EGEDA
under EWG-APEC

APEC
Asia-Pacific
Economic Cooperation

IRENA
International Renewable Energy Agency

6. Estimating bagasse consumption

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What is “bagasse”

- ***Bagasse*** is the fuel obtained from the fibre which remains after juice extraction in sugar cane processing.

Source: https://images.app.goo.gl/pu3od3X1DzcHQyPL6

It is expected that if an economy produced sugar from sugar cane, it consumed bagasse.

Purpose of the presentation and exercise

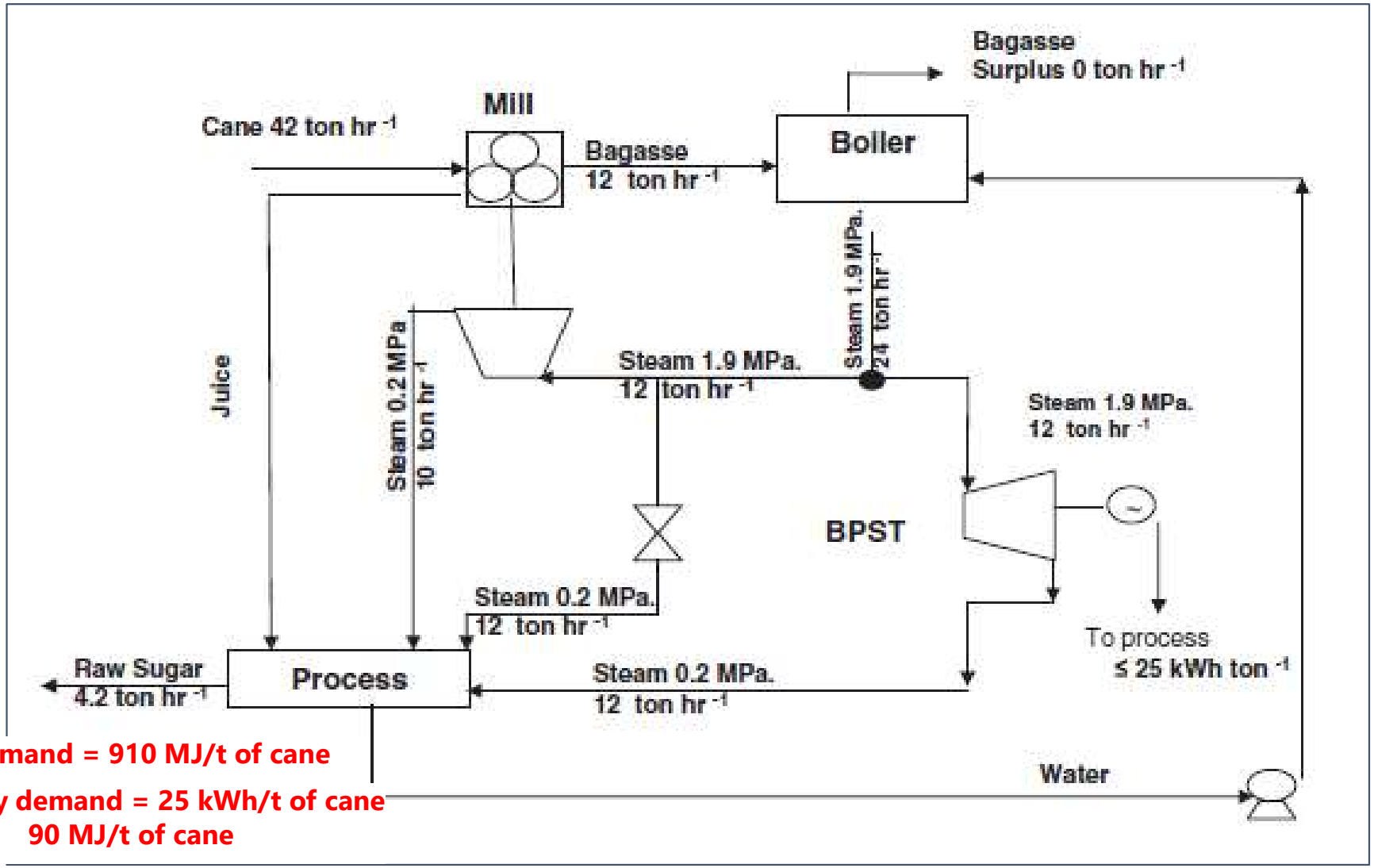
- To provide an estimation methodology for economies that are not able to report bagasse consumption
  - A simple methodology that is based on simplest technology – very low technological development (VLTD)
  - All the bagasse are assumed to be consumed in the sugar mill for both electricity and steam requirements

