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Solutions to Problems Faced by Sugarcane Growers in the State of Karnataka – A Feasibility Study

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Abstract

Purpose: Sugar industry is one of the agricultural based industries in Karnataka. In India, Karnataka has now emerged as the third biggest sugar producing state after Maharashtra and Uttar Pradesh. Sugarcane is growing in 5.20 Lakh hectares of land and nearly 410 Lakh tonnes of sugarcane is growing yearly in Karnataka. 85% of sugarcane is utilizing for sugar production and 15% to that of cane seed and Bella (jaggery). But all is not well for sugar cane growing farmers. In the state, the sugar industries are of large capacity, which are owned by private, public and cooperative societies. But some of these industries are facing various problems and not running continuously. If the industries do not buy the sugarcane, farmers are under utter loss. On the other side the industries which buy the sugarcane do not pay the cash on time. This is a serious agrarian crisis which is shaped by an increase in cultivation costs and a decline in agricultural income, which is pushing farmers into a debt trap. So the sugarcane growers are facing problems and not getting sufficient return from sugar industries on time. Hence the farmers are committing suicides every day.

What is the solution?

• Miniaturization of sugar industries: This will help group of small farmers to setup a small scale sugar industry themselves near their sugarcane fields. They need not to depend on anybody to sell their sugarcane.

• Government to stop import of sugar

• To encourage public to use more jaggery Mechanization of jaggery plants

• License to farmers to produce alcohol from molasses

•To encourage all sugar industries to have co-generation plants

Design/Methodology: Studied the various processes in an existing large scale sugar industry with all machineries. Feasibility report has been prepared in miniaturization of sugar industry. Processes in jaggery production also have been studied. **Findings**: It is possible to have miniaturization of sugar industry. In jaggery plants mechanization is required to improve purity/quality of jaggery. **Practical Implications:** Government policy must be changed. Farmers should be motivated to change their mindset to encompass non dependency.

Keywords: Farmers Growing Sugarcane, Karnataka, Miniaturization of Sugar Industries, TCD

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1. Introduction

Brazil produces about one-third of the world's sugarcane. India takes second position in growing sugarcane. In India, Karnataka has now emerged as the third biggest sugar producing state after Maharashtra and Uttar Pradesh. Sugarcane is growing in 5.20 Lakh hectares of land and nearly 410 Lakh tonnes of sugarcane is growing yearly in Karnataka. 85% of sugarcane is utilizing for sugar production and 15% to that of cane seed and Bella (jaggery). The table below shows the glimpse of sugar industries in the state of Karnataka.

1.1 Problem Statement

Most of the sugarcane growers are not getting sufficient income for their investment. Either they have to give their produced crops to large scale sugar plants or to small scale jaggery plants. Most of the large scale sugar plants are under loss due to various reasons and do not buy the sugarcane from the growers. Even the sugarcanes are bought; money is not given to the farmers on time. The next option is to give sugarcanes to jaggery plants. Since their crushing capacity is less, not all the sugarcane produced is used by jaggery plants. But in present international & national market both in rural & urban areas, people like sugar than that of jaggery. Hence mini sugar plants can be the solution for sugarcane growers..

1.2 Objective

Most of the sugarcane growers in the state of Karnataka are facing serious problems such as not getting sufficient and timely returns (money) for their crop from the sugar industries; this makes them to lose their confidence and leads to suicide. In order to find solution, the processes both in sugar plants and jaggery plants have been studied. Study on miniaturization of sugar plant has been carried out. Hoping that, the miniaturization would help the formers to set up their own small scale sugar industry, which facilitate the formers to have self dependency. In addition, the state of existing jaggery plants in and around Mandya (one of the most sugarcane growing districts in Karnataka) has also been studied to motivate the farmers to mechanize the plants.

Table 1. Glimpse of sugar industries in the state of Karnataka

Sl. No.	Sector	Working sugar factories	Non working sugar factories	Total
1	Public	2	1	2
2	Joint	0	1	1
3	Co-operative	22	2	24
4	Private	35	4	39
	Total	**59**	**7**	**66**

2. Feasibility Study on Miniaturization of Sugar Plant

This study has been carried out in two phases. Firstly feasibility study on converting an existing jaggery plant into mini sugar industry with 10 TCD (tonnes of sugarcane crushed per day) capacity. Secondly, feasibility study on sugar plant with 150 TCD capacity.

