de Farelo (0,6% de óleo)

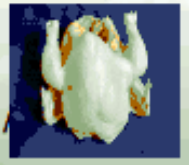
RESULTADOS DA PRODUÇÃO DE BIODIESEL COM O ÓLEO DE SOJA:

- Produção de Biodiesel: 191 litros
- Preço do Biodiesel na Bomba: R$ 2,00 por litros
- Receita com Biodiesel: R$ 382,00

RESULTADOS DA PRODUÇÃO DE FRANGO COM O FARELO DE SOJA:

- Produção de Frango Congelado (limpo) 450 kg
- Preço do Frango no Supermercado: R$ 2,20 por kg
- Receita com Frango: R$ 990,00

CONCLUSÃO:



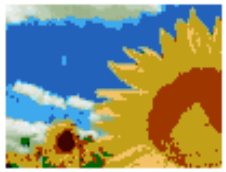
Relação entre as Receitas Alimentos / Biodiesel: 2,59

Tecbio
NOSSO NEGÓCIO É BIODIESEL

REVISÃO: agosto/2009

ESTUDO DE CASO:

GIRASSOL



GRÃOS DE GIRASSOL:

Teor de Óleo: 35 – 48%

Processo de Extração: Extração por Solvente Média

de Óleo Extraído: 40%

1.000 kg de Grãos de Girassol Produz: 400 kg

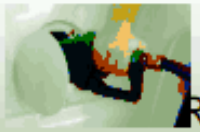
de Óleo + 600 kg de Farelo (0,6% de óleo)

RESULTADOS DA PRODUÇÃO DE BIODIESEL COM ÓLEO DE GIRASSOL:

- Produção de Biodiesel: 424 litros
- Preço do Biodiesel na Bomba: R$ 2,00 por litros
- Receita com Biodiesel: R$ 848,00

RESULTADOS DA PRODUÇÃO DE LEITE COM FARELO DE GIRASSOL:

- Produção de Leite Integral 1.800 litros
- Preço do Leite UHT no Supermercado: R$ 1,80 por litro
- Receita com Leite: R$ 3.240,00



CONCLUSÃO:

Relação entre as Receitas Alimentos / Biodiesel: 3,82

Tecbio

NOSSO NEGÓCIO É BIODIESEL

REVISÃO: agosto/2009

Biorefinary Of Miracle Medicional Plant Moringa for food and Fuel

Much of the plant is edible by humans or by farm animals. The leaves are rich in protein, vitamin A, vitamin B, vitamin C and minerals. 100g of fresh Moringa leaves have 8.3 g protein, 434 mg calcium, 404 mg potassium, 738 µg vitamin A, and 164 mg vitamin C.

Feeding the high protein leaves to cattle has been shown to increase weight gain by up to 32% and milk production by

Macaúba: Brazilian Miracal energy plant for fuel , food , feed and Fiber

The Acrocomia popularly known as macaúba, is native from the Brazilian states of Alagoas, Pernambuco, Rio Grande do Norte, Paraíba and Ceará, being more common in these three states, which occurs in Atlantic forest ,The productivity yields of oil is between 1500-10000 kg of oil per hectare per year, the second largest productivity after palm oil (Elaeis guineensis). The oil content in the pulp varies from 30 to 78% with a mean value of 65%. The oil content in the seeds varies from 35 to 69% with a mean value of 48%. this oil is non-edible lowproduction costs, thus t an alternative feedstock for biodiesel due to economic and

PROCESSO DE FABRICAÇÃO DE ÓLEO E FARINHA DE PEIXE

Aquecimento
100°C

54% água;
4% sólidos;
e 42% óleo

Separação do líquido
da biomassa sólida

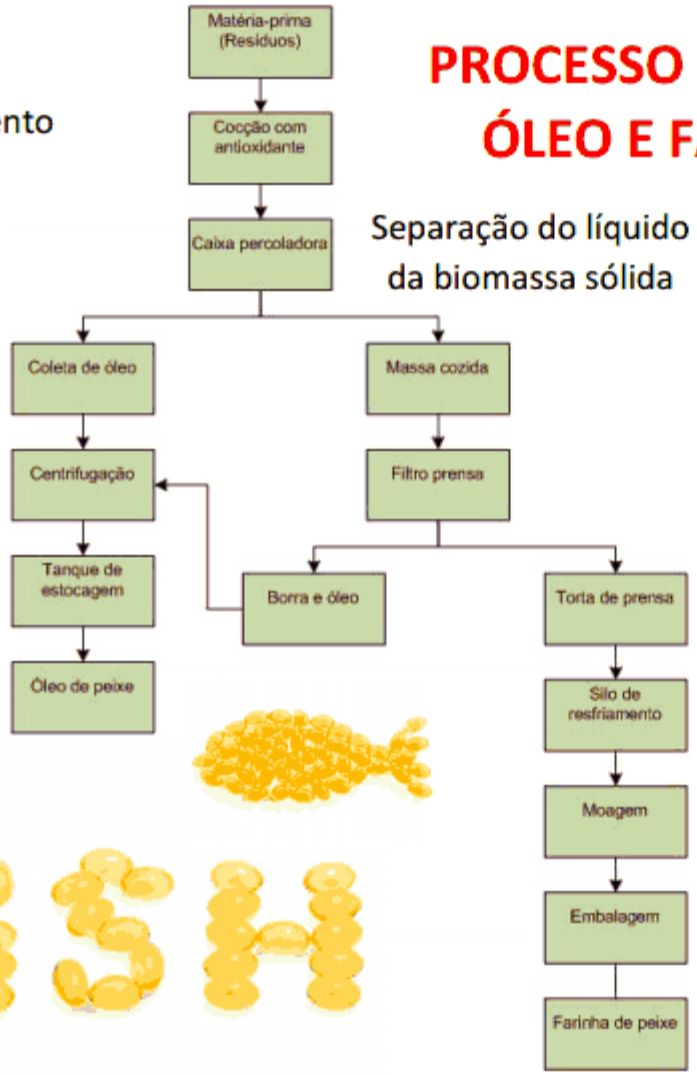


Figura: Resíduos de peixes

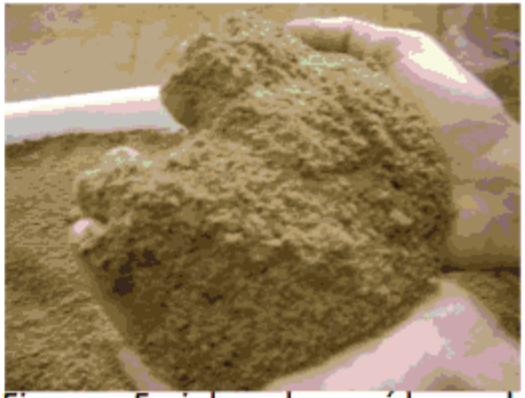


Figura: Farinha de resíduos da indústria de filetagem de tilápias

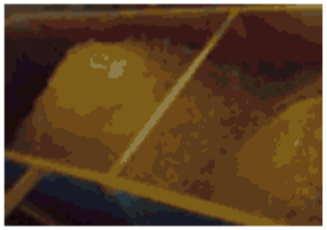
Equipamentos utilizados para a fabricação de farinha e óleo de peixes:

