

MICRO DISTILLERIES FOR ALCOHOL FUEL

IS IT ECONOMIC, SOCIAL
AND
ENVIRONMENTALLY SUSTAINABLE?

BY

Juarez de Sousa e Silva
Federal University of Viçosa

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OUR DILEMMA

Energy

Food

Sustainability



RENEWABLE ENERGY - BIOENERGY

How ensure the internal supplying of food and bioenergy without decreasing food production?

- Recovering degraded areas ?
- More efficient use of the farm land?

RENEWABLE ENERGY

Is the energy generated from NATURAL resource and, once used, can be replaced by the **NATURE**

CAN THE BIOENERGY BE REPLACED NATURALLY ?

From cultivated biomass?

For farming (may be possible)

Industry ?

Housing?

Transportation?

Who will going to pay?

BIOMASS SOURCES

On farm use:

Biomass energy (the best and low price solar collector);

Agricultural residues (Energy or Fertilizer) ?



Coffee husk has
Usable 8380 MJ/ton
or
30 kg of potash per ton

BIOENERGY SOURCES



What is the best place?

The best place?

Why

?

Why not



BECAUSE

In rural areas we can find:

- **Solar energy** - Water heating, grain drying, (fruits dehydration)? and (electricity) ?;
- **Livestock** - biogas and organic fertilizers;
- **Energy crops and oilseeds** – Biofuel;
- **Forests energy** - firewood and charcoal.

WHY NOT

Farmer can not afford to produce energy
(subsidy)

Governmental problems (Environment)

Sugar/Ethanol producers don't want competition

LACK OF JUDGMENT
Mainly for charcoal production





**IN WHAT FARM ACTIVITIES
REQUIRE ENERGY?**

- ✓ Tillage;
- ✓ Planting;
- ✓ Harvest;
- ✓ Farm machinery operation;
- ✓ Cooling;
- ✓ **Drying and storage;**
- ✓ Transportation;
- ✓ Comfort and housing.
- ✓ Commercialization



Average

20km - 60 ton of sugarcane = 4.2 ton of ethanol + 18 ton of bagasse + water

With energy we reduce losses



To increase Production with productivity **Energy** is needed (rice)

Input	Modern		Transition		Tradicional	
	Qty/ha	MJ/ha	Qty/ha	MJ/ha	Qty/ha	MJ/ha
Machinery	-	4.200	-	335	-	173
Fuel	224,7 lts	8.988	40 lts	1.600	-	-
N		10.752		2.520	-	-
P	-	-	-	-	-	-
K	67,2	605	-	-	-	-
Seeds	112	3.360	110	1,650	107,5	-
Irrigation	683,4 lts	27.336	-	-	-	-
Insecticide		560	1,5	150	-	-
Herbicide	5,6	560	1,0	100	-	-
Drying	-	4.600	-	-	-	-
Eléctricity	-	3.200	-	-	-	-
Transport	-	724	-	31	-	-
Total	-	64.885		3.386	-	173
Productivity		5.800		2.700		1.250

LIGHT FOR ALL: A SUBSIDIED PROGRAM

The energy is not sufficient for :

- irrigation,
- cooling,
- animal feed production
- small food industry.

WHAT CAN WE DO WITH POWER SUPPLY LESS THAN 5 HP?





THE REAL QUESTIONS

Is it possible to produce energy to run farm machinery, tractors, transportation and food at the same time?

Is it possible to make money with bioenergy at farm level?



YES

AT FARM LEVEL WE HAVE THE BEST SOLAR COLLECTORS THE BIOMASS



and



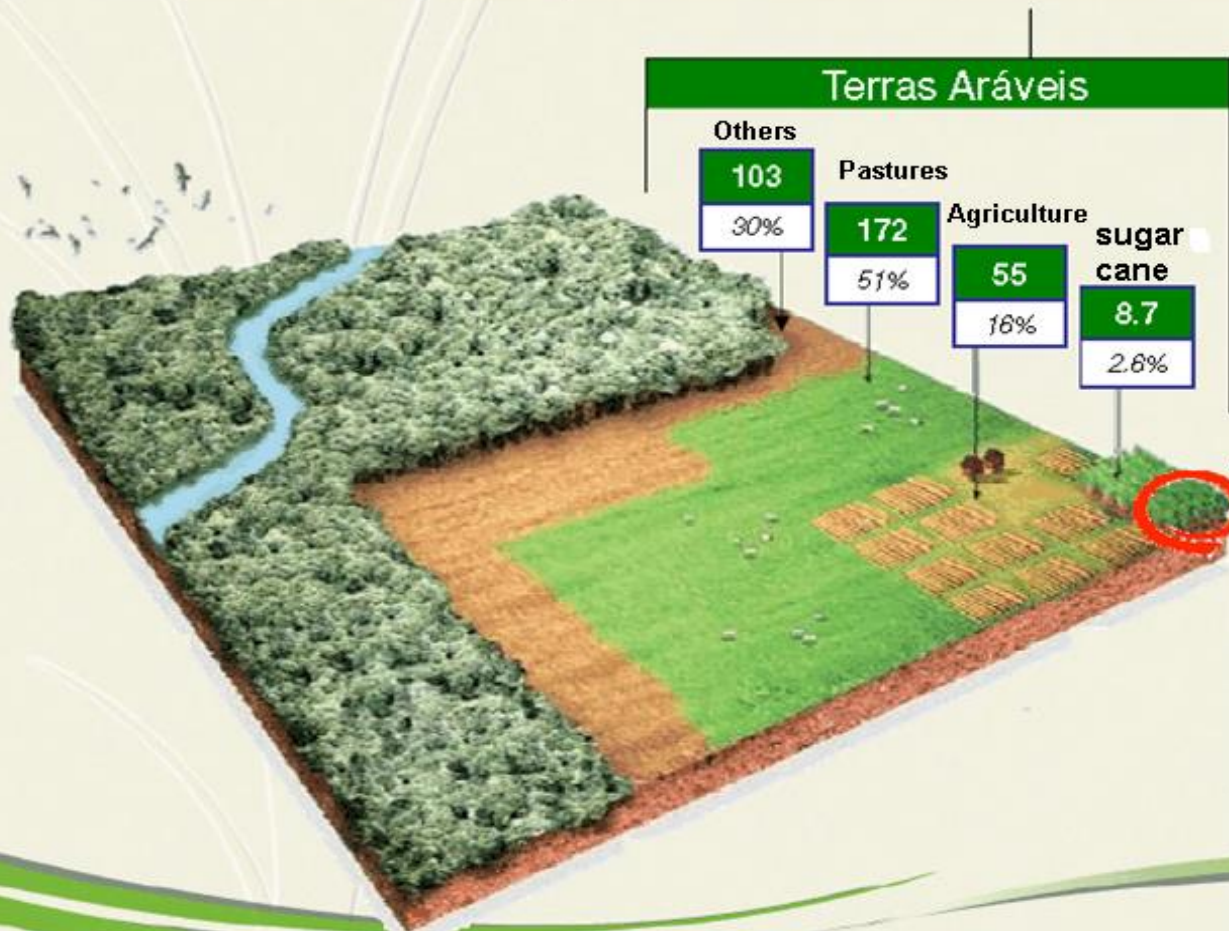
For specific applications ETHANOL FUEL



Land use in Brazil

Millions Hectars

Total area	Natural vegetation	Mechanized	Others
851	498	338	15
100%	58%	40%	2%



Sugarcane for ethanol



Productivity in ethanol liters /ha



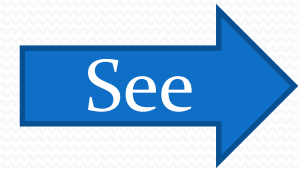
* Área referente ao ano de 2009

Fonte: IOONE, ESALQ e IBGE. Elaboração: Cosan e UNICA.

