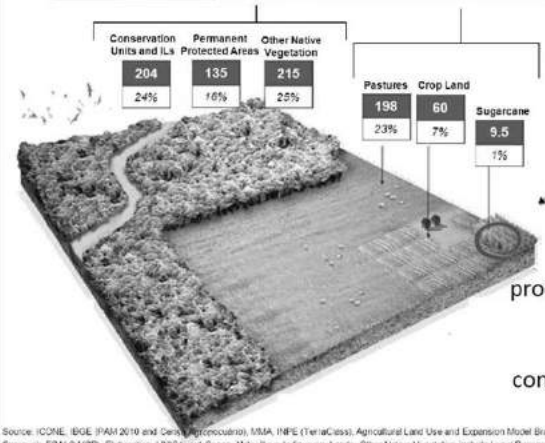
CTC- CENTRO DE TECNOLOGIA CANAVIEIRA

Land for Sustainable Sugarcane

Million Hectares

Total Area	Native Vegetation	Land in Actual Use	Other Uses
851	554	258	38
100%	*65%*	*30%*	*5%*

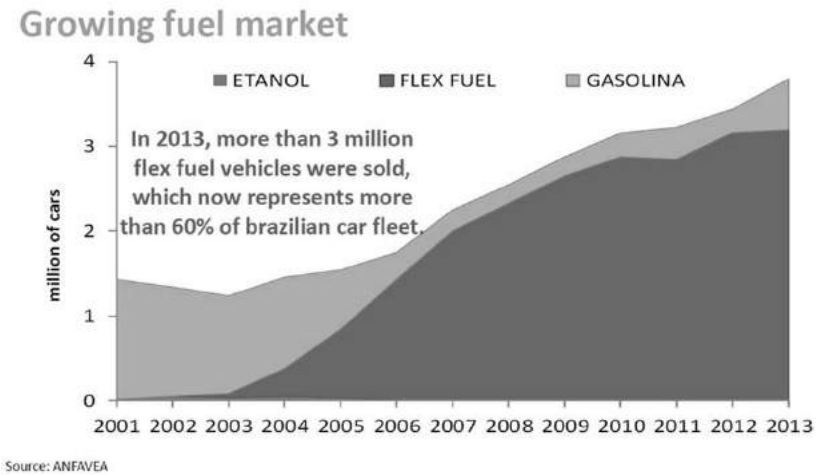


By improving the low yield of cattle production it will be possible to free large amount of land for other purposes. Brazilian federal agricultural zoning considered up to 64 Mha able to produce sugarcane w/o irrigation.

Source: ICONE, IBGE (PAM 2010 and Censo Agropecuário), MMA, INPE (TerraClass), Agricultural Land Use and Expansion Model Brazil Ag-LUE-BR (Gerd Sparovek, ESALQ/USP). Elaboration: UNICA and Cosan. Note: ILs = Indigenous Lands. Other Native Vegetation include Legal Reserves (RLs)

3

Demand for Sugarcane



Source: ANFAVEA

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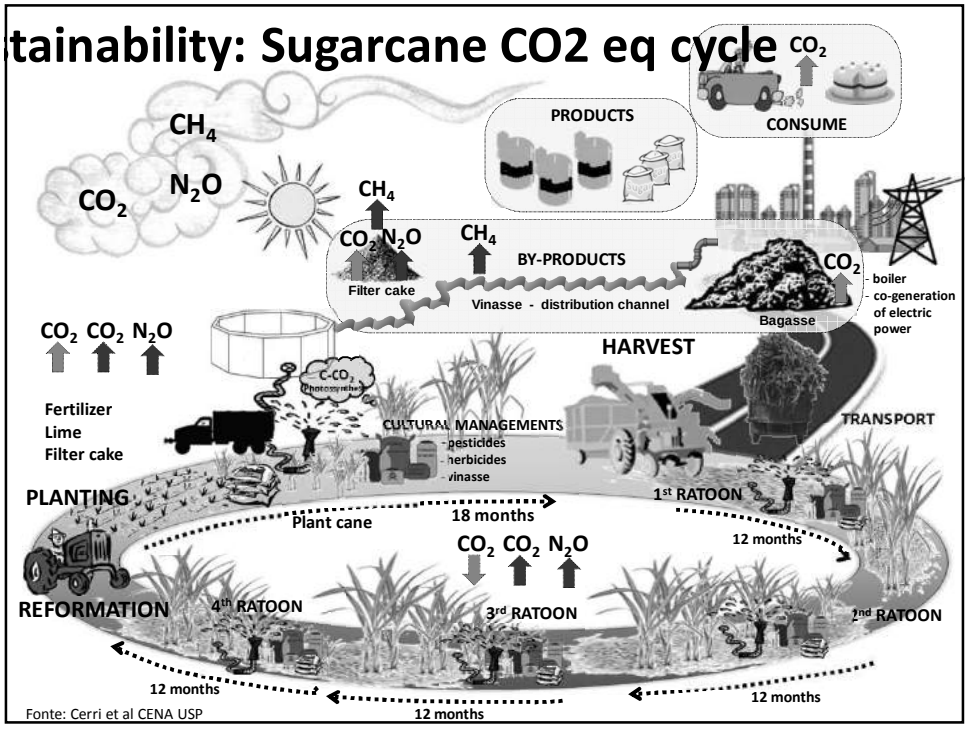
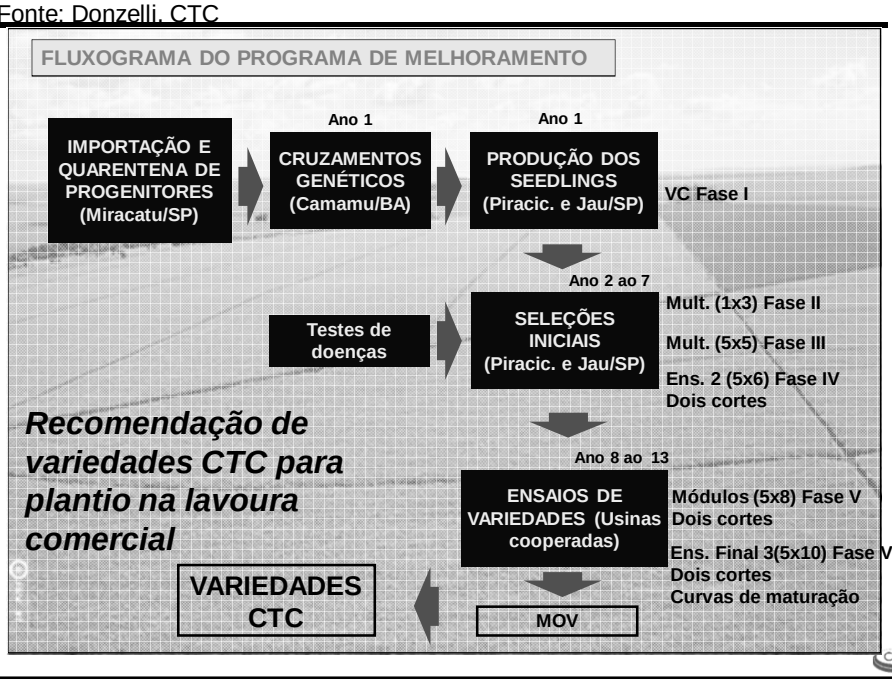
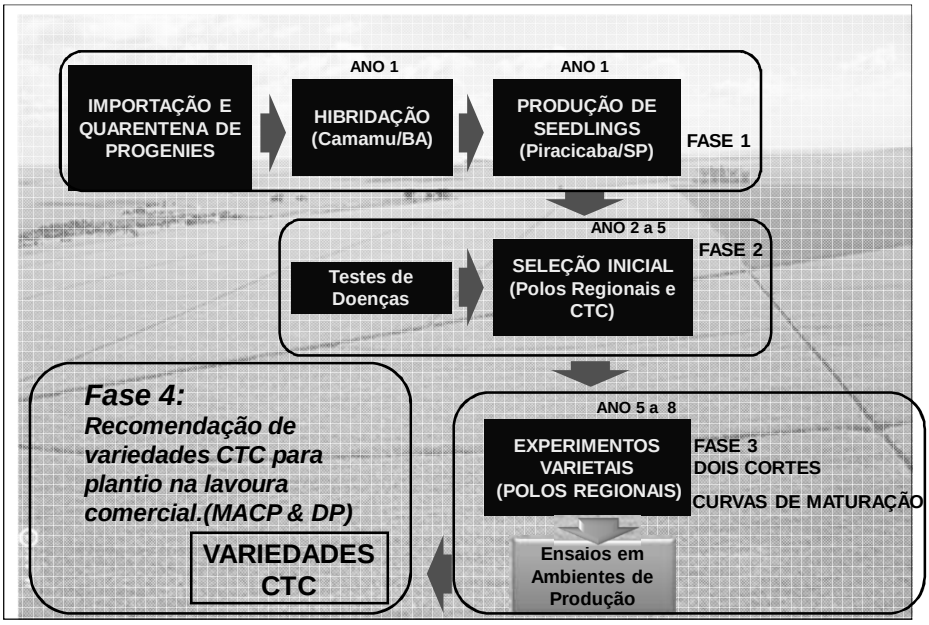