Rosca sem fim

Digestor

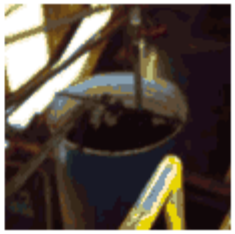
Caixa percoladora

Filtro prensa

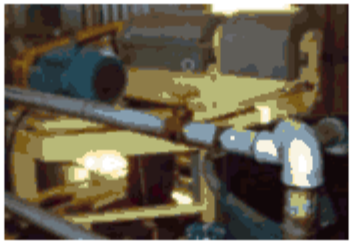


Tanque de resfriamento

Moinho



Tanque de óleo e borra



Centrifuga

Tanque de óleo

PROCESSO DE FABRICAÇÃO DE BIODIESEL E GLICERINA

ENTRADA: 87% DE ÓLEO; 12% DE ÁLCOOL E 1% DE CATALISADOR

SAÍDA: 86% DE BIODIESEL; 4% DE ÁLCOOL E 10% DE GLICERINA

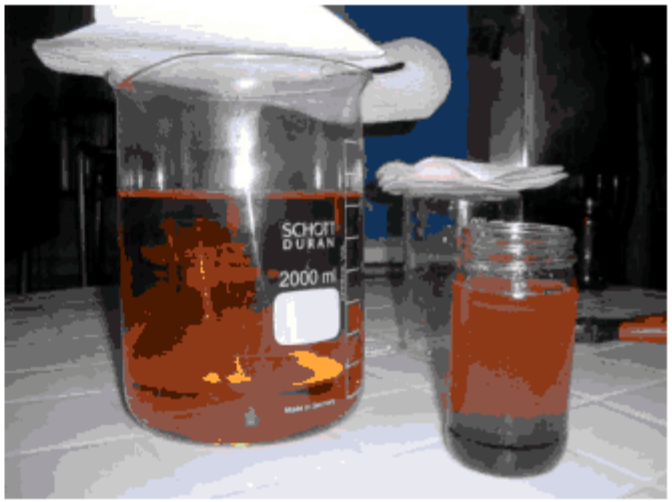


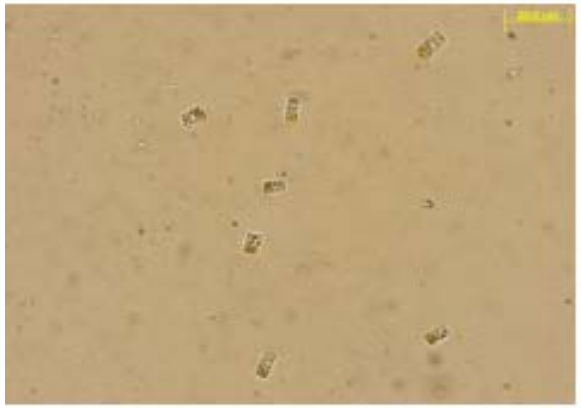
Figura: Óleo limpo e purificado a esquerda e óleo sujo contendo glicerina a direita.

Microalgal Biofuel Clean Technology from Green biomass

Yields

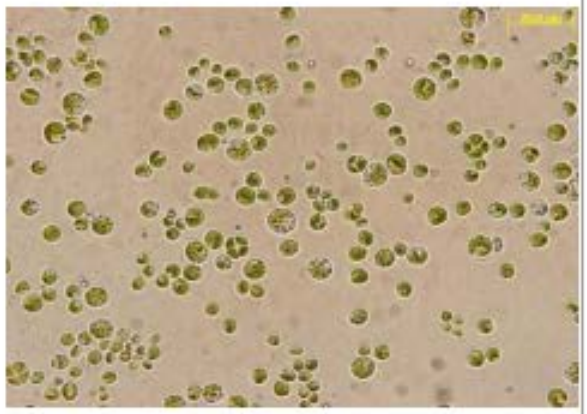
Crop	Yield Oil (L / ha)	Area required (M / ha)	Percentage of crop area existing in the U.S.
Corn	172	1,540	846
Soybean	446	594	326
Canola	1,190	223	122
Jatropha	1,892	140	77
Coco	2,689	99	54
Palm oil	5,950	45	24
Microalgae	136 900	2	1.1
Microalgae	58,700	4.5	2.5