ALCOHOL AS FUEL

WHY ALCOHOL AS FUEL IN BRAZILIAN FARMS ?

- 57% of energy used in the farms are based on diesel
- Ethanol fuel from SUGARCANE is “RENEWABLE”
- Ethanol is a versatile Fuel.
- The byproducts from ethanol production (Bagasse and Vinasse) can be incorporated in others farm activity;



The green portions of the SUGARCANE can be used for animal feeding.

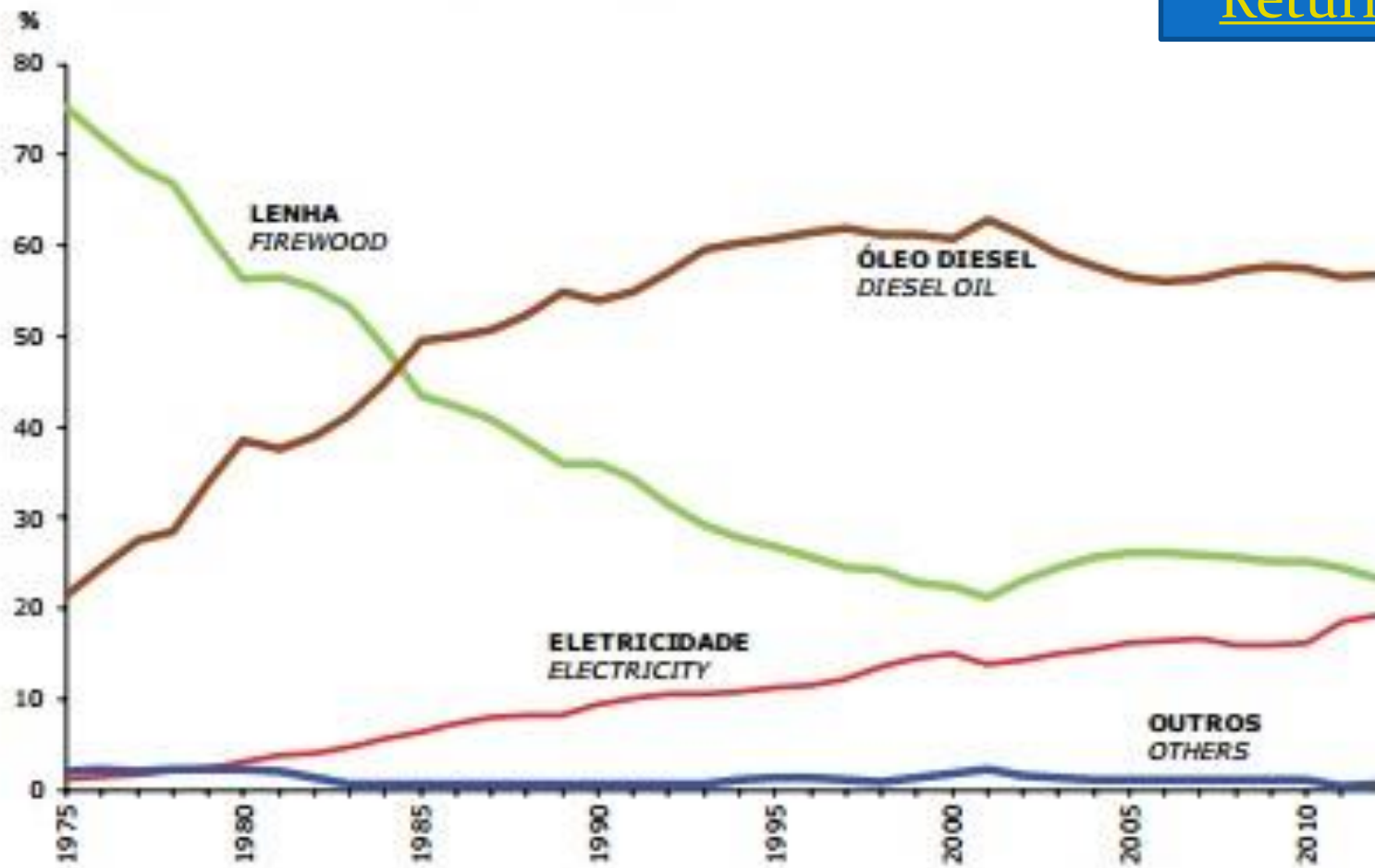


ALCOHOL AS FUEL

Gráfico 3.3 – Estrutura do Consumo no Setor Agropecuário

Chart 3.3 – Agriculture and Livestock Sector Energy Consumption

[Return](#)