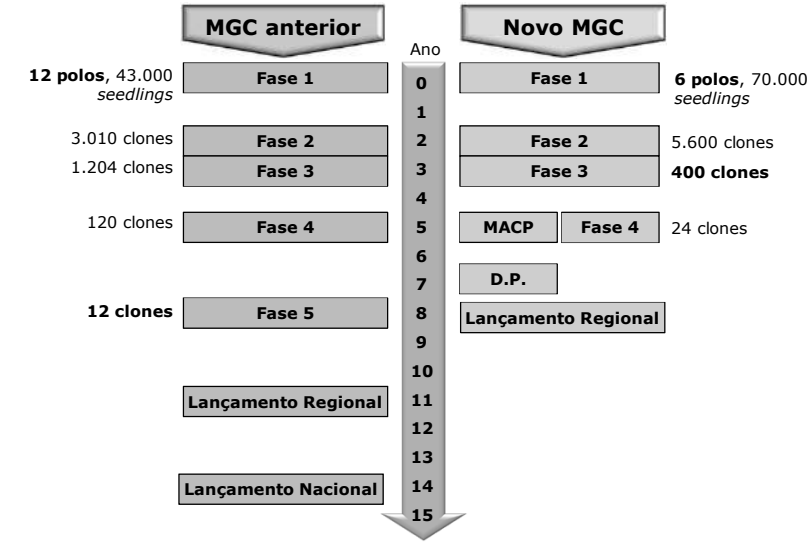
Fonte: Donzelli, CTC



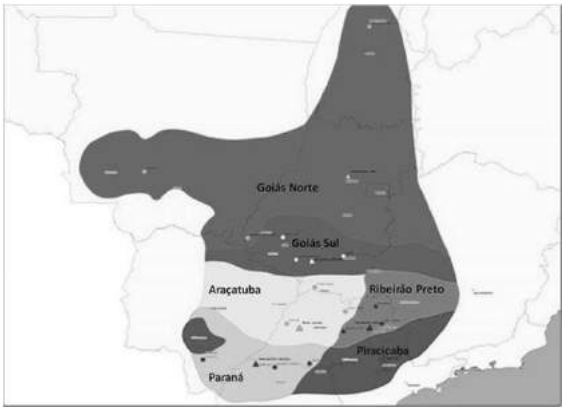
FLUXOGRAMA DO PROGRAMA DE MELHORAMENTO



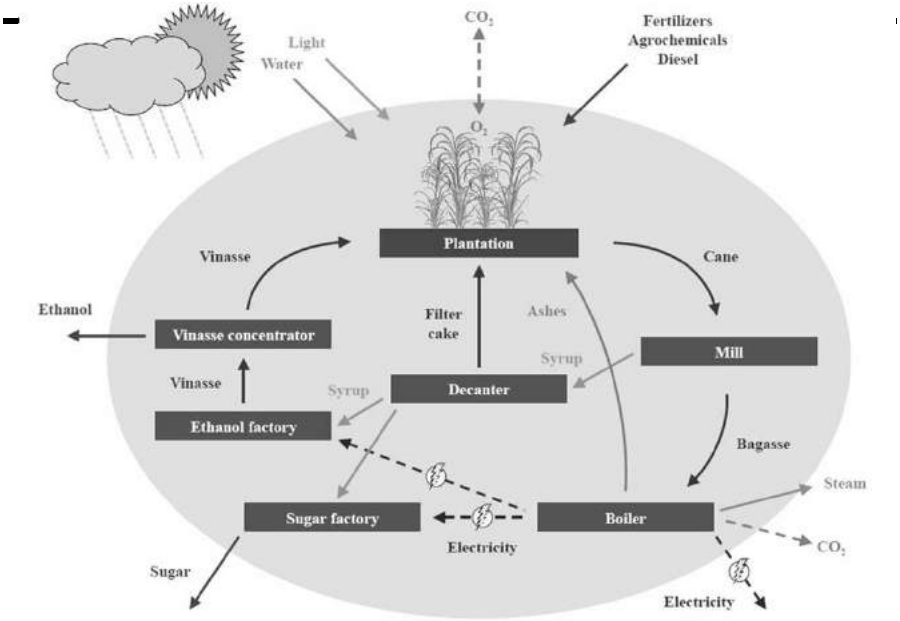
Novo modelo de Melhoramento Genético – Fluxos