1.1 Strain Biology / Selection



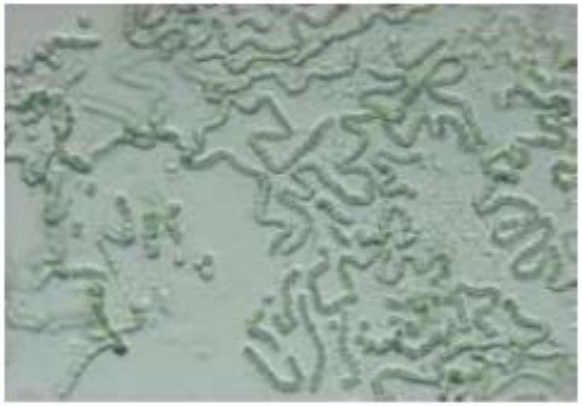
Chaetoceros gracilis

Perfect strain = Productive, Stable and Utilize low resources



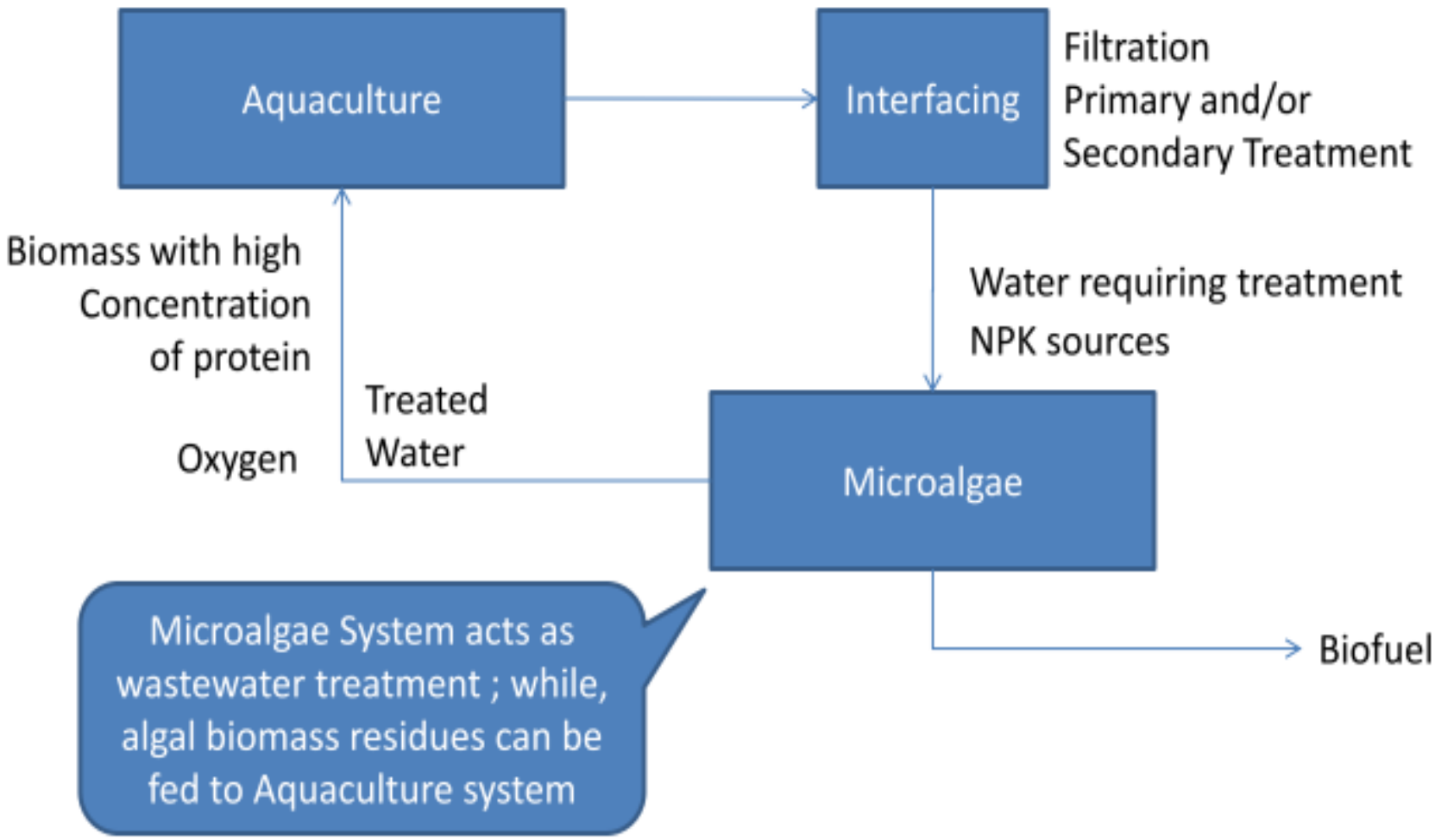
Chlorella vulgaris

Dunaliella sp.

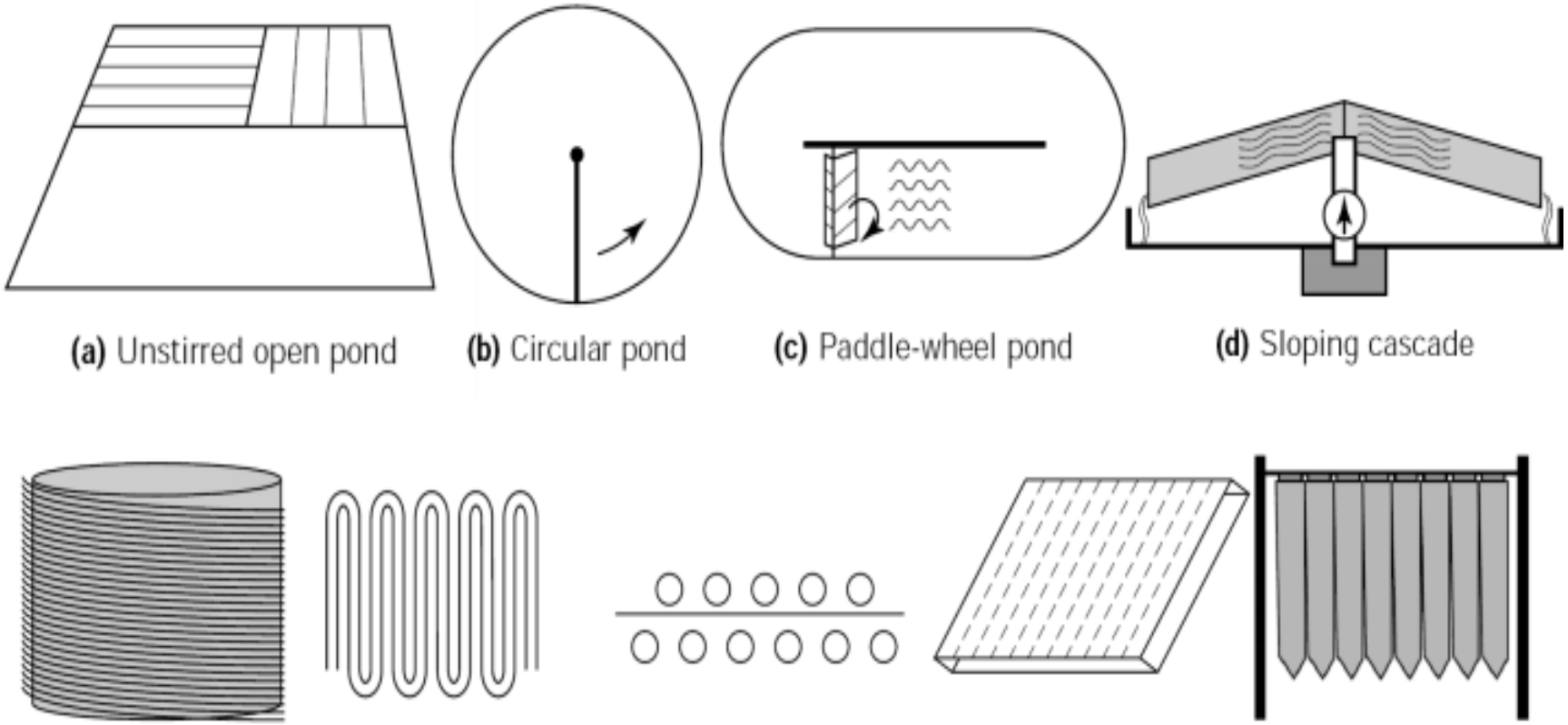


Anabaena ambigua

Co-location Concept : With Aquaculture



Open or Closed System / Phototrophic or Heterotrophic



Phototrophic : CO_2 → compete with microalgae itself

Or

Heterotrophic : Other carbon sources (sugar, glycerol, etc.) → Compete with Fermentation tech.