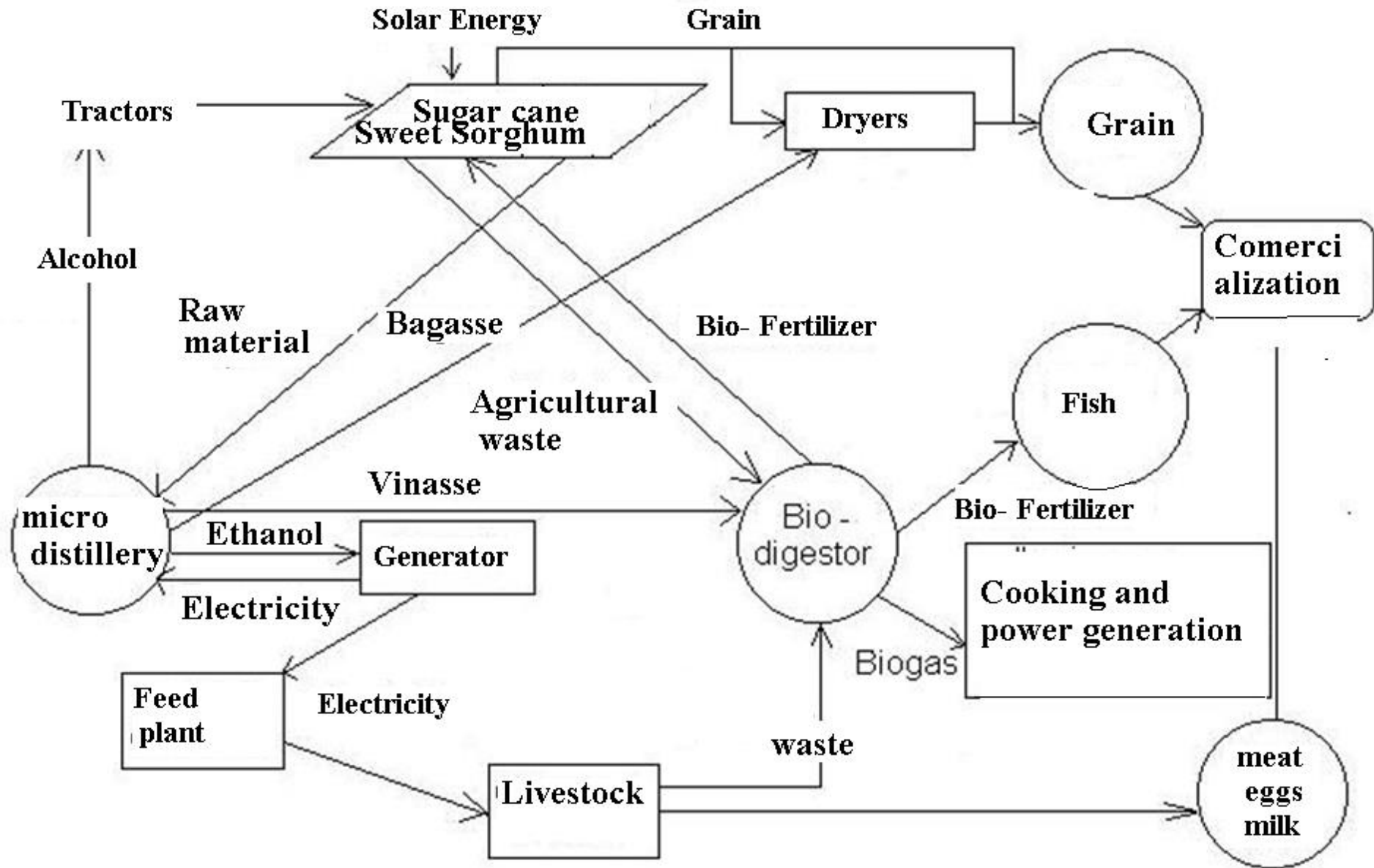


ALCOHOL AS FUEL

WHY ALCOHOL (CONTINUATION)

- The farm cost of alcohol fuel is much lower than the cost of diesel in the gas station (US\$ 0.013/MJ x US\$ 0,028MJ) or (US\$ 0.3 x US 1.00)/Litter
- The local production alcohol can supply isolated communities and will contribute to regional development ; and
- There is a worldwide demand for the use of clean fuel.

OUR PROPOSAL FOR ENERGY AND FOOD PRODUCTION (virtuous cycle)



SOME QUESTIONS MADE BY FARMERS

What is ethanol fuel?

How it can be produced at farm level?

How is the production cost?

Can I make money ?

Where and how to use it?



What is it ethanol fuel?

Brazilian ethanol fuel is the product obtained by distillation of the fermented SUGARCANE juice.

The ethanol fuel is an ethanol-water solution with ethanol content between 83% to 92,3% .

Harvest

Should be performed when the cane is ripe or with 20-22% of sugar content.



2.5 tons/day



400 tons/day

Mechanized



Manual 6.0 tons/day

JUICE EXTRACTION

CRUSHING

At small farm level is used a single mill.



The juice extraction is less efficient, and resulting bagasse with great amount of sugar.

USE OF BAGASSES AND LEAVES

If properly chopped and supplemented with PROTEIC Foodstuff , the bagasse and leaves can be used as cattle feed.



Animal Feeding - Based on Sugarcane residues

THE BAGASSE CAN ALSO BE USED

- As fuel for furnaces and boilers;
- To cover the ground in confinement systems
- As organic fertilizer when decomposed with cattle manure