Polos Regionais – cobertura edafoclimática



SP/Piracicaba	A-I, B-I, C-I	PR/Paraná	C-I, D-I e E-I
SP/Ribeirão Preto	A-II, B-II, C-II A-III, B-III, C-III	SP/Araçatuba	C-II, D-II e E-II C-III, D-III e E-III
GO/Goiás norte	B-IV, C-IV; D-IV B-V, C-V; D-V	GO/Goiás sul	C-IV, D-IV, E-IV C-V, D-V, E-V

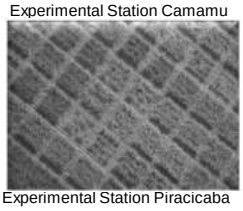


CTC History

Experimental Station Camamu

Quarentine Station Miracatú

CTC- Centro de Tecnologia Canavieira



Experimental Station Piracicaba

CTC headquarters

1969 — Copersucar Technology Center

1979

2004 — CT Canavieira Oscip

2011 — CTC S/A

Reprodução Proibida

CTC Overview

Timeline

COPERSUCAR → CTC → CTC

1879-1969 — Initiation of private operations in the sugarcane industry

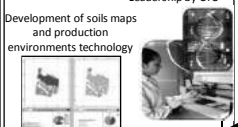
- 1879
- 1931 — Start up of the first private "Engenho" in Brazil
- Brazil´s first official use of ethanol as fuel

1969-1983 — First private investment in the sugarcane R&D sector

- 1969 — Foundation of the Copersucar Technology Center
- 1983 — Launch of the first CTC variety SP-1143

1984 -2004 — Growth and diversification in the sugar and ethanol industry

- 1986 — Development of automation controls for the sugarcane mills
- 1992 — Development of soils maps and production environments technology



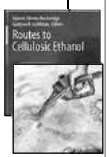
- 1995 — Sugarcane Genome Project development Leadership by CTC
- 1999 — Big Improvements of mechanization in sugarcane cutting, loading and transportation

2005-2010 — Restructuring and expansion of CTC´s activities

- 2004 — Development of sugarcane dry cleaning systems and straw recovery technology

- 2005 — CTC is transformed into an open association with non-profit purposes

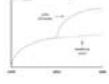
- 2007 — Start in CTC of the E2G project



Restructuring and expansion of its activities for all regions of Brazil

2011-2012 — CTC S.A

- 2011 — CTC is converted into a private corporation
- 2012 — Deployment of the new Strategy

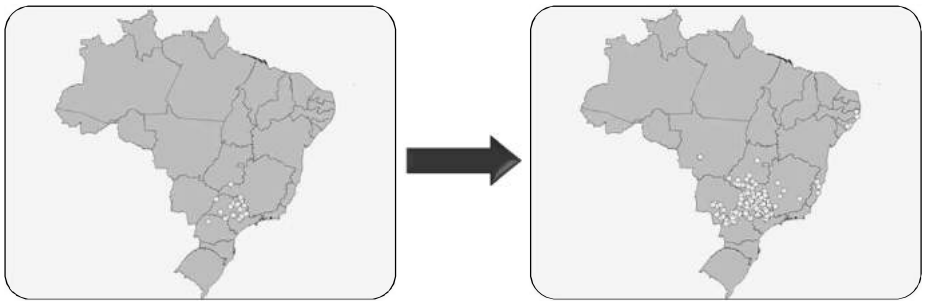


- 2013* — Access to BNDES and Finep funds

FINEP BNDES

CTC Evolution

2004 **2012**

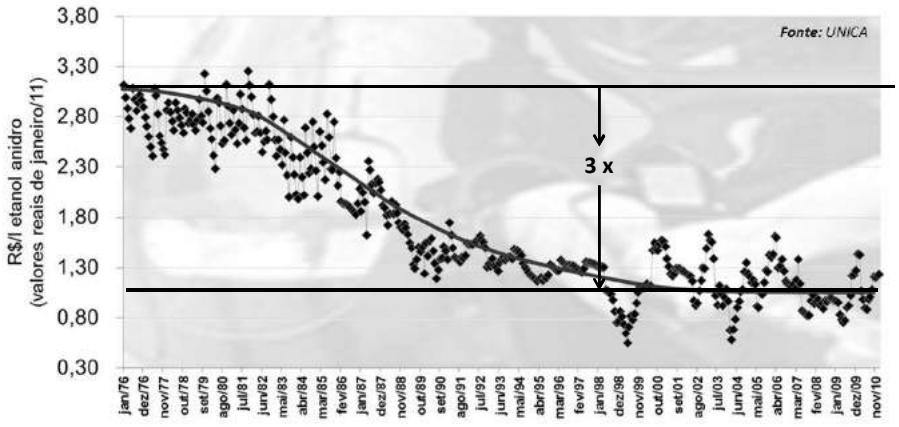


From 2004 to 2012 - CTC has increased from 73 associated members up to 154 stakeholders , including 12 thousand cane growers.