Cane sugar production process

- Sugar cane is crushed to get the juice or unrefined sugar water
  - Bagasse (the remains of the cane stalks) is produced in the process (30% of the mass of sugar cane)
- The unrefined sugar water is clarified through a chemical process to get the clean sugar water
- Filtration and evaporation reduce the clean sugar water to sugar crystals (raw sugar) and molasses
- Raw sugar (not fit for consumption) is then filtered and dried repeatedly until it becomes food-grade sugar

Source: https://ww.leaf.tv/articles/how-to-make-sugar-from-sugar-cane/

Energy flow in sugar production



Steam demand = 910 MJ/t of cane

Electricity demand = 25 kWh/t of cane
90 MJ/t of cane

Source: Pippo, W A, and Luengo, C A, 2013, Sugarcane energy use: accounting of feedstock energy considering current agro-industrial trends and their feasibility, International Journal of Energy and Environmental Engineering, Vol 4:10.

Energy use in VLTD sugar production

- Electricity
  - 25 kWh per ton of sugar cane = 90 MJ
- Steam for crushing and heat
  - 910 MJ per ton of sugar cane
- Total energy
  - 1000 MJ per ton of sugar cane
  - 9% electricity and 91% steam

Sugar production in APEC economies

Economy	Sugar cane (in tonnes)
	Production
Australia	33,506,830
China	108,097,100
Indonesia	21,744,000
Japan*	1,217,298
Malaysia*	29,433
Mexico	56,841,523
Papua New Guinea*	237,455
Peru	10,336,178
Philippines	24,730,820
Chinese Taipei	621,871
Thailand*	104,360,867
United States	31,335,984
Viet Nam	17,945,204

Note: Based on FAO imputation methodology
Source: Food and Agriculture Organization Statistics (FAOSTAT);

BD, CDA, CHL, HKC, ROK, NZ, RUS and SGP do not produce sugar cane

Exercise – Estimating bagasse in Mexico

	Sugar cane	Bagasse		Electricity	
	Tonnes	Tonnes	TJ	MWh	TJ
Production					
Imports					
Exports					
Stock changes					
International bunkers					
Domestic supply	**0**	**0**	**0**		
Transfers					
Statistical differences		0	0		
Power plants					
CHP plants					
Commercial heat plants					
Charcoal production					
Biomass pellet and briquette production					
Other transformation					
Energy sector and own use					
Distribution losses					
Total final consumption		**0**	**0**		
Industry sector					
Transport sector					
Commercial and public services					
Residential					
Other					
Net calorific value (MJ/t)		7,720			

Exercise – Estimating bagasse in Mexico

	Sugar cane	Bagasse		Electricity	
	Tonnes	Tonnes	TJ	MWh	TJ
Production	56,841,523	17,052,457	131,645		
Imports					
Exports					
Stock changes					
International bunkers					
Domestic supply	**56,841,523**	**17,052,457**	**131,645**		
Transfers					
Statistical differences		0	0		
Power plants					
CHP plants		1,534,721	11,848	1,421,038	5,116
Commercial heat plants					
Charcoal production					
Biomass pellet and briquette production					
Other transformation					
Energy sector and own use					
Distribution losses					
Total final consumption		**15,517,736**	**119,797**		
Industry sector		15,517,736	119,797		
Transport sector					
Commercial and public services					
Residential					
Other					
Net calorific value (MJ/t)		7,720			

Answer sheet

Supply and consumption 2017		Bagasse Tonnes
Production	(+)	
Imports	(+)	
Exports	(-)	
Stock changes	(+)	
International Bunkers	(-)	
Domestic supply	(=)	
Transfers		
Statistical Differences		
Power plants		
CHP plants		
Commercial heat plants		
Charcoal production		
Biomass pellet and briquette production		
Other transformation		
Energy sector and own use		
Distribution losses		
Total final consumption		
Industry sector		
Transport sector		
of which road transport		
Commercial and public services		
Residential		
of which traditional uses		
Other		
Net calorific value (MJ/t)		7,720

Electricity Production (in MWh)

Completed answer sheet

Supply and consumption 2017		Bagasse Tonnes	
Production	(+)	17,052,457	(131,645 TJ)
Imports	(+)		
Exports	(-)		
Stock changes	(+)		
International Bunkers	(-)		
Domestic supply	(=)	**17,052,457**	
Transfers			
Statistical Differences			
Power plants			
CHP plants		1,534,721	(11,848 TJ)
Commercial heat plants			
Charcoal production			
Biomass pellet and briquette production			
Other transformation			
Energy sector and own use			
Distribution losses			
Total final consumption		**15,517,736**	
Industry sector		15,517,736	(119,797 TJ)
Transport sector			
of which road transport			
Commercial and public services			
Residential			
of which traditional uses			
Other			
Net calorific value (MJ/t)		7,720	

Electricity Production (in MWh)	
1,421,038	(5116 TJ)

Hands-on Exercise

https://www.egeda.ewg.apec.org/
https://irena.org/