FERMENTATION

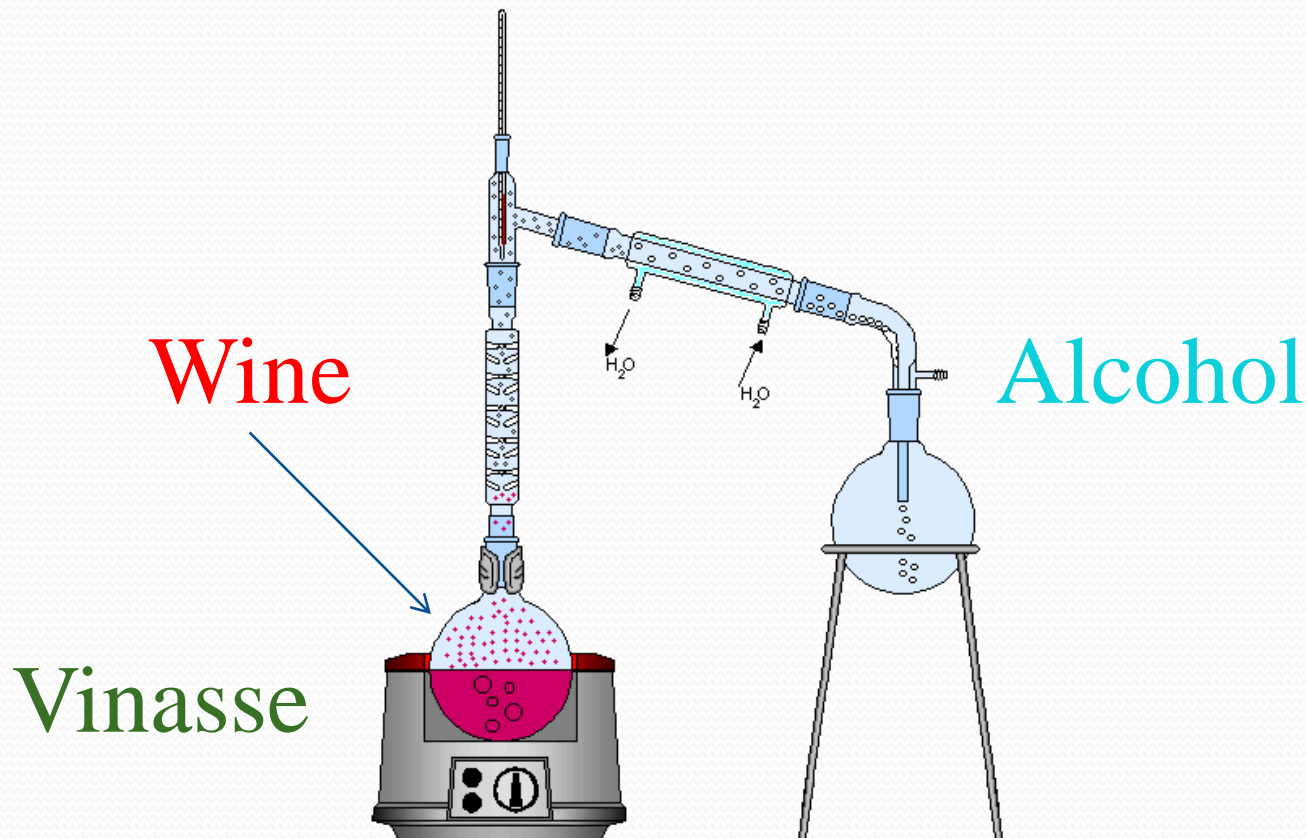


Diluted juice in fermentation process

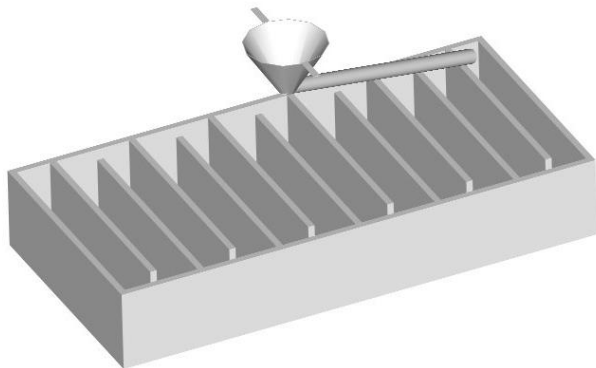
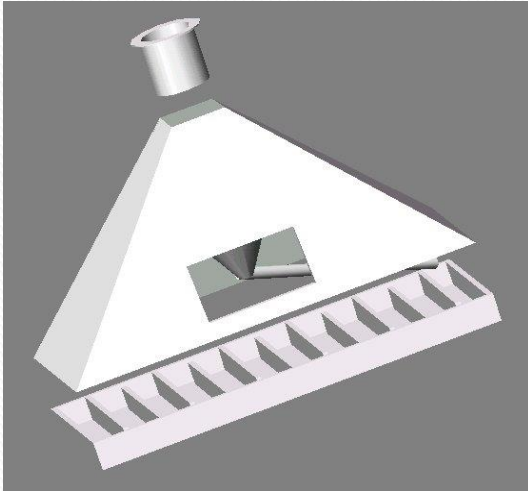
The fermentation process takes 16 to 26 hours at room temperature between 28 and 32 ° C

DISTILLATION

The fermented juice (0% sugar) is called wine.
The wine has 92-88% water and 8-12% of alcohol.
The distillation produces alcohol and Vinasse.



CONTINUOUS DISTILLATION SYSTEM



DEA-
UFV

COLUMNS IN SERIES AND PARALLEL



Still with parallel columns (serially connected) and direct heating furnace

ALCOHOL FUEL FROM CACHAÇA RESIDUES

During the production of CACHAÇA is obtained three products: **HEAD**, **HEART** and **TAIL** of the distillation

HEAD (in general 15% of total).

heart (spirit): Yields about 70% of total (the ideal is 60%).

TAIL: Is the final and worst fraction (15% of total alcohol yield).

The **HEAD** + the **TAIL** fractions



ALCOHOL FUEL

VIDEO

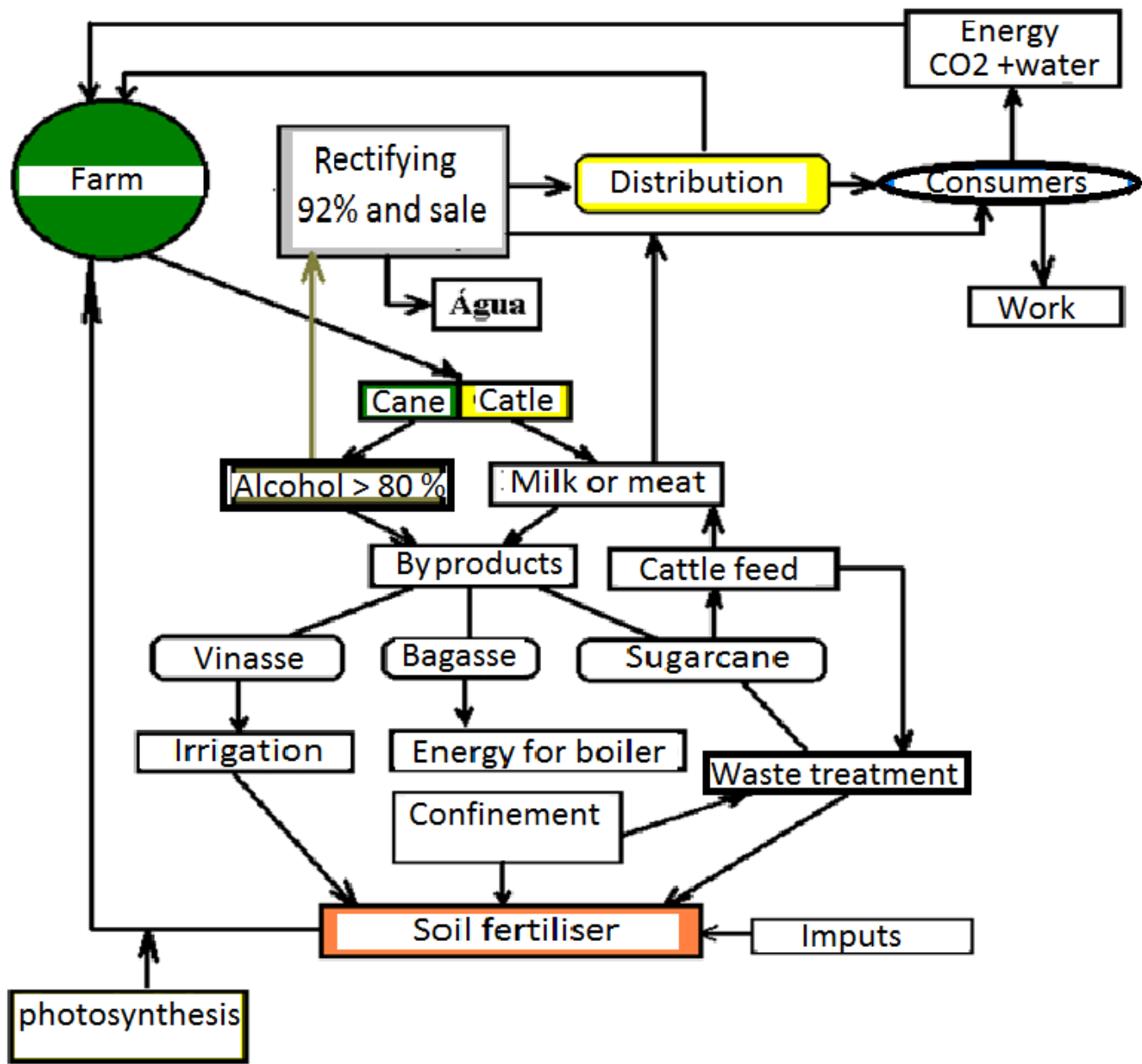
NOTE: For each 1000 liters of “High quality” **CACHAÇA** produced, we can take 250 to 300 liters of alcohol fuel from byproduct