Results:Integrated Pyrogas , biogas and ethnol from cassava proces industrial wastes

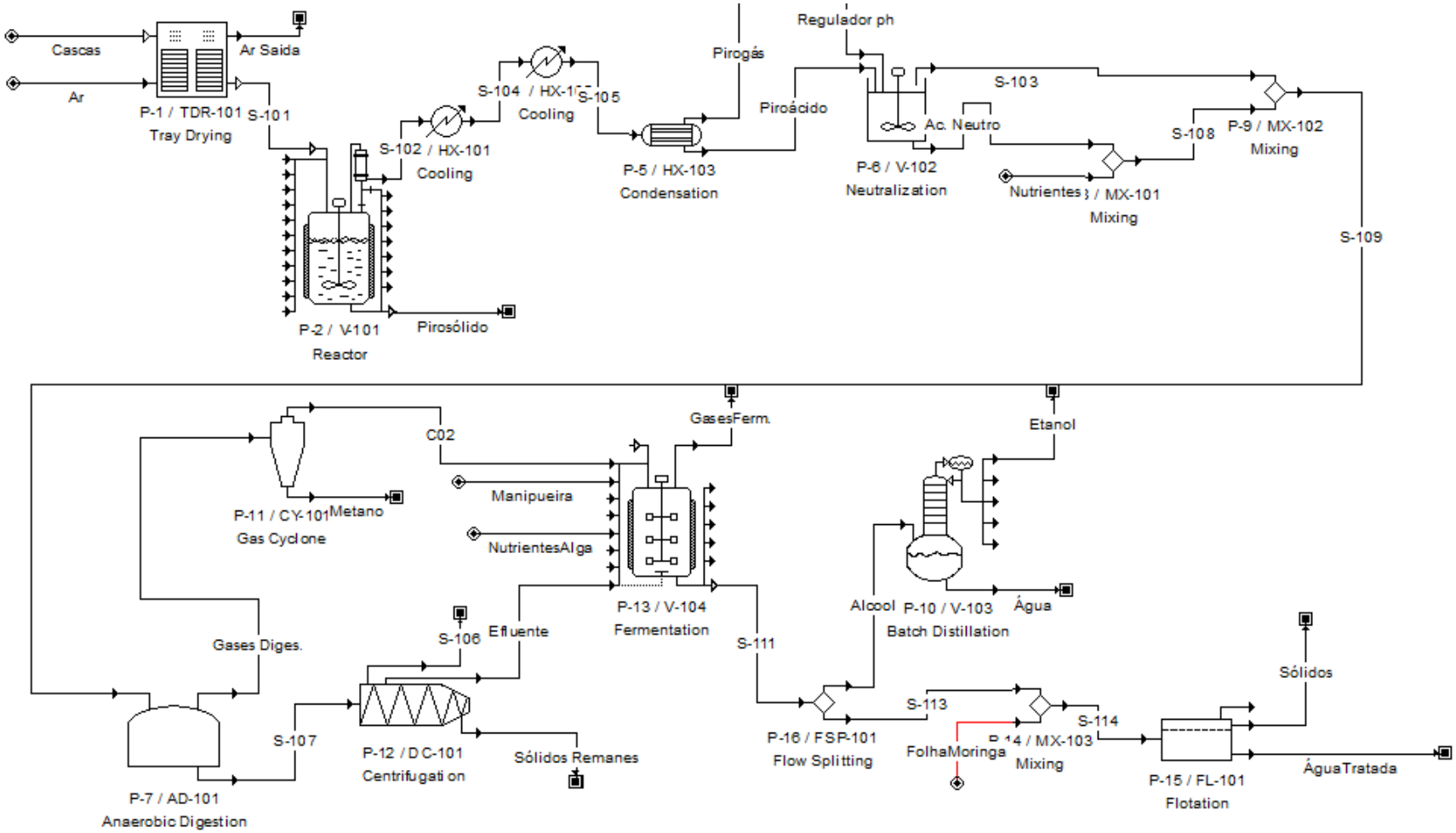
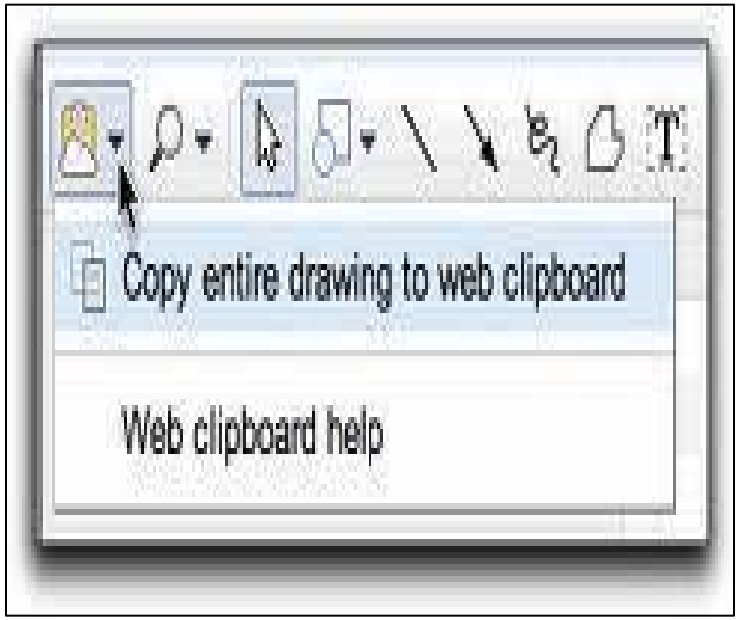


Figure 3 - Ecological Industrial complex open source project development of integrated food, fuel and feed from Agro wastes.

