

JAGGERY PROCESSING



AATMANIRBHAR BHARAT

**PM Formalisation of Micro Food Processing
Enterprises Scheme (PM FME Scheme)**

INTRODUCTION

- India and China are home of sugarcane
- Gur is an Indian product and its history is as old as 800 BC
- In 647 AD Chinese sent a mission to Magadha to learn the art of sugarcane processing

Common Name: Jaggery

Family: Arecaceae/Palmae

Scientific Name: *Saccharum officinarum* L.



IMPORTANCE

36% population lives below poverty line

Per capita availability of cereals and pulses for majority is 468 gms/day which is less than needed.

43% children and 51.8% married women suffer from anemia

Energy rich food having huge demand and it is ecofriendly nutritive sweetner

MARKET POTENTIAL

By 2020 country will require 54 million ton sweetener Jaggery is expected to provide 35% of it

Consumption Pattern

1960-61

15.2 kg/person/year

2014-15

11 kg/person/year



RELATIVE SWEETNESS SCALE



Compound	Rating
Sucrose	100
Fructose	140
High fructose corn syrup	120-160
Glucose	70-80
Galactose	35
Maltose	30-50
Lactose	20

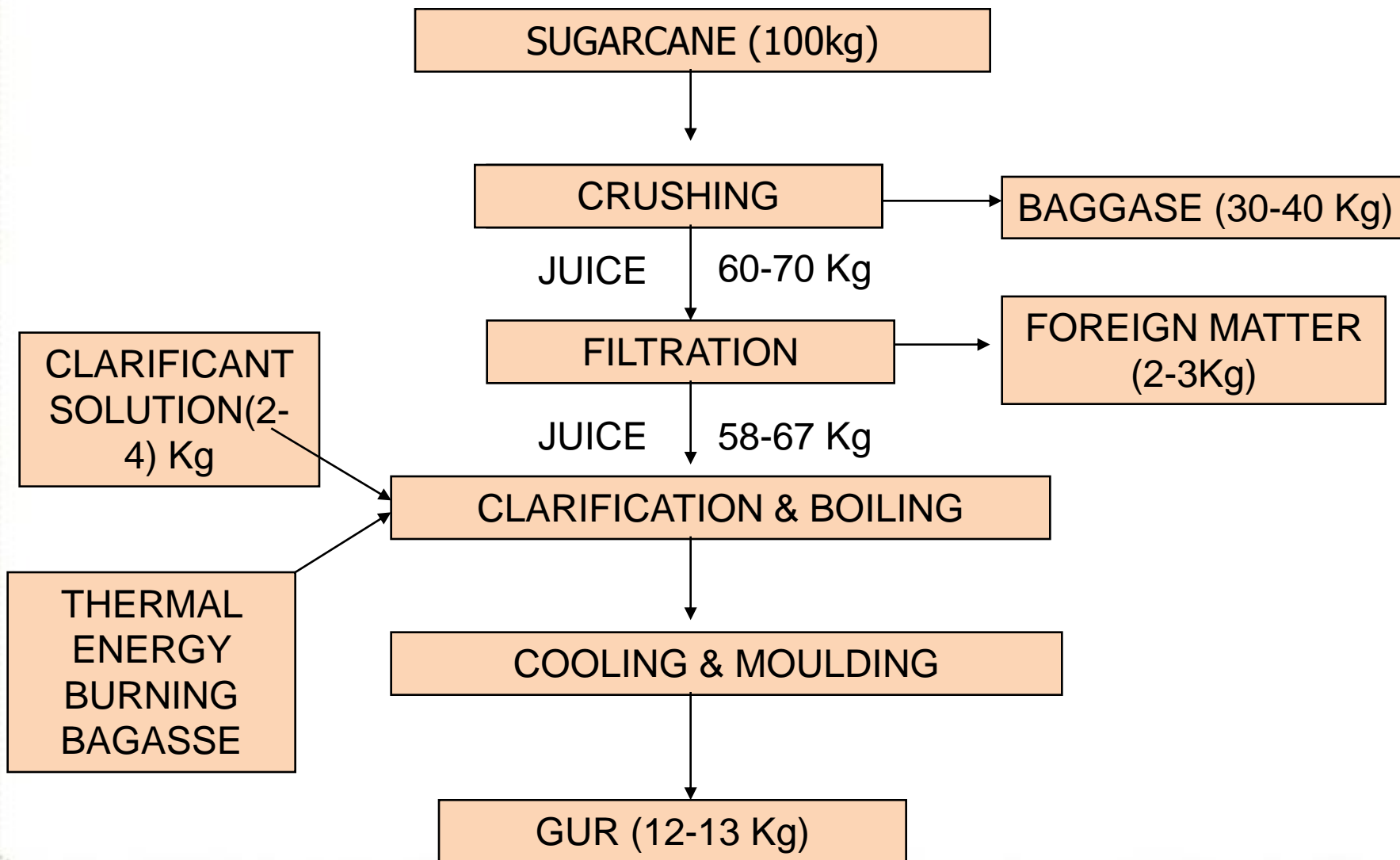


Proximate composition of sugar and jaggery (per 100 gm)

Constituent	Sugar	Jaggery
Sucrose, g	99.5	60-85
Reducing sugar, g	-	5 - 15
Protein, g	-	0.4
Fat, g	-	0.1
Calcium, mg	-	8.0
Iron, mg	-	11.4
Phosphorus,mg	-	4.0
Total minreals,g	0.05	0.6 – 1.0
Moisture, g	0.2 – 0.5	5-10
Energy, kcal	398	312 - 383

Gur also has 168mg carotene, 0.02 mg thiamine, 0.05mg riboflavin, 0.05 mg vitamin c

JAGGERY PROCESSING



SUGARCANE

Composition

Millable cane	%
Water	73-76
Solids	24-27
Soluble solids	10-16
Fibre	11-16





Harvesting

- ❑ Sugarcane harvest – brix more than 21 per cent
- ❑ Sugarcane should be cut very close to the ground
- ❑ Remove 2 –3 immature internodes along with top portion
- ❑ Cane should be detashed
- ❑ Soil adhering to the cane removed



Sugarcane management

Matured and Clean cane



CRUSHING



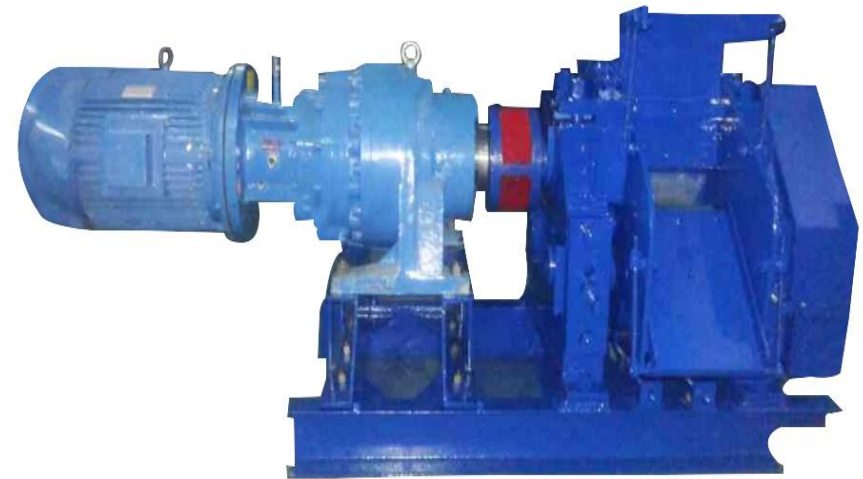
Bullock Driven (Now absolute)