ALCOHOL FUEL PRODUCTION IN A COOPERATIVE SYSTEM

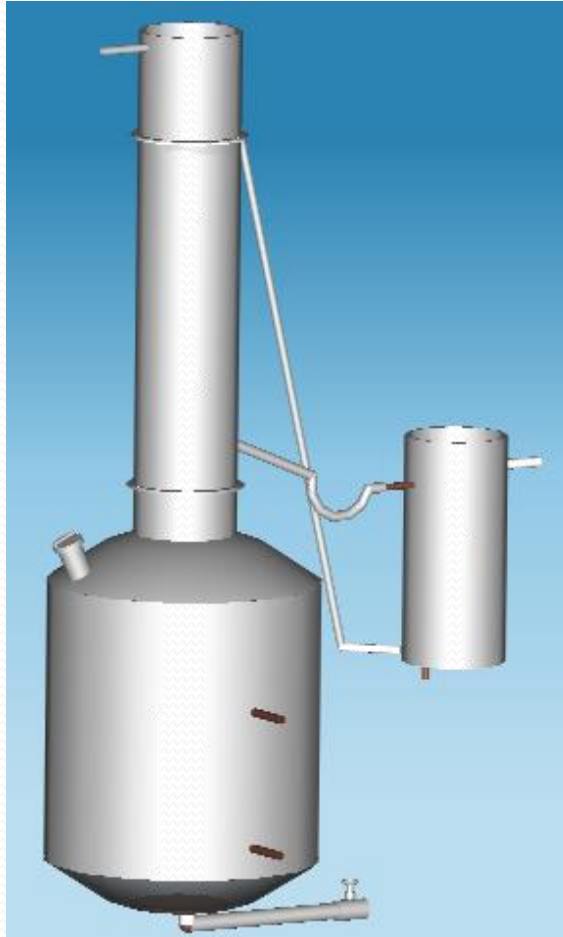
The farmer will produce an hydro alcoholic solution of 85 ° GL or higher .

The cooperative will rectify the mixture to 92.5 ° GL (Brazilian commercial grade)

For farm use, the solution with 85 ° GL is considered as ALCOHOL FUEL.



PRE-STILL / COLUMN



PRE-STILL



PRE-STILL / COLUMN

Santa Luzia Farm

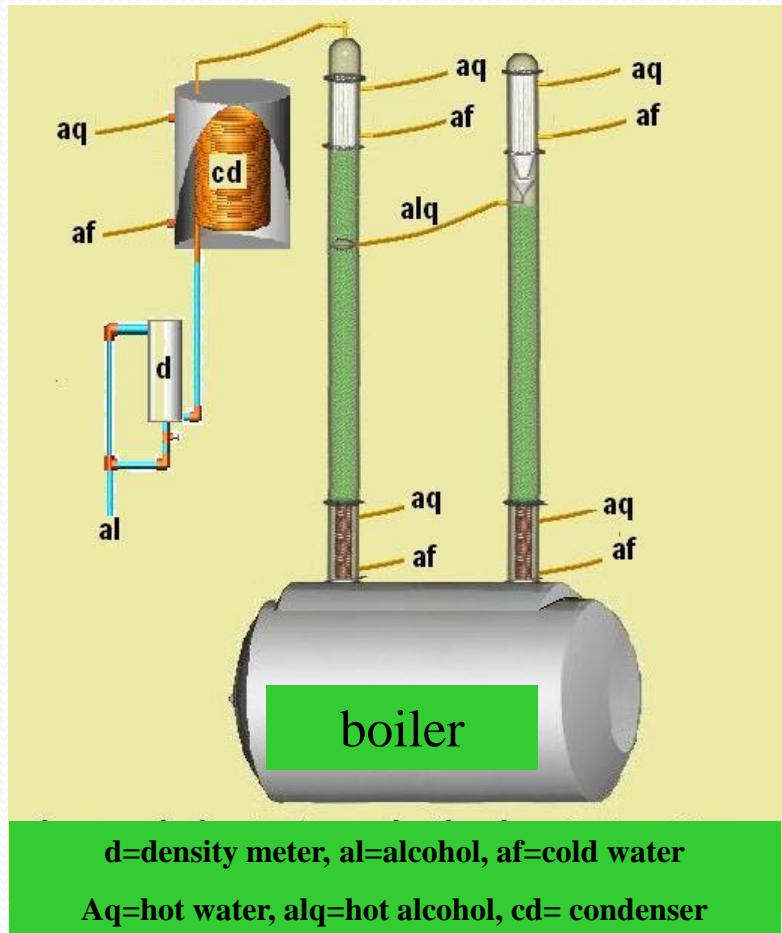


Batch system

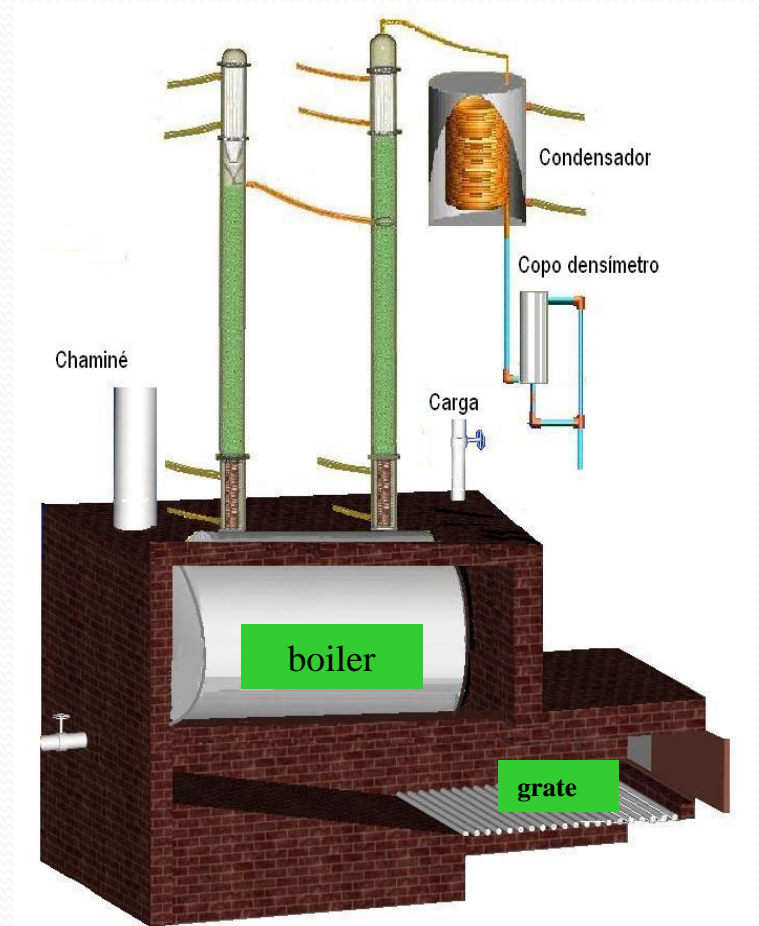


Continuous flow system

Columns in series / parallel



Installation diagram of a distiller with columns in series / parallel.