Today this represent 60% of all sugarcane planted in Brazil

ETHANOL LEARNING CURVE

Ethanol price evolution (CONSTANT R$ deflated jan 2011)

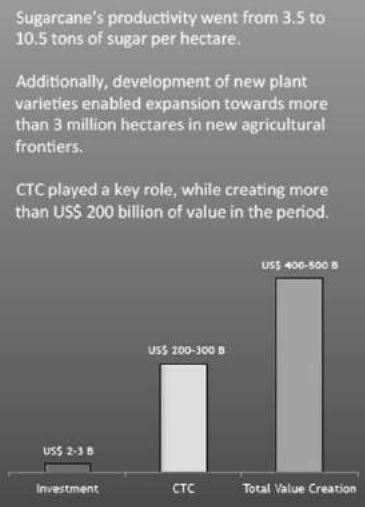


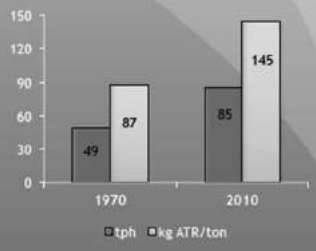
Last year : 97 kg produts / TC or ~ R$ 103,00/TC = 3 kg wax= 0,5 kg yeast extract
Sugar in sugarcane 136,75 kg Total Sugars / TC Price of TS: R$ 0,4728 1 TC: R$64,66

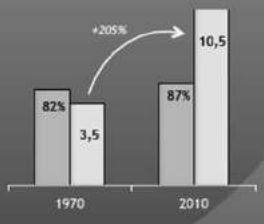
Reprodução Proibida

Technological development in all aspects of sugar & ethanol production led productivity to almost triple in the last 40 years.

- Sugarcane's productivity went from 3.5 to 10.5 tons of sugar per hectare.
- Additionally, development of new plant varieties enabled expansion towards more than 3 million hectares in new agricultural frontiers.
- CTC played a key role, while creating more than US$ 200 billion of value in the period.



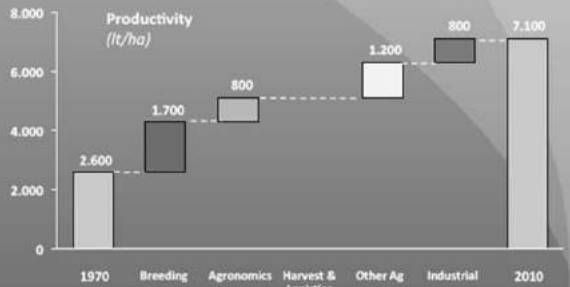


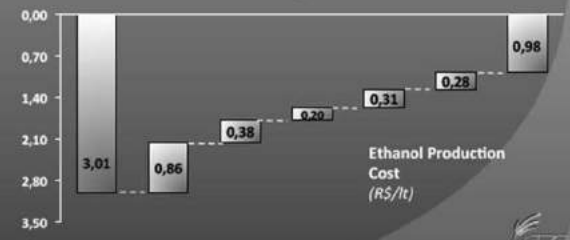


Source: CTC

In the same period, ethanol production increased to 7,100 from 2,600 liters per hectare.

- The development of newer varieties generated 40% of the yield gains.
- Improved agronomic practices have allowed productivity to increase by 75%.
- The enhancement of industrial processes complemented the gains obtained in the fields.
- At the same time, different technologies made ethanol production environmentally friendly.



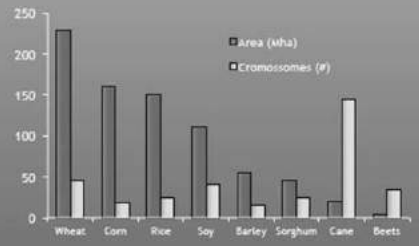


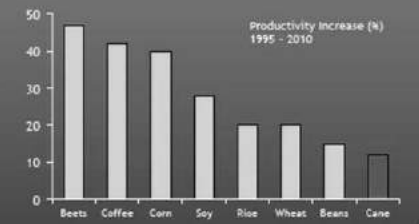
Source: CTC

4

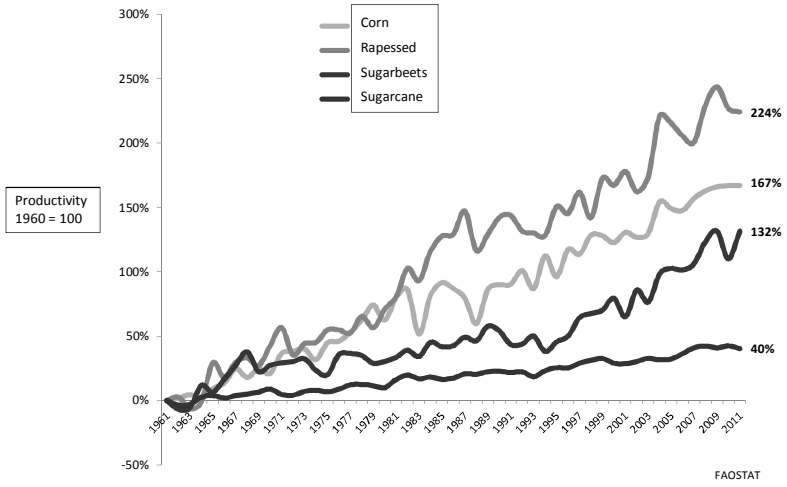
However, in the last 15 years, the productivity of other crops increased much faster than sugarcane's.

- While sugarcane's genetics is much more complex, its area is 8 times smaller than that of corn.
- These factors have made corn a preferential destination of R&D investments by large technology companies and institutions.
- Despite its unique potential, low R&D budgets have slowed down gains in sugarcane.
- As a result, in the last 15 years, sugarcane's productivity improvements lagged behind that those of most crops.