Juice recovery

50%

CRUSHERS



Power Operated Crushers

Juice recovery 60-70%

Horizontal roller crusher 2 - 4 %

better recovery

Capacity 2-3 qtls /hr – 10 qtls /hr

Power needed 5 hp - 16 hp

CRUSHERS

Factor affecting extraction of juice

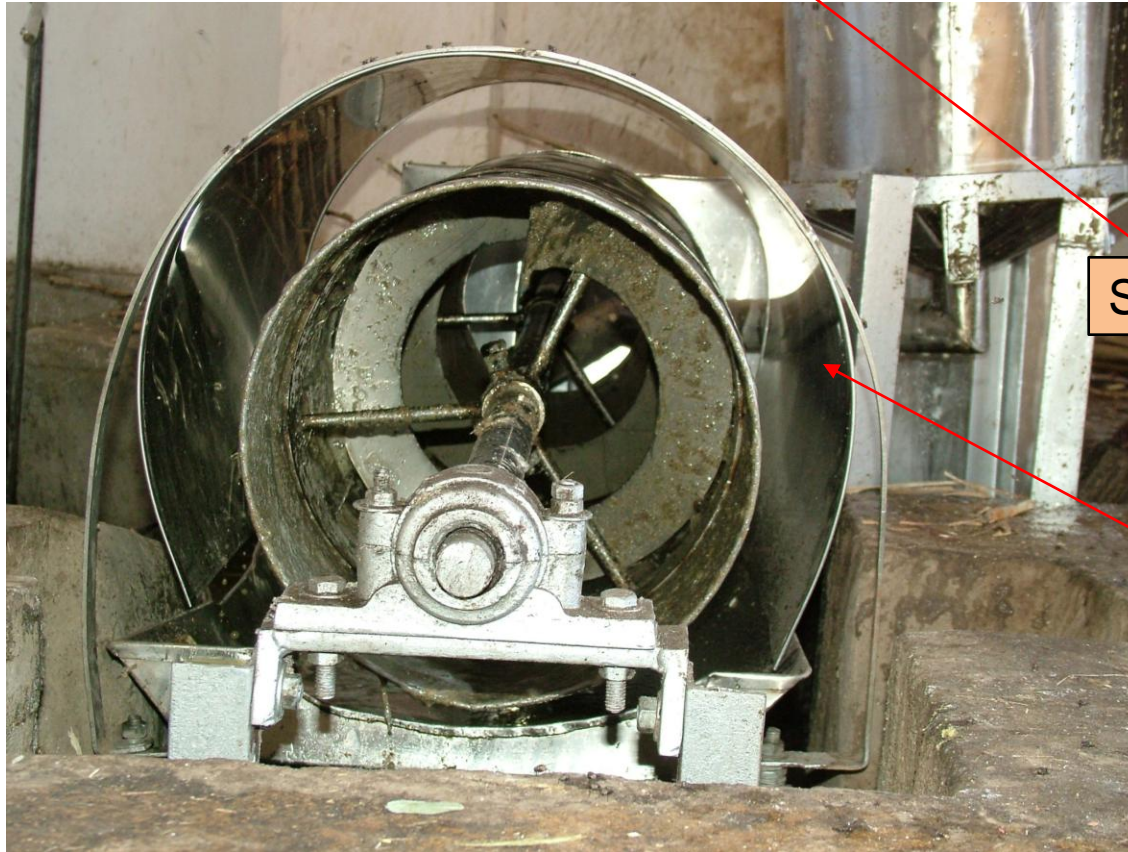
- **Gap between rollers (6mm, crushing – 1mm extracting)**
- **Size and speed of rollers**
- **Orientation of rollers**
- **Grooves on rollers(grip, preparation and juice drainage)**
- **Bearing and bushes**



Filtration to remove coarse impurities like straw etc and sediments after allowing juice to remain in trough for some time

MECHANICAL ROTARY FILTER : SIDE VIEW

Primary filter



SS Screen cylinder

Spirals

CLARIFICATION

Purpose

- **Minimize acid inversion (control Ph)**
- **Eliminate inorganic salt**
- **Eliminate colloidal substances to improve colour and luster**
- **Remove colouring substances chlorophyll etc.**

PARTIAL ELIMINATION OF RAW CANE JUICE

Raw cane juice can be improved by partial elimination of the following:

1. Hydrogen ion concentration –To minimize sucrose inversion
2. Inorganic salts – Dissolved inorganic salts are responsible for viscosity.
3. Colloidal substances- Substances in colloidal state whose presence render it difficult to filter the juice and elimination of colloidal impurities improves the colour and lustre of jaggery.
4. Coarse particle in suspension.
5. Colouring substances present in the juice like chlorophyll, carotenes, anthocyanin and saccharetin ETC

CLARIFICATION USING WILD OKRA



Root and Stem are used for clarification

Wild Okra (Deola)

Among all vegetative clarificants Deola (wild okra) solution is best at Juice pH of 6.0