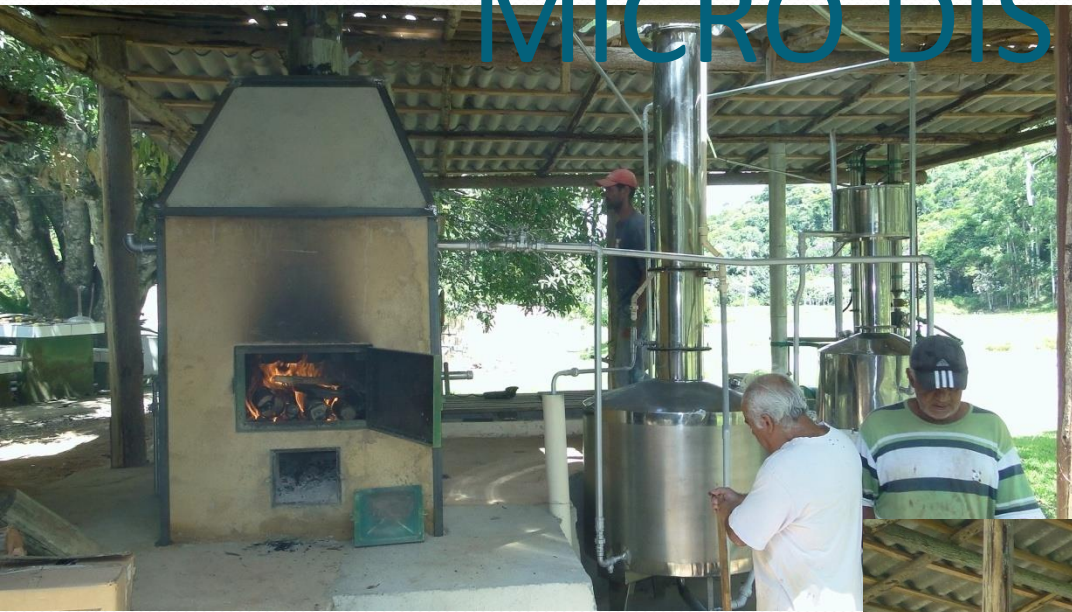
Still columns in series/parallel with direct heating furnace