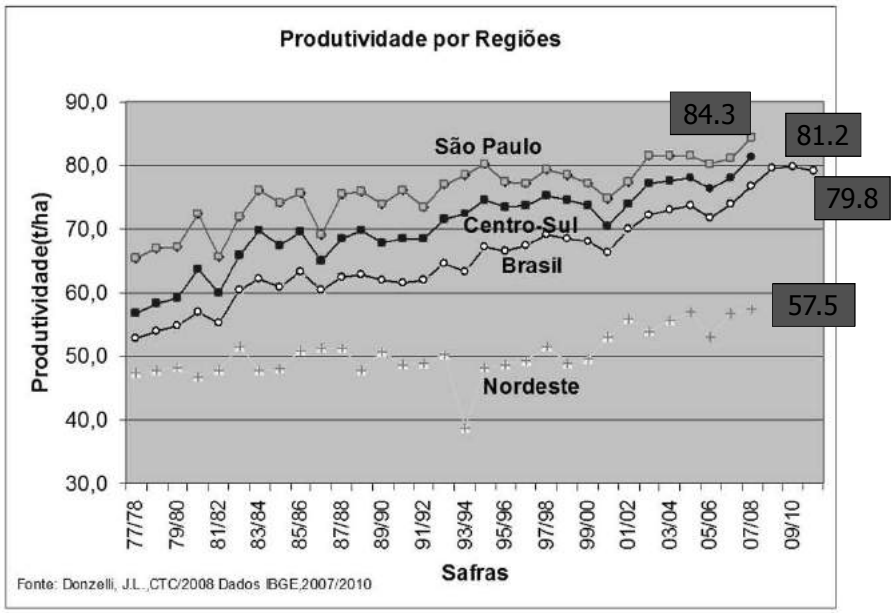




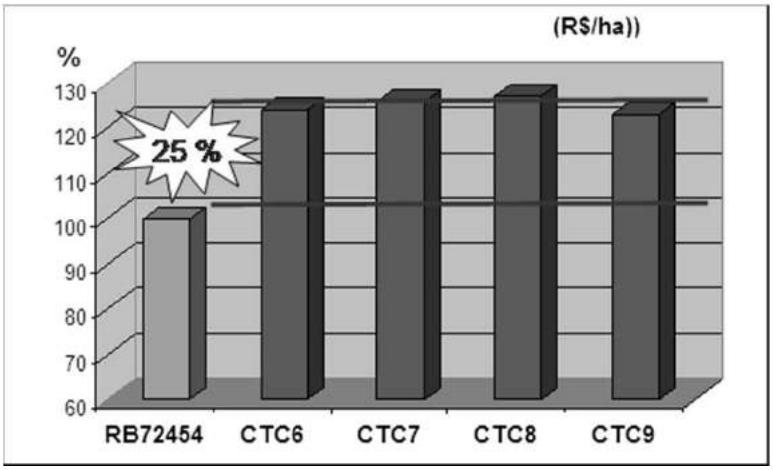
As a result, sugarcane was left far behind.