Google online colleborative tool for repid proposal and research



Moringa Plantation Investments

Production of seeds/ha : ton 9

Land under cultivation :10 ha

ALL c Cash flow in US dolares

MO Seeds (in tons) : 90

Crude OIL: 32400

BIODIESEL : 32400

Press Cake : 54900

Glycerol : 3240

CAPITAL

Plantation :5,400,000

Crushing :3,000,000

BIODIESEL :9,000,000

TOTAL: 17,400,000

Moringa Bio Deisel Economical Viability for fuel and Protein Co product Using Clean Technology

SALE : 24,300,000

Biodiesel

Glycerol : 2,430,000

Intercrop : 600

Press cake : $2,745,00

CER-Revenue (Biodiesel) 0

CER-Revenue (Plantation) :0

BIODIESEL : $4,536,000

TOT AL : $5,802,400

PBT $: $24,272,600

TAX :$7,281,780

NET PROFIT per year $: $16,990,820

Fish wate Bio Deisel Economical Viability for fuel and Protein Co product Using Clean Technology

(1) Rvenu = (B) * (F) =547,500.00

(2) Cost= (H) * (F) = 276,615.25

(3) Total = (1) - (2) = 270,884.75

(4) Depreciacao = ((D) - (C))/(G) = 43,371.68

(5) Total Profit= (3) - (4) = 314,256.43

(6) Profit after Tax= (5) - (5)*(E) = 219,979.50

(7) Cash Flow = (6) + (4) =263,351.17

(8) Rate of Return, Engineering (ie) = (7)/(A) =0.61

(9) Rate of Return(5)/(A) =0.72

(10) Pay back Time , year = (A)/(5) =1.38

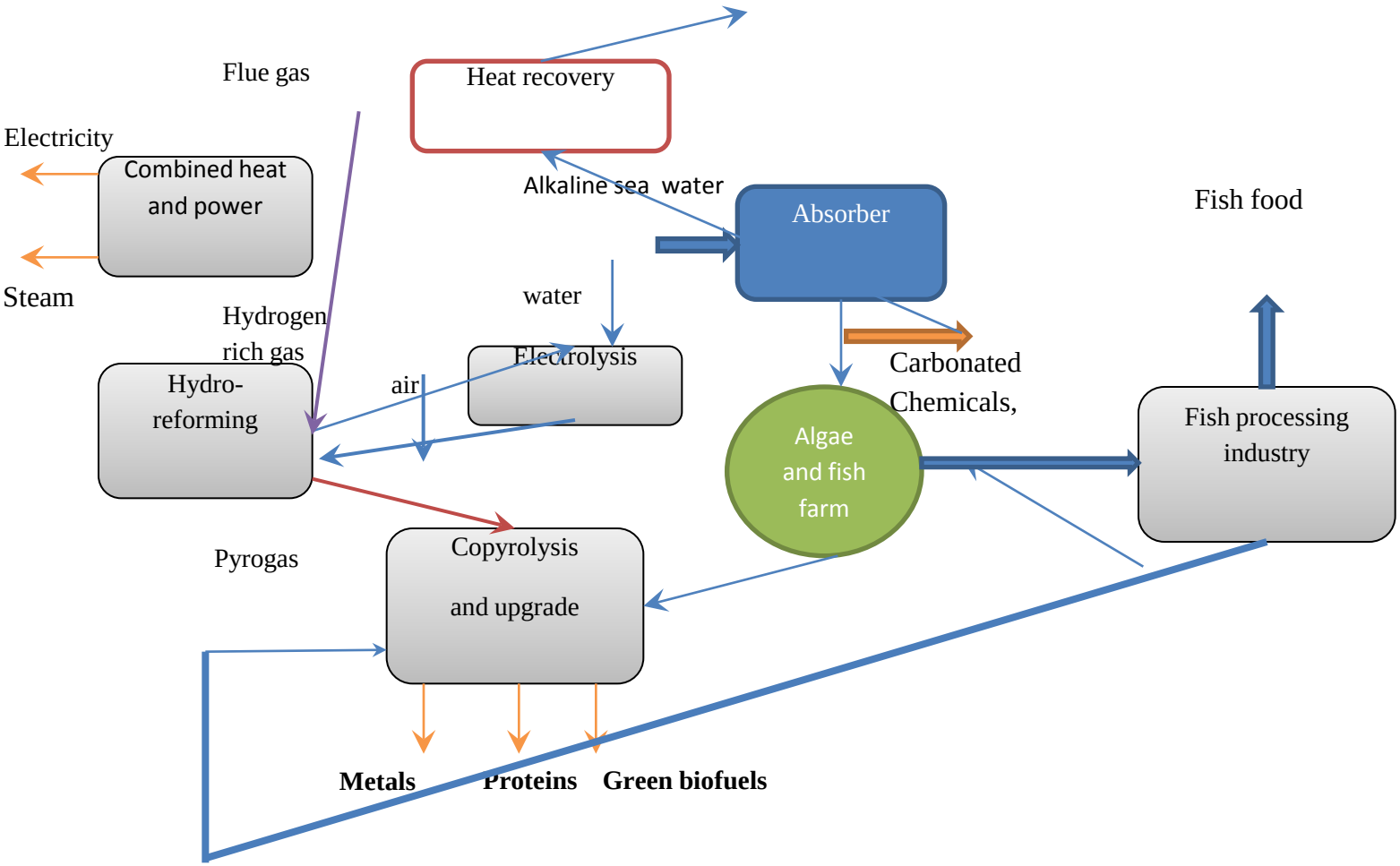
(A) Production Capcity (Kg / ano) =36500

(B) Product Price per Kg(Food +BioD =R$ 15

(C) Process Cost (U$ / Kg) = 7.58

(D) Fixed Investments =433716.75

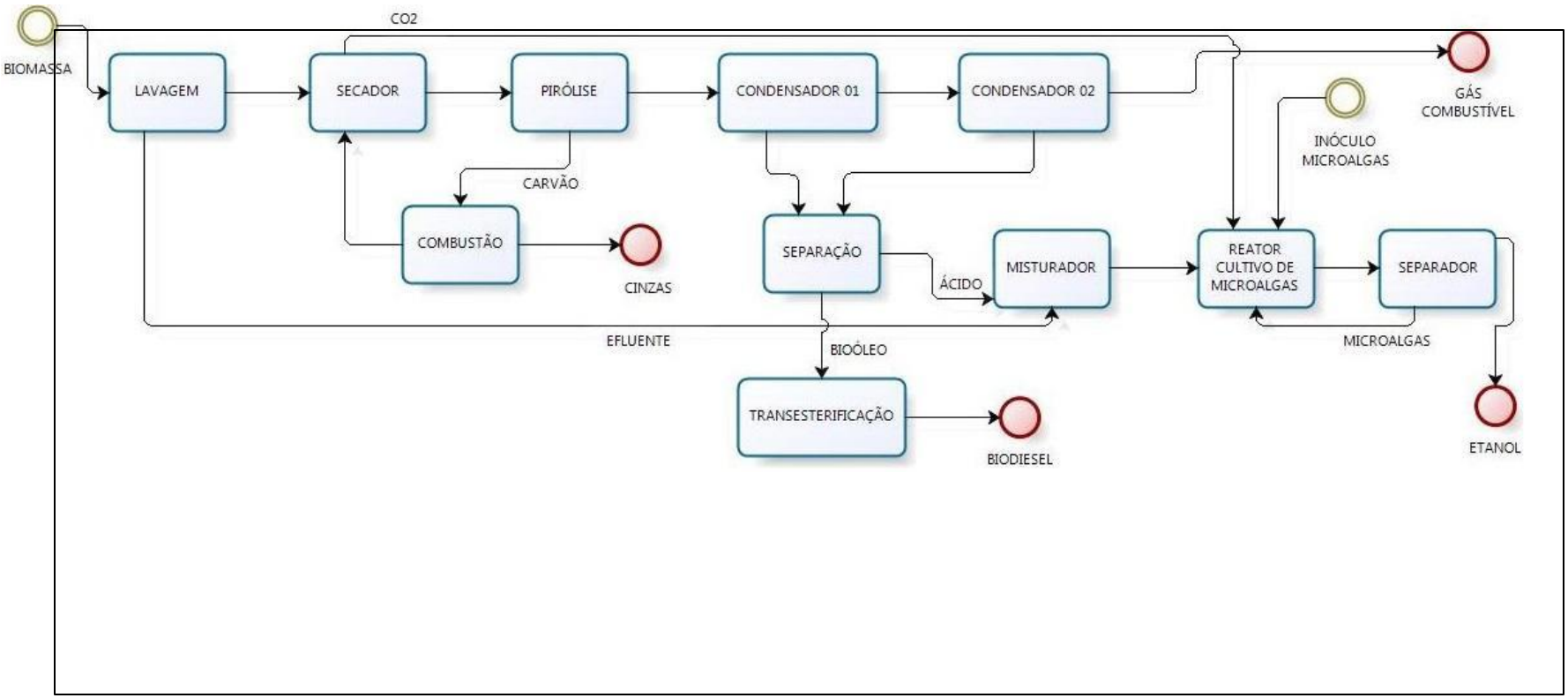
Ecologicle dream biorefienery FOOD, FUEL; ENERGY (FFE) (New concept)