40-50g of stem is needed per 100kg of Sugarcane juice

CLARIFICATION USING WILD OKRA

- **Add 100 - 125 ml of 10% lime solution per qtl of juice to raise pH of juice from 5.6 to 6.8.**
 - **This will check acid inversion.**
 - **But add phosphoric acid to lower pH to 6.0 before boiling**
-
- **Add Sodium hydro sulphite 3.5 gm/qtl (35ppm SO₂) or Sodium bicarbonate 5- 8gm /qtl**
 - **Bleach colour, brighten colour temporarily**

CONCENTRATION

- The juice is boiled till it reaches striking point temperature. ($115^{\circ}\text{C} - 118^{\circ}\text{C}$)
- Churning is done for uniform heating hence better product quality





COOLING MOULDING AND PACKAGING



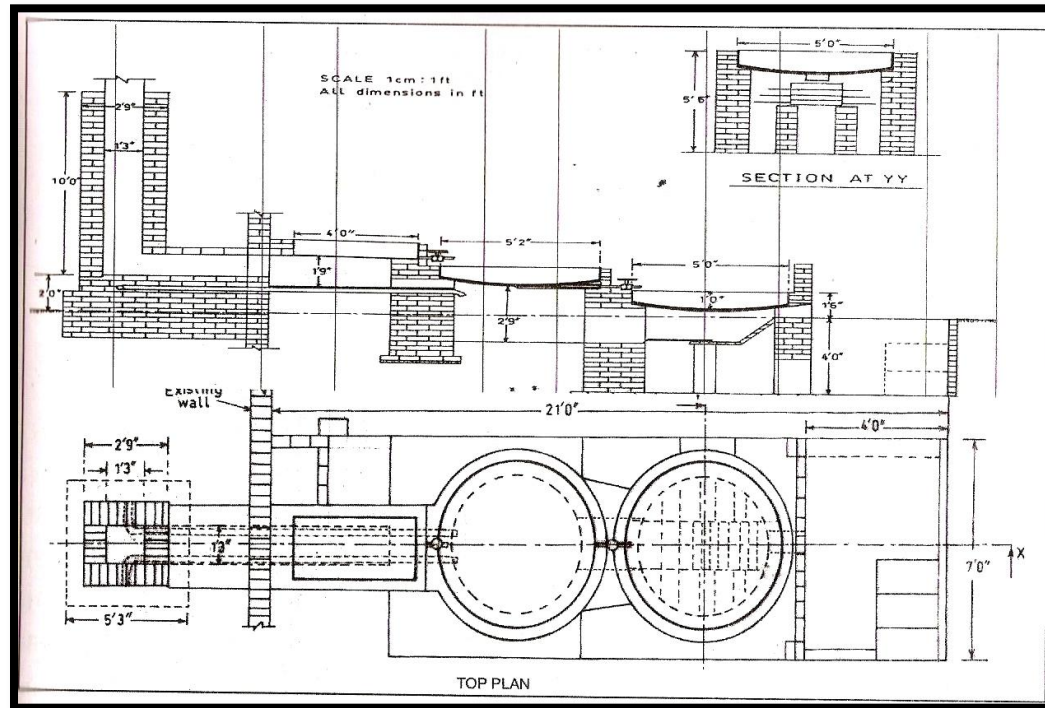
USING BRIX METER FOR ESTIMATING THE TSS OF FRESH JUICE



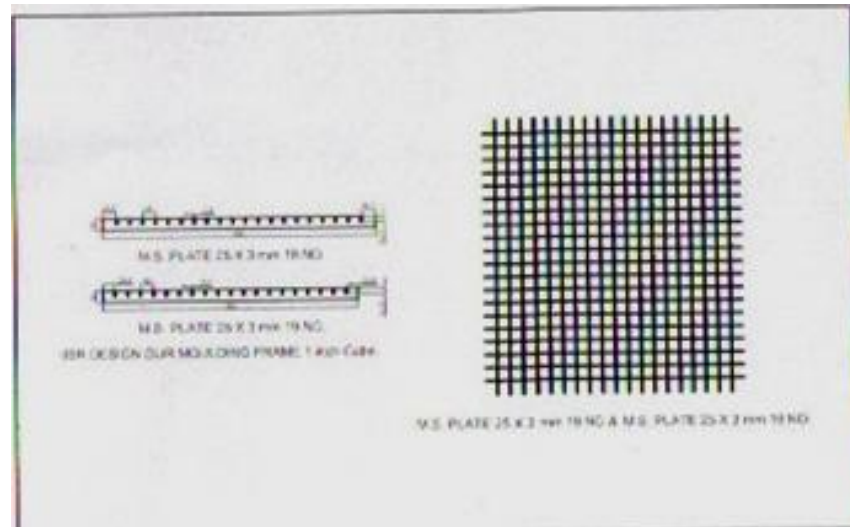
MEASUREMENT OF PH OF FRESH CANE JUICE



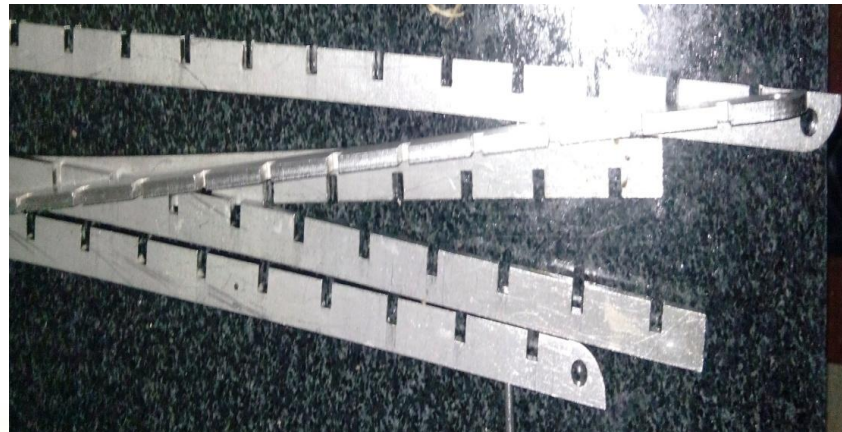
DRAWING OF THREE PAN BOILING SYSTEM AT IISR, LUCKNOW



DESIGN OF MOULDING FRAME



Slotted flats of and slotted flats of is used to make on set for production of kg of cube jaggery.