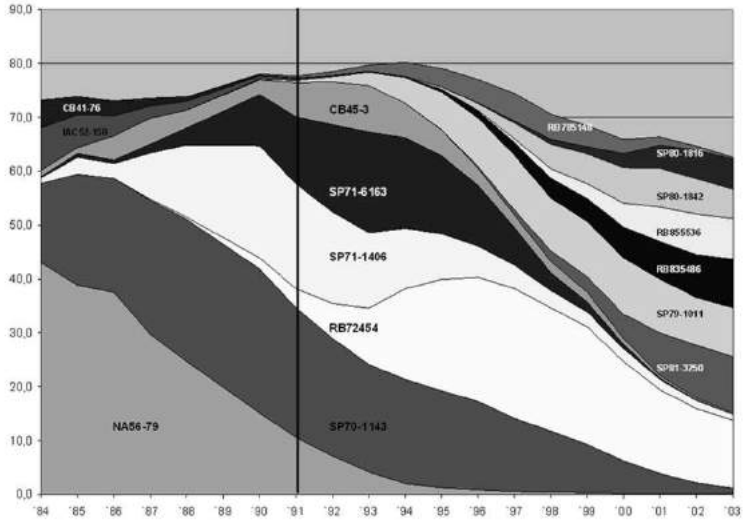
Sugar Cane Productivity



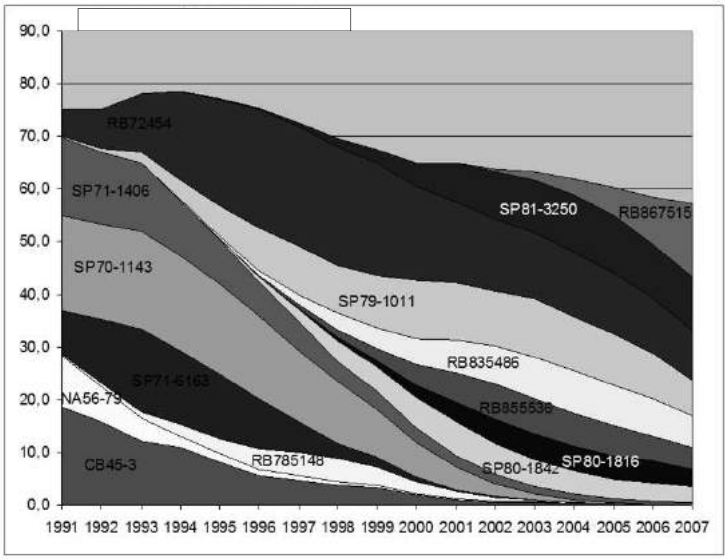
New Varieties benefits



AREA PER VARIETY %

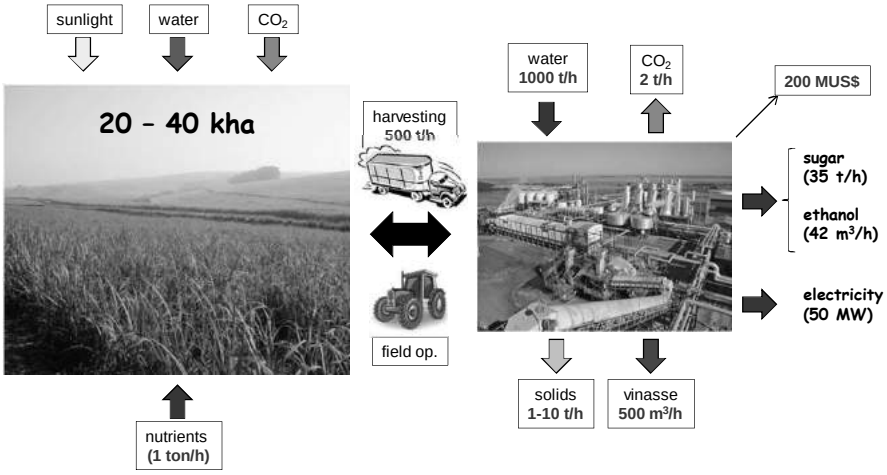


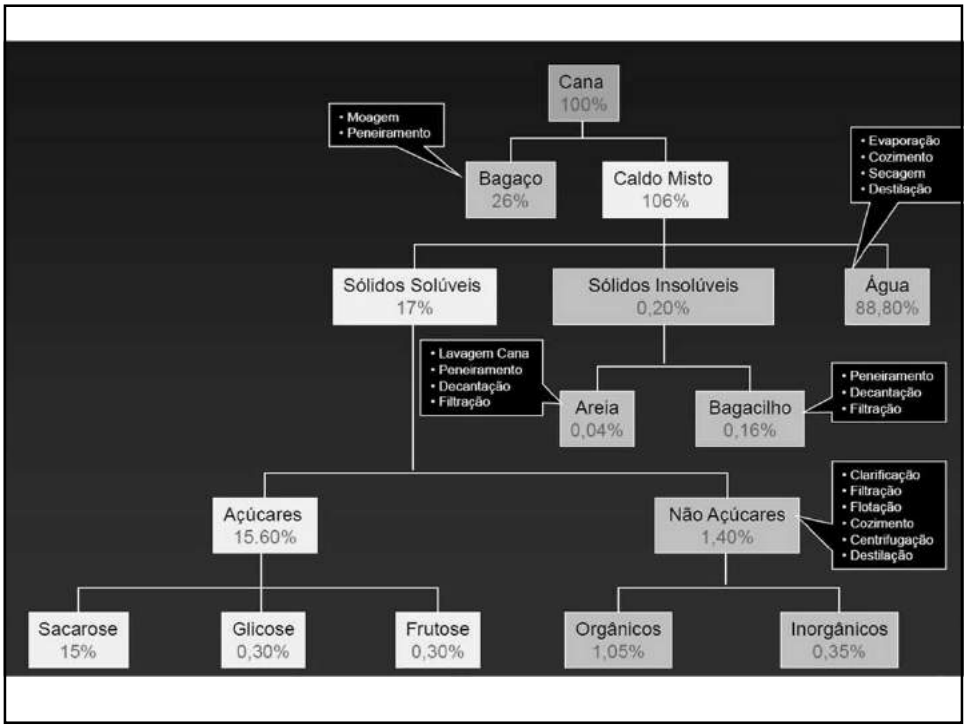
CTC TECHNOLOGIES

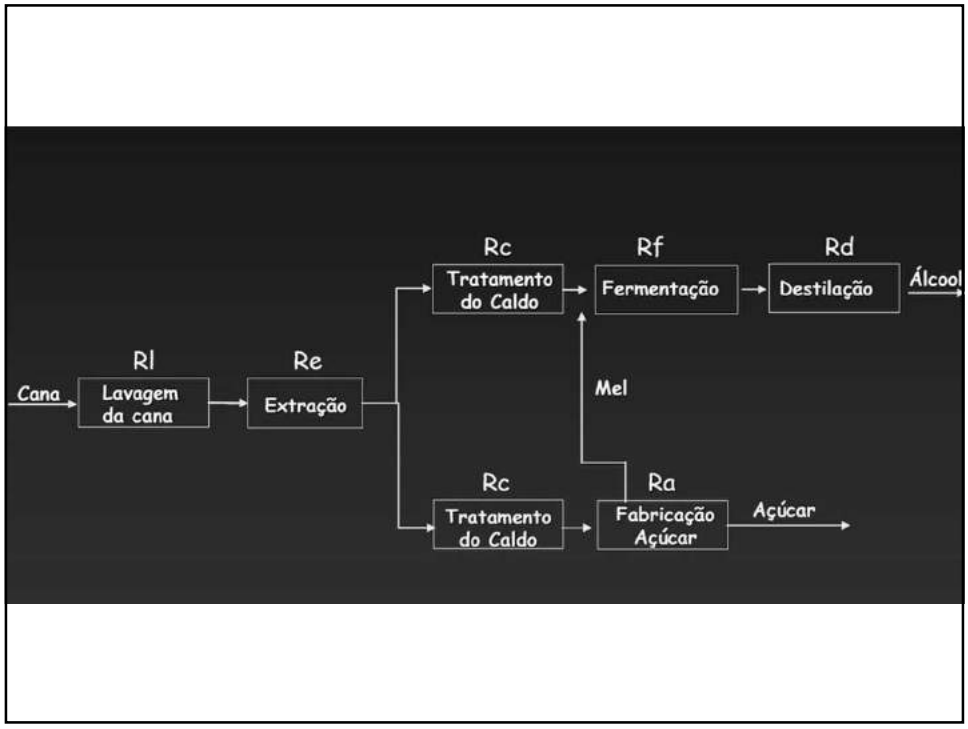


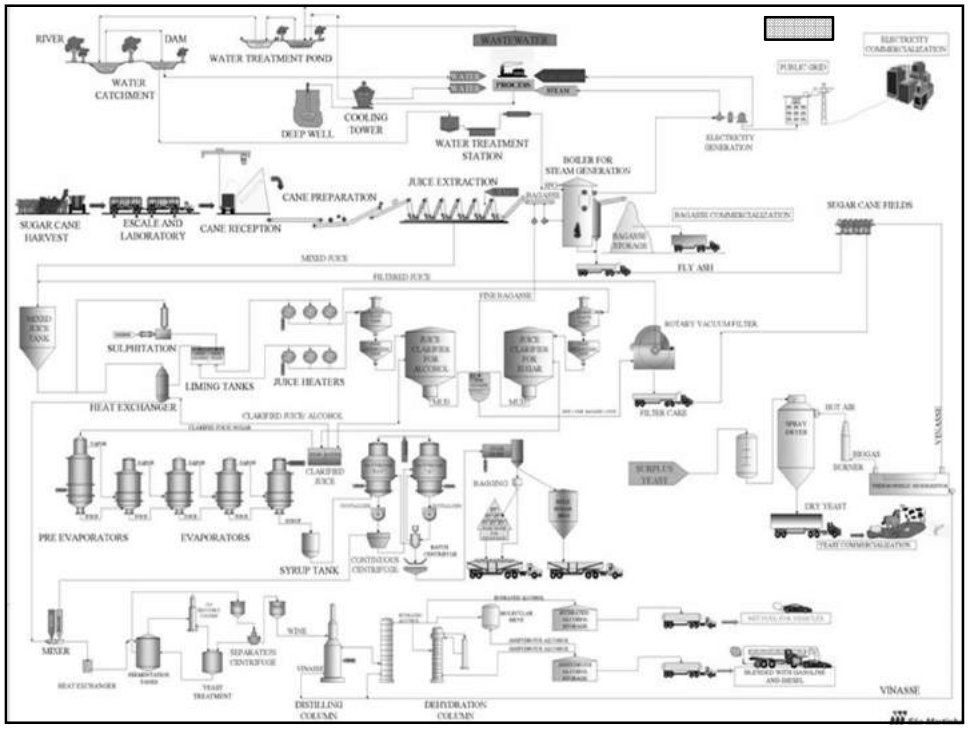
Agro-Industrial Reference Unit – Processing Scales