Columns in series / parallel



Still columns in series/parallel with direct heating furnace

MICRO DISTILLERY



Pre-distiller and alembic



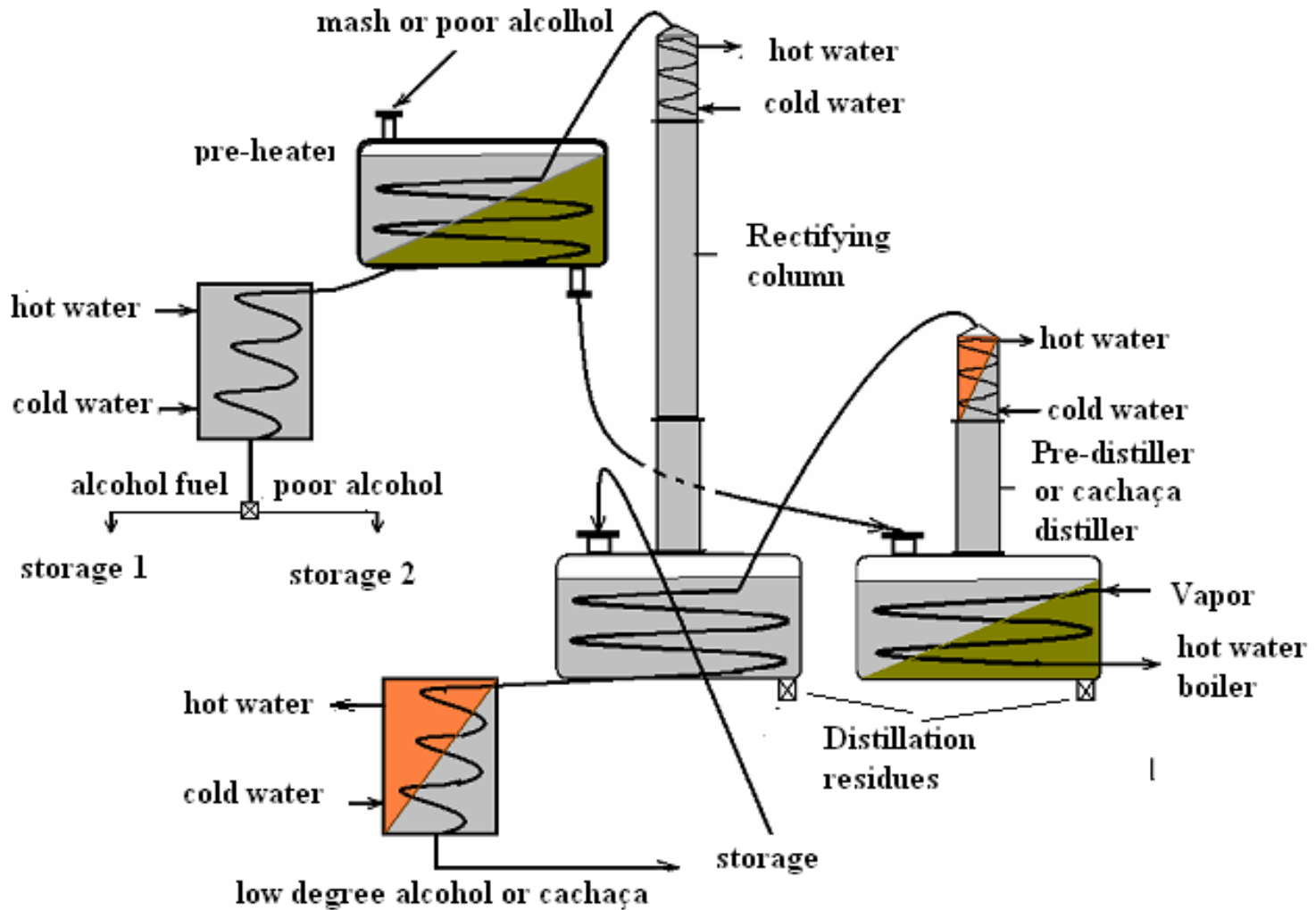
Distillation Column



Didactic unit in
Santa Luzia farm



A COMPLETE SYSTEM FOR ON FARM ALCOHOL PRODUCTION



Scheme for a mini-distillery with pre-heating system for efficient use of energy

A COMPLETE SYSTEM FOR ON FARM ALCOHOL PRODUCTION

PRODUÇÃO DE ÁLCOOL COMBUSTÍVEL NA FAZENDA

1 - Fornalha/Caldeira

2 - Chaminé

3 - Panela do pré-destilador

4 - Coluna do pré-destilador

5 - Condensador do pré-destilador

6 - Panela da coluna de retificação

7 - Coluna do retificador

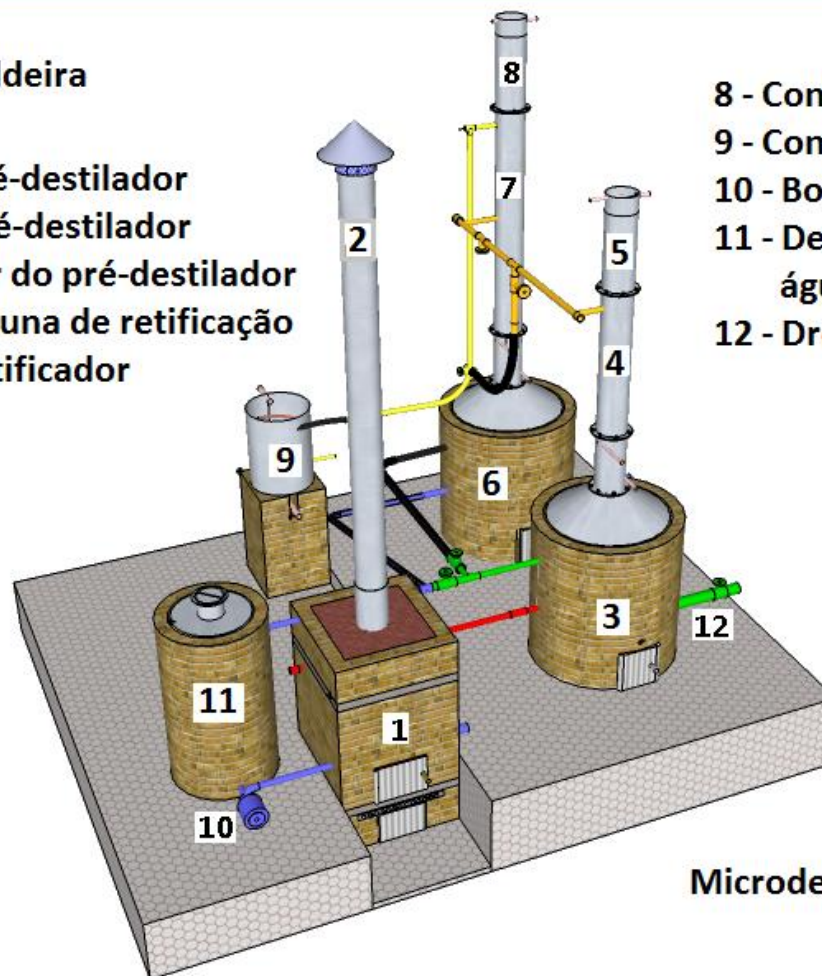
8 - Condensador do retificador

9 - Condensador final

10 - Bomba de recirculação

11 - Depósito do retorno de
água quente

12 - Dreno do vinhoto



Microdestilaria Modelo UFV

www.microdestilaria.com.br

www.poscolheita.com.br

ON FARM RECTIFYING COLUMN



Lester Farm – Três Corações county - MG

25.000Liters/Year

Electric Power Generation



(10 kVA)



(40 kVA)

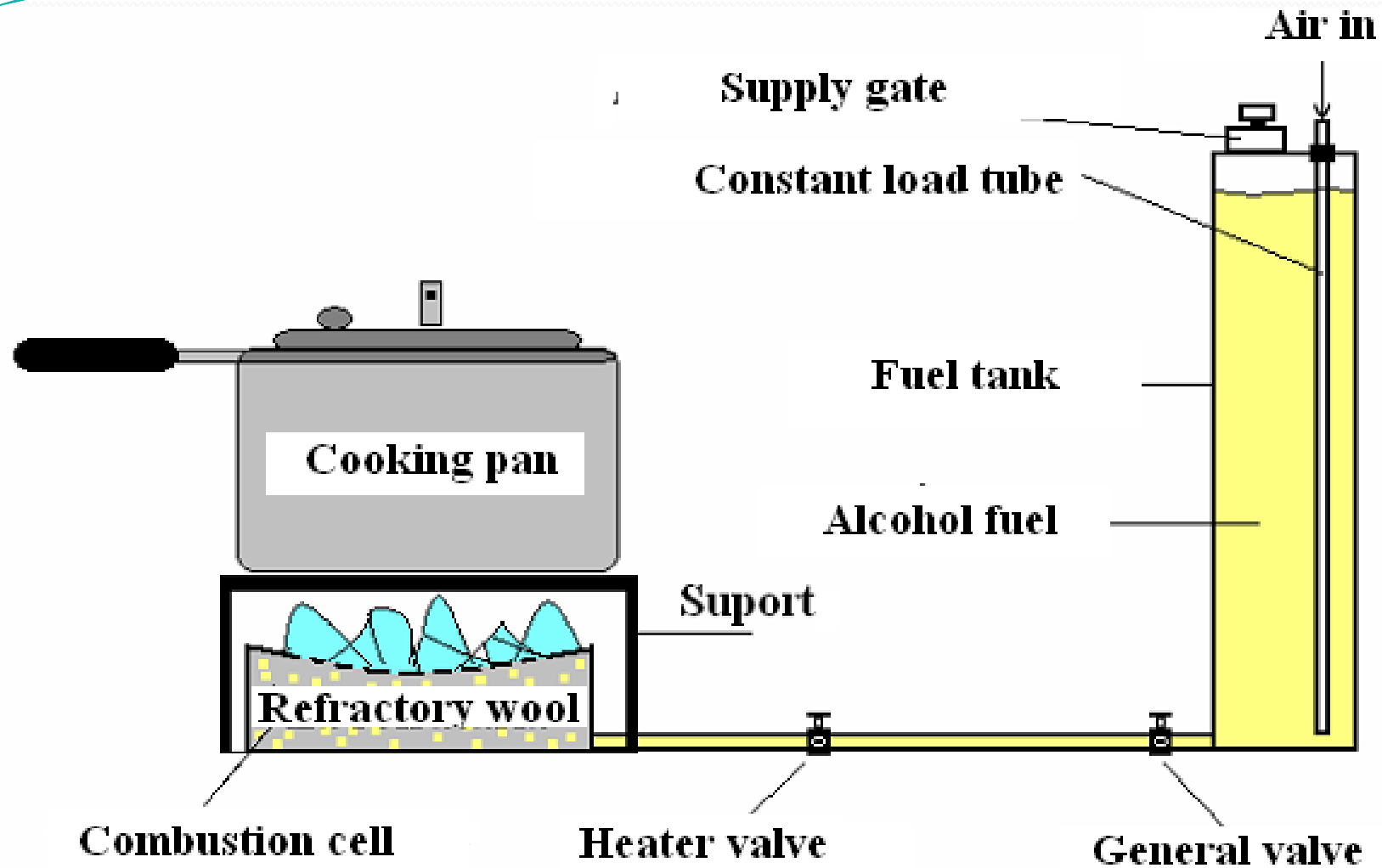
Electric Power Generator Fueled with ethanol