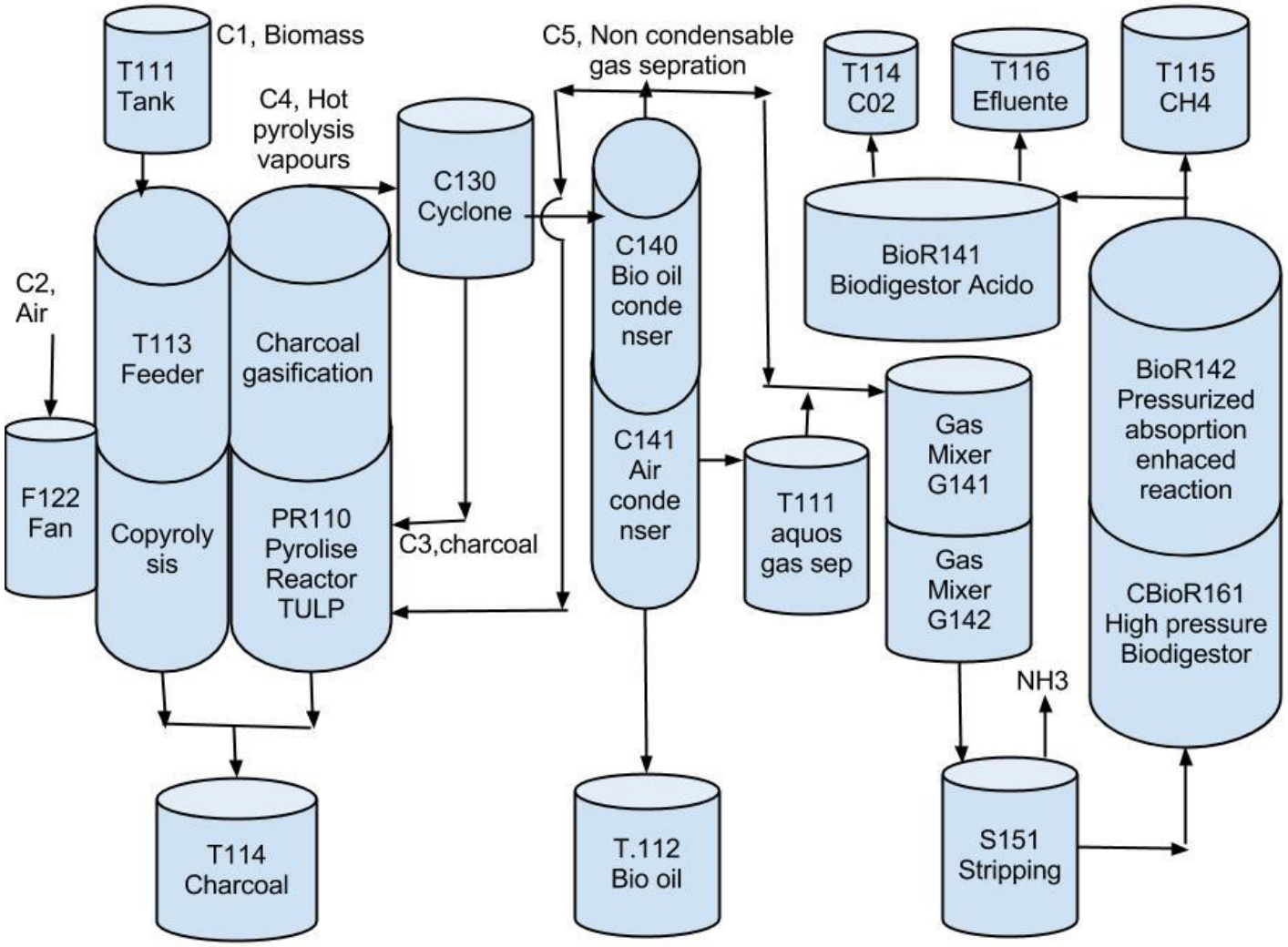
Co-wastes

Norwegian/brazilian patent will be filed

Integrated Pyrogas and Biogas Process