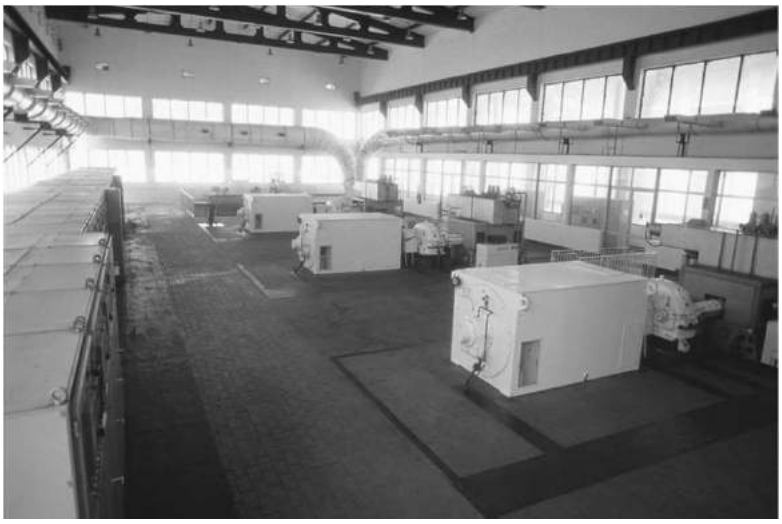
Agricultural production + Logistics + Industrial Processing

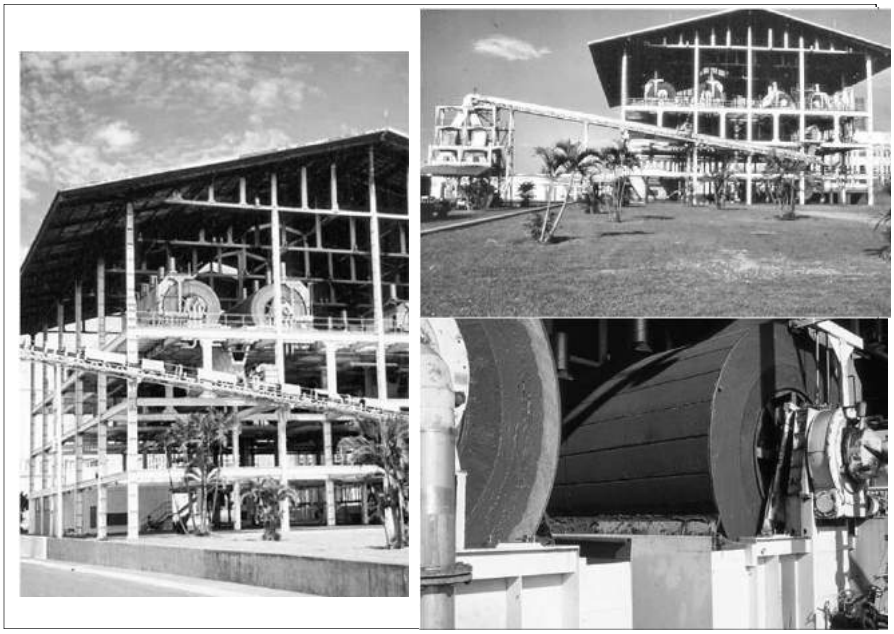


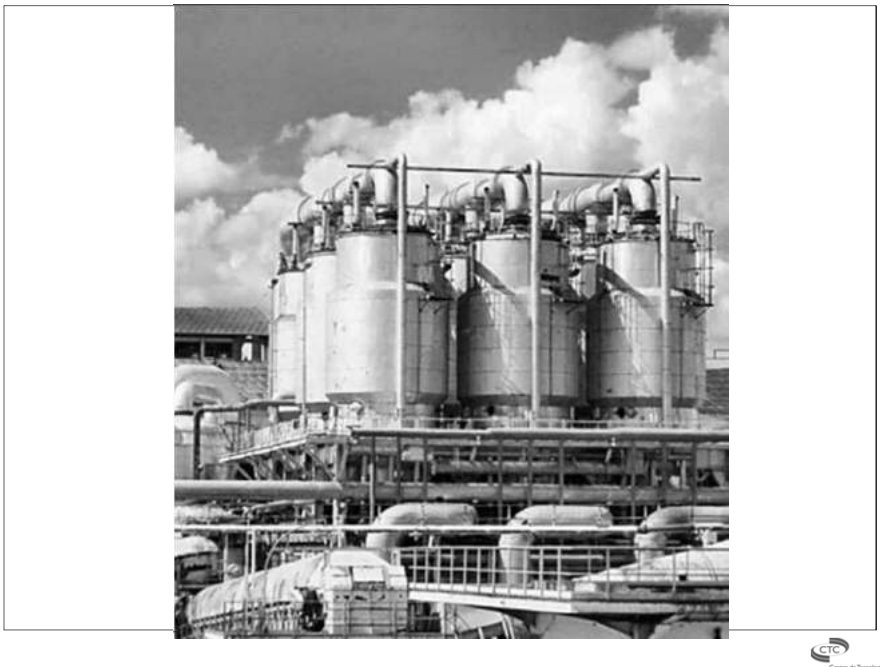


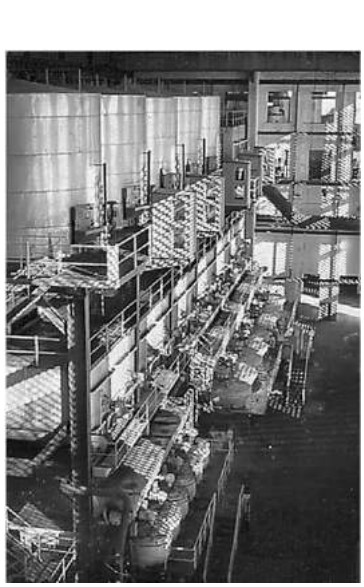

Rc
Rf
Rd
Tratamento do Caldo
Fermentação
Destilação
Álcool
Rl
Re
Cana
Lavagem da cana
Extração
Mel
Rc
Ra
Tratamento do Caldo
Fabricação Açúcar
Açúcar