1"x1"x1" cube weigh 20-22 gms

Bulk density 0.625g/cc
True density 1.460g/cc

Capacity (7kg – 15) kg /batch



सत्यमेव जयते





NUTRITIONAL INFORMATION OF LOLLIPOP

Energy : 1.1 gram

Carbohydrate : 9 gram

Fibre : 0.4 gram

Fat : 2.6 gram



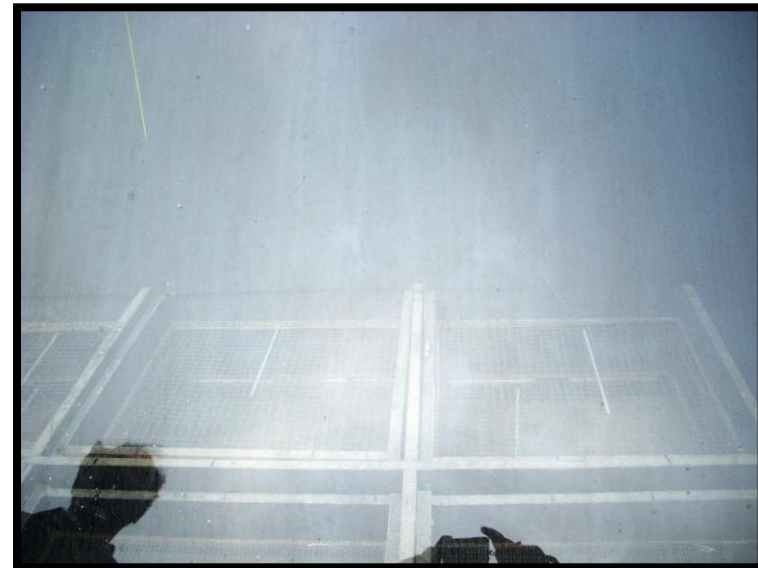
MACHINERY

Solar Drier

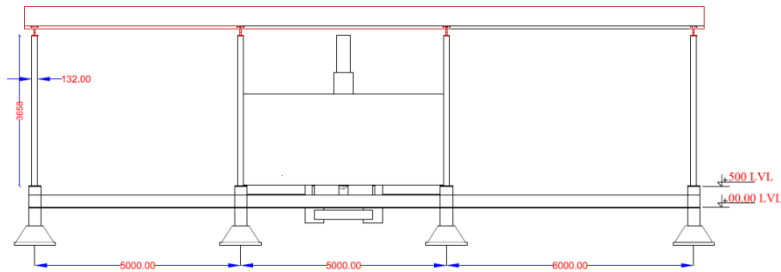


- Capacity 100 kg/batch, Drying temp. 45°C, Drying time: 6 hrs/ batch
- Jaggery moisture at production (13-15) %
- For safe storage moisture (5-7)%
- 1/3 to 1/2 of total production is stored for consumption after rainy season
- 10 % loss during storage costs Rs 800 million/year

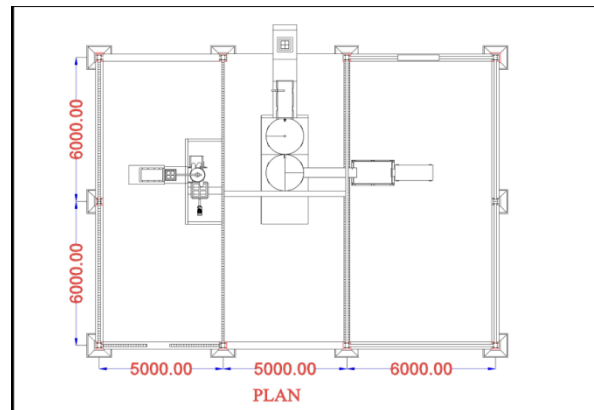
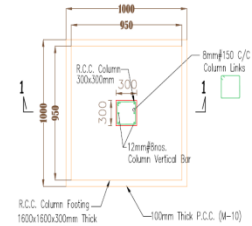
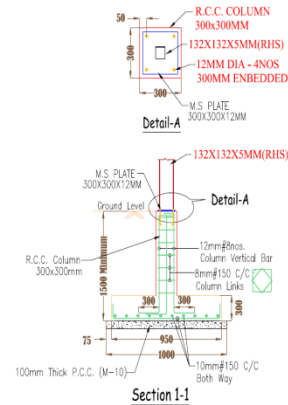
SOLAR DRIER



LAYOUT OF JAGGERY SHED



ELEVATION



PLAN

Total land requirement is around 500 sq.m
Jaggery shed of 100 sq.m

PLANT AND MACHINERY

S.No	Particular	Qty.
1.	Cane Crusher 10 q/h gear type Operated by 10-15 HP Motor	01
2.	Storage tanks (SS)	03
3.	1.5 Meters diameter MS/SS Pans with 4 handles	02
4.	Gutter pan	01
5.	Laboratory Equipments (brix meter, pH meter, temperature sensor)	01 set
6.	Cooling tank (Chak)	01
7.	Jaggery Tools (Ladle, Strainer, Strainer – Micro mesh ,moulding platform, Scoop, Khurpi, Buckets, sealing machine etc.	02 set
8.	Moulding frame(SS) set	08
9.	Moulding frame Platform	02
10.	Furnace	01
11.	Blender	01
12.	Band sealer	01
13.	Accessories(pump. Pipe, fittings etc.)	



Plant running season	October to April (200 days)
Jaggery production in season	100 tons