Simple Pyrogas and Biogas Reactors



Bioconversion of agro waste

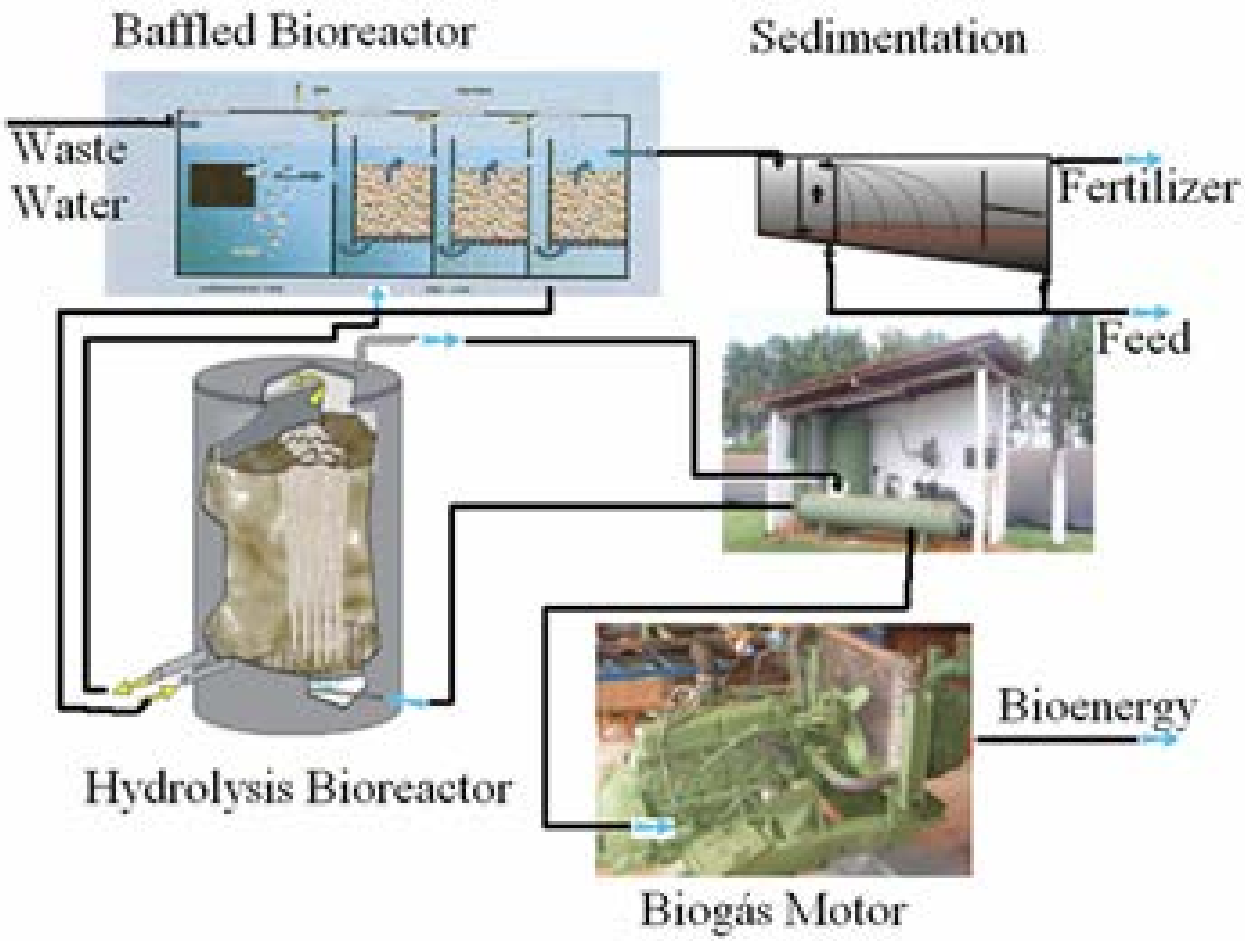
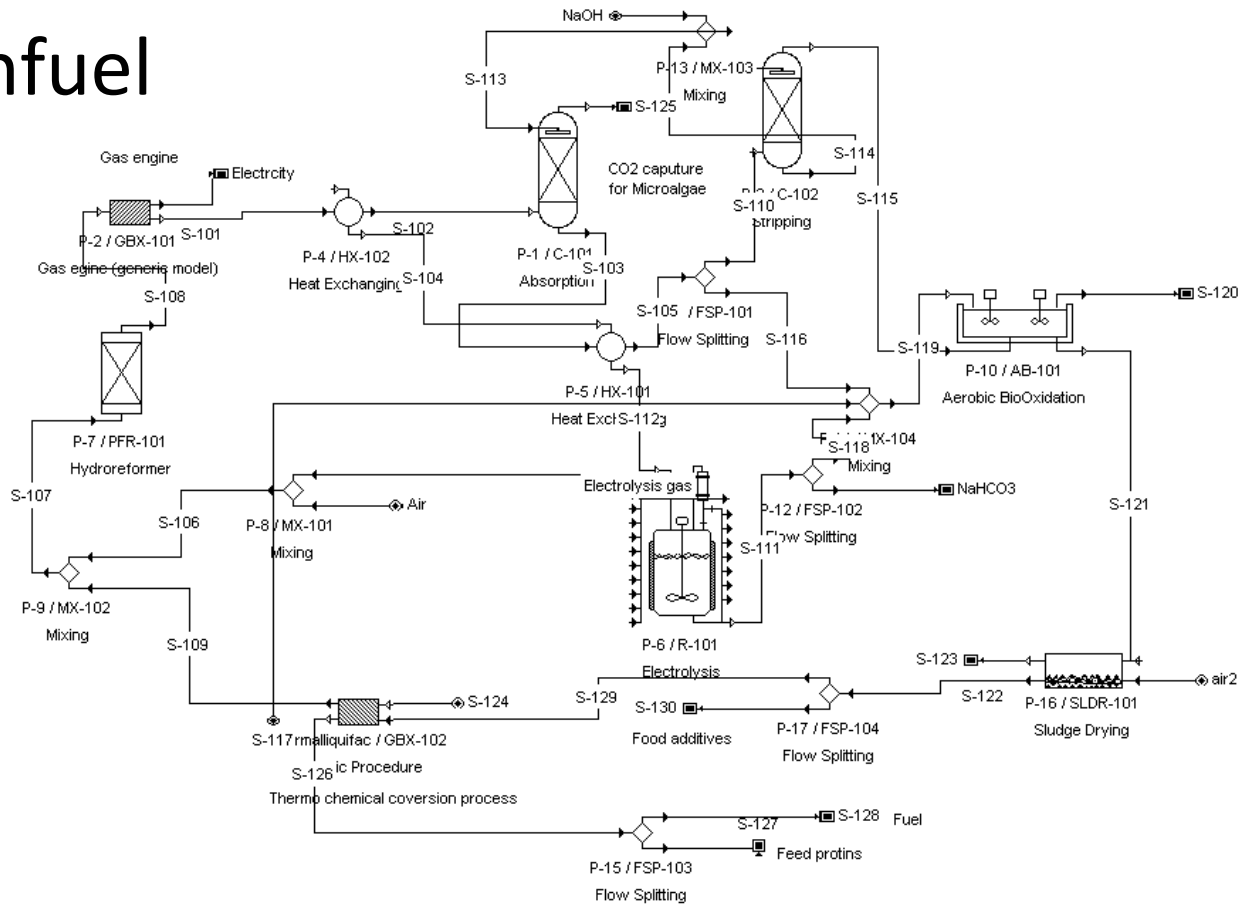