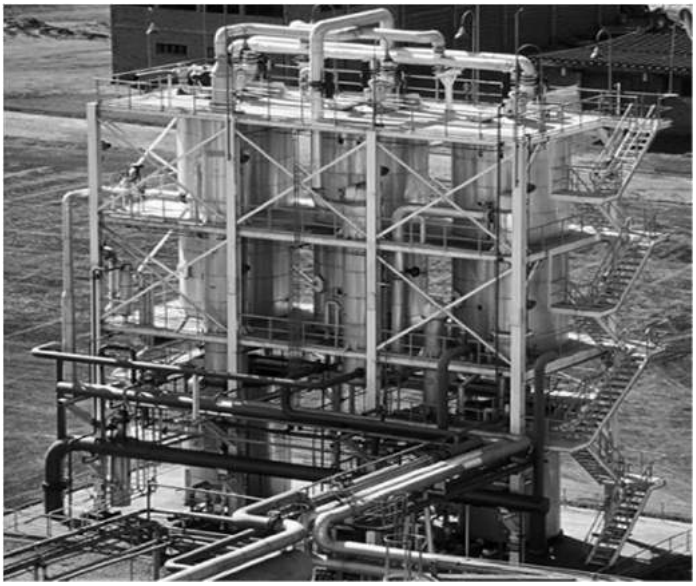

RIVER
DAM
WATER CATCHMENT
WATER TREATMENT POND
WASTE WATER
DEEP WELL
COOLING TOWER
WATER TREATMENT STATION
ELECTRICITY GENERATION
ELECTRICITY COMMERCIALIZATION
BOILER FOR STEAM GENERATION
SUGAR CANE HARVEST
ESCALE AND LABORATORY
CANE RECEPTION
CANE PREPARATION
JUICE EXTRACTION
BAGASSE COMMERCIALIZATION
SUGAR CANE FIELDS
FLY ASH
MIXED JUICE
FILTERED JUICE
FINE BAGASSE
SULPHITATION
LIMING TANKS
JUICE HEATERS
HEAT EXCHANGER
ROTARY VACUUM FILTER
FILTER CAKE
CLARIFIED JUICE/ ALCOHOL
CLARIFIED JUICE
PRE EVAPORATORS
EVAPORATORS
SYRUP TANK
RAISING
SURPLUS YEAST
HOT AIR
BIOGAS BURNER
VINASSE
DRY YEAST
MIXER
SEPARATION CENTRIFUGE
YEAST TREATMENT
WINE
DISTILLING COLUMN
DEHYDRATION COLUMN
VINASSE



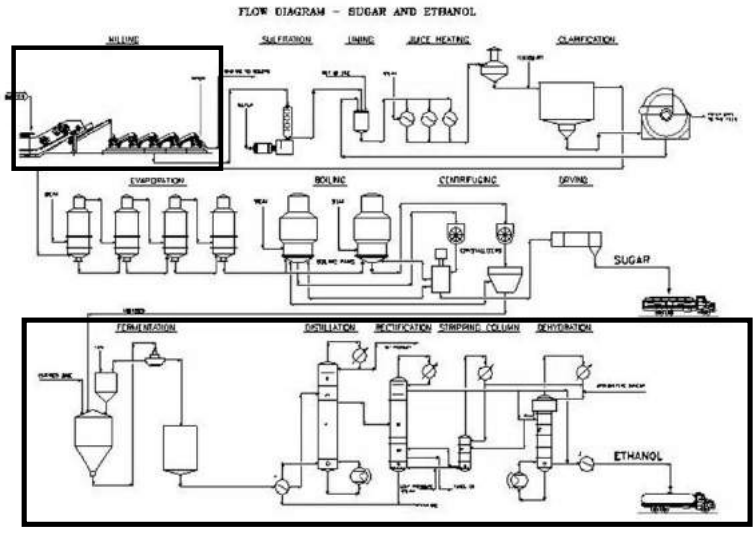






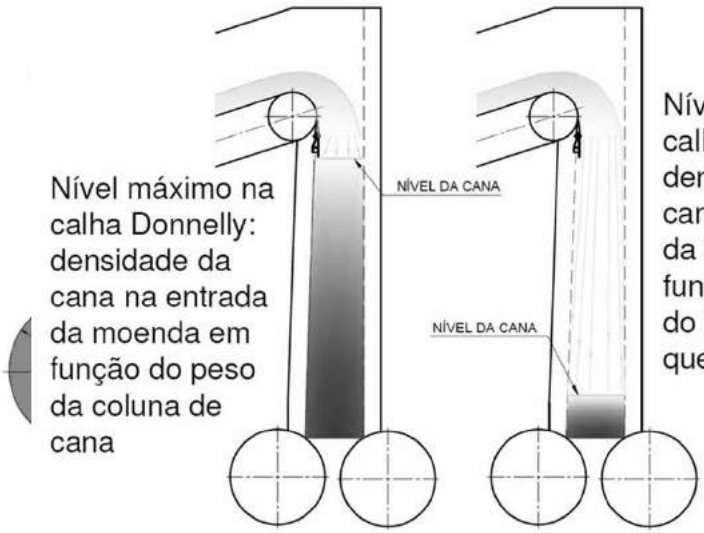


SUGAR CANE PROCESSING



EVOLUTION OF MILLING

Nível máximo na calha Donnelly: densidade da cana na entrada da moenda em função do peso da coluna de cana

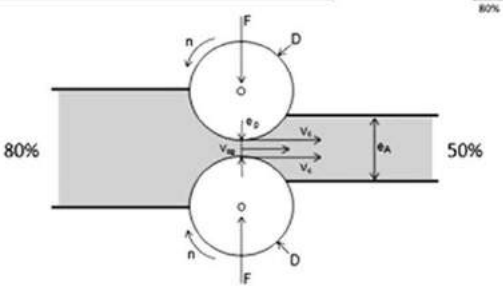


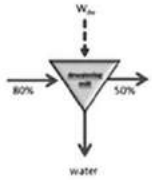
Nível baixo na calha Donnelly: densidade da cana na entrada da moenda em função energia do impacto da queda da cana

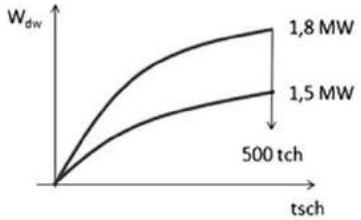
Paulo Delfini STAB 2013

EVOLUTION OF MILLING

Dewatering mills







$$W_{dw} = \frac{nD}{\eta_{gear}}\left(\left[0.5\frac{6r-5}{\sqrt{r}(1+\sqrt{r-1})}\sqrt{\frac{\phi_A}{D}}+0.04\right]F+L\right)$$

$$W_{pt} = K \cdot m_{bg}^{1+a}$$