Manpower Requirements	4-5
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Budget requirement	Approx 15 lakhs
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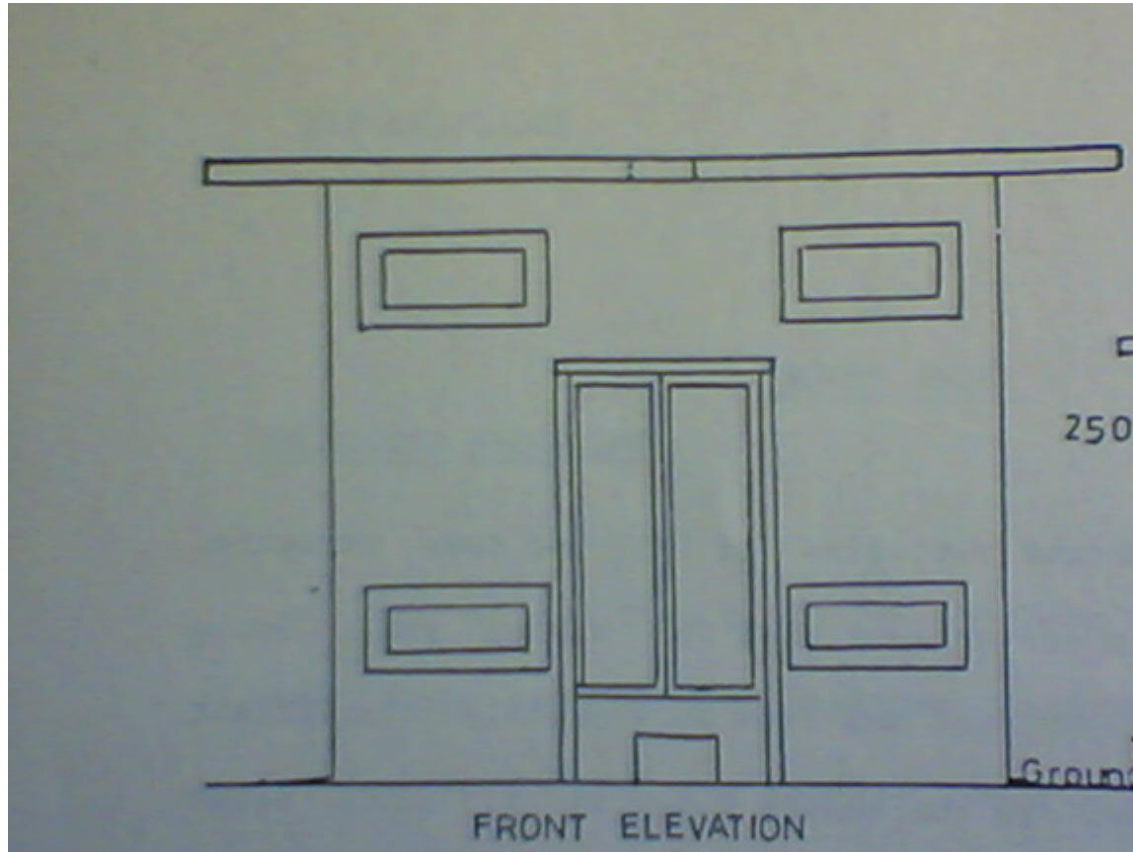
CANE JAGGERY SPECIFICATIONS (IS 12923:1990)

Characteristics	Unit	Grade I	Grade II
Sucrose	%(db), min	80	70
Reducing sugar	% (db), max	10	20
Moisture	%(db), max	5	7
Water insoluble matter	%(db), max	1.5	2.0
Sulphated ash	%(db), max	3.5	5.0
Sulphur dioxide	ppm (db), max	50	50
Ash insoluble in dilute HCl	%(db), max	0.3	0.3
Total sugar as invert sugar	%(db)	90	90



Gur storage bin
Capacity: 1qtl

IISR GUR DRYING-CUM-STORAGE GODOWN (CAPACITY 6T)



Front Elevation

ECONOMICS

Capacity of plant	110 qtls/day
Jaggery production	13.2 Qtls/day
Working period	125 days
Total investments (Machinery & working) (excluding land)	Rs 10 lakhs
Land area needed	400sq m
Covered area	9mX6m
Payback period	4 years

MARKET AND EXPORT POTENTIAL

- Jaggery is majorly used in the food processing industry for confectionery items, toffees, chocolates, chewing gums etc.
- Despite facing a fluctuating trend in jaggery imports globally, the jaggery market is expected to grow at the rate of 6% by the end of 2023.



- India accounts for more than 60% of world jaggery production, but Brazil is the major exporter of gur.
- In India conventional methods are used for jaggery production as most of its manufacturing units are located in rural areas and making these units organized by giving more importance to branding and packaging will provide more export possibilities.



PM Formalisation of Micro Food Processing Enterprises Scheme (PM FME Scheme)



For More details Contact:

National Institute of Food Technology and Entrepreneurship and Management
Ministry of Food Processing Industries
Plot No. 97, Sector-56, HSIIDC, Industrial Estate, Kundli, Sonipat, Haryana-131028

Website: <http://www.niftem.ac.in>

Email: pmfmecell@niftem.ac.in

Call: 0130-2281089

THANKYOU