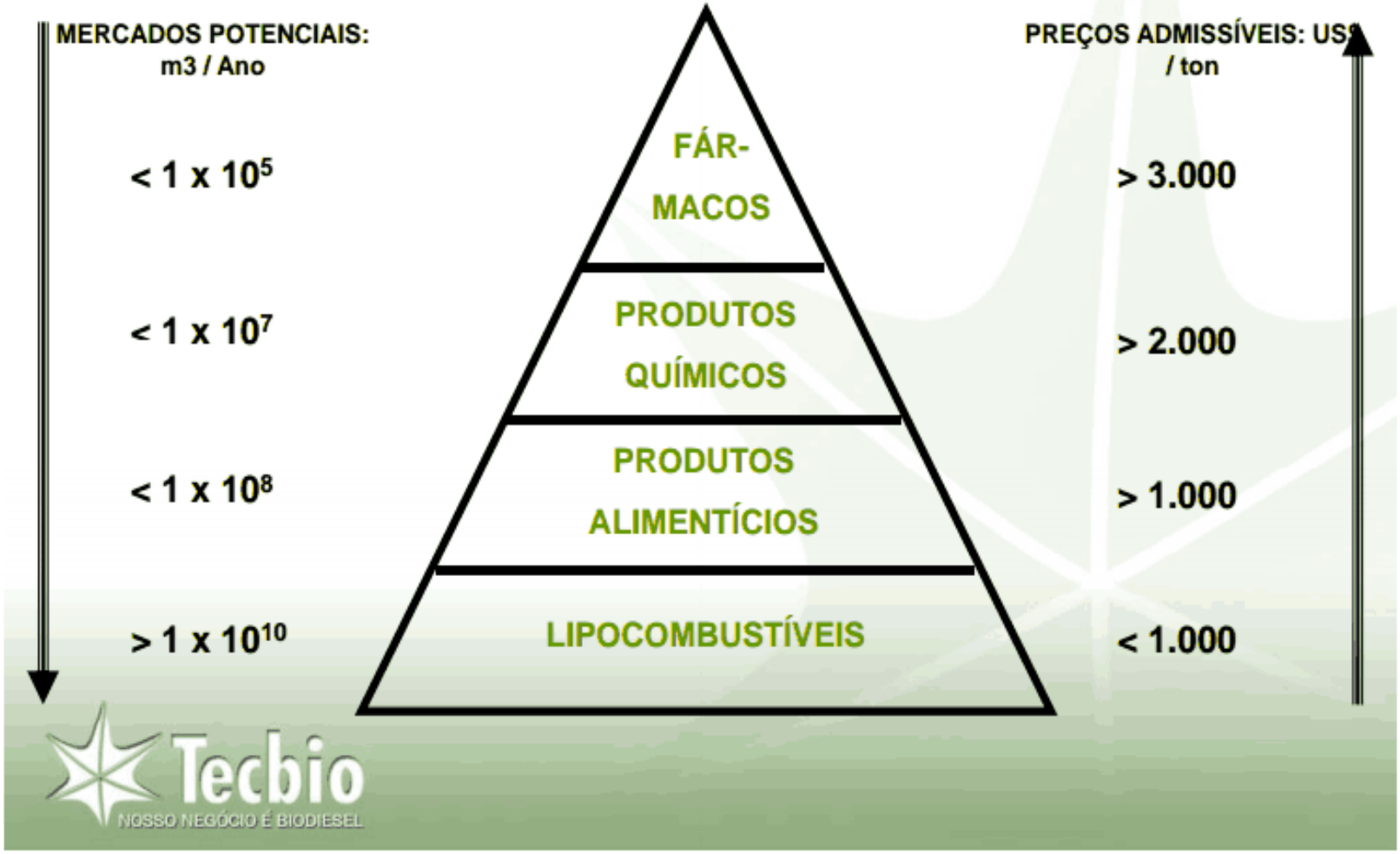
Figure 1 - Base case community bioenergy power project for rural trigeneration need.

Super pro simulation of Integrated Biosystem for fuel and Energy

Greenfuel



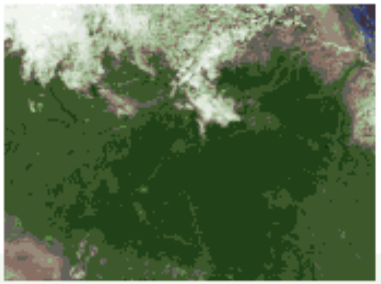
HIERARQUIA DOS USOS DE ÓLEOS VEGETAIS

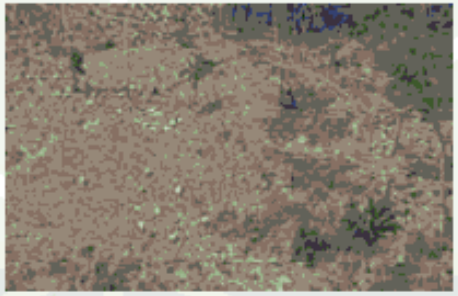


BIODIESEL & DESMATAMENTO

É POSSÍVEL PRODUZIR BIODIESEL SEM DESFLORESTAR.

AO CONTRÁRIO: É RECOMENDÁVEL PRODUZIR BIODIESEL ATRAVÉS DO REFLORESTAMENTOS DE ÁREAS DEGRADADAS.





Tecbio
NOSSO NEGÓCIO É BIODIESEL

Conclusions

The integration of thermoconversion, bioconversion, fuel cell and IC engine need specialized expert helps too, there is demand for both the neat , cold trigeneration of energy. Synergetic concepts of integrated innovative process system have been developed in this work for the integration of renewable power methane plants in biogas plants, biomass gasification plants, pyrogas biomethane , CO2 seperation.Biodeisel and feed production from waste was realized.

Also from waste c02 from methane , micro alage production as well as biodeisel for decentral rural area may bee soon made possible to imporove the bioeconomy local using wastes as well as fish wastes , moringa e macuba via P+L , clean Integraedbisosytem

Conclusão

A integração de termoconversão, bioconversão, células de combustível e motor IC precisa especialista especializado ajuda muito, há demanda para tanto o puro, trigeração frio de energia. E conceitos sinérgicas de sistema integrado de processo inovador foi desenvolvido neste trabalho para a integração de plantas de metano de energia renováveis em centrais de biogás, plantas de gaseificação de biomassa, e locais de gás natural, indústria intensiva de CO2, aterros sanitários e usinas de esgoto.

Também a partir de resíduos c02, micro produção Alage bem como biodeisel para descentralização área rural pode abelha breve possível para imporove a bioeconomia local, utilizando resíduos, bem como resíduos de peixe, moringa e macuba via P + L, limpo Integraed sistema bio.