ALCOHOL FUEL FOR COOKING



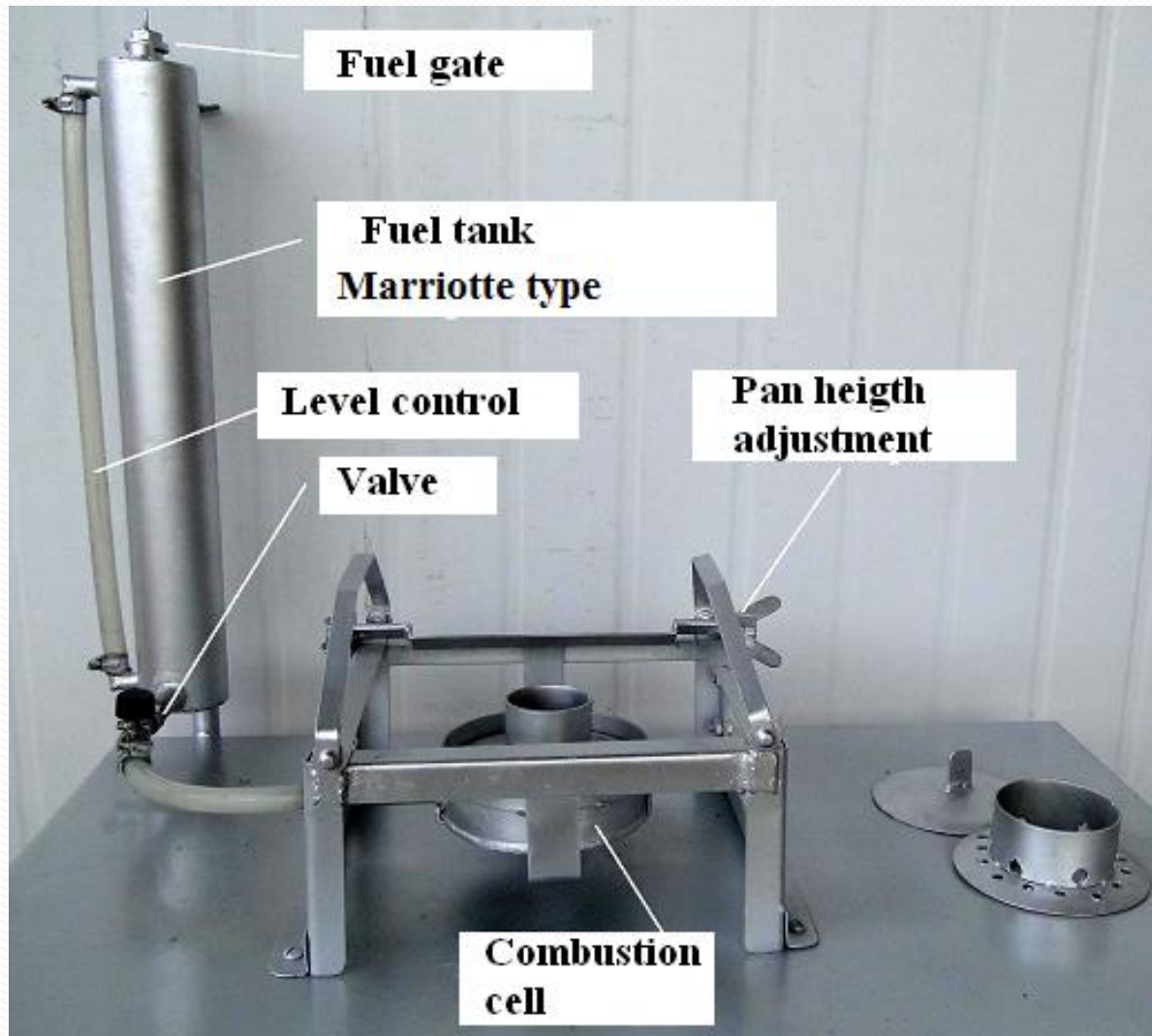
Non-pressurized alcohol stove widespread in Brazil by
GAIA Project

ALCOHOL FUEL FOR COOKING



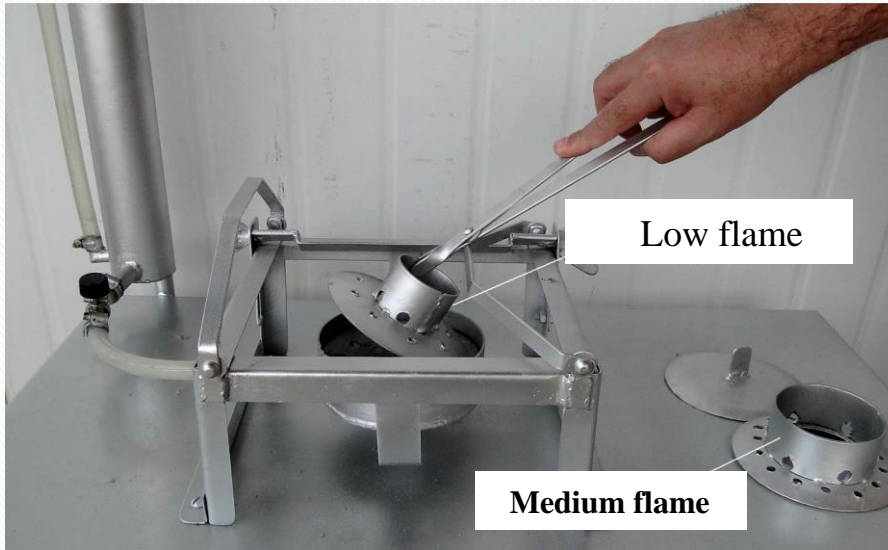
Non-pressurized alcohol stove (UFV model)

ALCOHOL FUEL FOR COOKING



Alcohol stove (UFV prototype)

ALCOHOL FUEL FOR COOKING



Placement of flame reducer



Details of the economic cover and safety "pliers"

USE IN VEHICLES



Alcohol use: 10 to 12 km / L

TRACTOR

MWM engine that replaces 60% of diesel for ethanol fuel,
without loss of power



Consumo 10 to 12 km/L

MOTORCYCLE

Honda (in Brazil, the market provides the popular model CG 150 Mix)
36.5 km / L.



THANK YOU VERY MUCH



Prof. Juarez de Sousa e Silva
Agricultural Engineering Department
E-mail: juarez@ufv.br

ON FARM ALCOHOL
PRODUCTION – Equipment,
production systems and uses