2.1 Feasibility Study on Converting Jaggery Plant into Mini Sugar Industry with 10TCD Capacity

In the process of study, several jaggery plants have been visited to checkout whether the existing jaggery plant can be converted into a mini sugar plant. In all the jaggery plants visited in & around **Srirangapatna** (Mandya district, Karnataka) it is found that the average sugarcane crushed per day varies from 7 tonnes to 13 tonnes, hence it was decided to check feasibility of mini sugar plant in a jaggery plant of 10 tonnes capacity. The visited jaggery plants follow old technology & methods for jaggery production. Only the crushers from the jaggery plants can be used in mini sugar industry. So, the other components required to setup a sugar industry are needed. But for this small capacity, investing huge amount is a risk. As the capacity is less the output of the plant will also be less. Hence from this study we came to the conclusion that investing huge amount & not getting sufficient returns is not a good option. So this is not feasible. Hence we thought of increasing to 150TCD.

2.2 Feasibility Study on Sugar Plant with 150 TCD Capacity

Setting up a sugar plant in a jaggery plant is not economically viable; hence feasibility of mini sugar plant of 150 TCD capacity has been checked. This study checks out the possibility of sugar plant of 150 TCD capacity, so that a group of sugarcane growers can join together & setup their own sugar industry. In this work, the capacity of a large scale sugar plant has been scaled down. The details are as follows:

2.2.1 Details of the Components Required for the Mini Sugar Plant of 150 TCD Capacity

2.2.1.1Boiling House

The main function of the boiling house is clarification of juice. Clarification is a process where the raw juice which consists of unwanted & foreign particles from the sugarcane juice as wax & other impurities are removed & the juice extracted from this process is called clear juice.

Boiling house consists of:

1. Crusher, 2. Juice heater, 3. Plate type heat exchanger, 4. Sulphated juice heater, 5. Clear juice heater, 6. Settlers and 7. Filters

Description /Specification of Sugar Cane Crushers

Due to standardization, the parts are interchangeable. The castings of the rolls are close grained which resists wear for a longer life. It is of high rigid construction and robust design. It gives of service due to its high grade material. It is simple in construction, very light

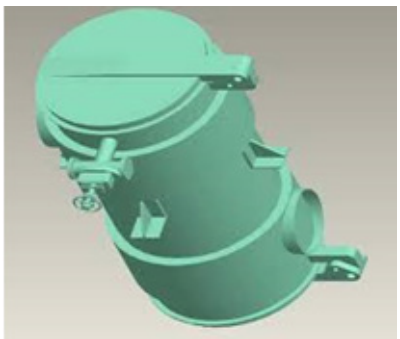
on bullocks and easy to manipulate. The capacity is 150 TCD. The cost is approximately Rs. 15.00 Lakh.

Juice Heater

The juice extracted from the mill is collected directly in a container, container area is calculated as shown below:

Shell Internal Diameter	354mm
Number of Heaters	1
Shell Thickness	4.5mm
Calandria Height	3191mm
Tube Outside Diameter	32mm
Tube Wall Thickness	1mm
Tube Hole Triangular Pitch	45.2mm

Required heating surface is equal to =Q*Cj*2.303log (t-ti/t-to) ; Where Cj = Heat transfer co-efficient = 0.9w/m^2 ^{o}c, Q=Quantity of juice in m^3/hr, t=bagasse temperature in ^{o}c, i=juice entry temperature in ^{o} c, to =juice outlet temperature in ^{o}c



In this the mixed juice is heated in a vertical tubular container up to 60-65 ^{o} C

The juice enters at 30 ^{o} C & leaves the container at 654 ^{o} C in between this process the bagasse is burnt to produce temperature up to 120 ^{o} C so as to get juice at required temperature.

Required heating surface = $Q*C_j*2.303\log (t-t_i/t-t_o) = 4.71*.9*2.303\log [(120-30)/(120-70)] = 2.645m^2$

Juice heater is made up of stainless steel of grade 14 & the estimated cost is around 1.65 Lakh.

Sulphated Juice Heater

From raw juice heater which is heated is transferred to sulphation vessel here the juice is treated with SO_2(sulphur di oxide gas) for further purification process, where th pH of the juice is maintained at 7 to 7.2 this treated juice is further is heated to 100^{0}C to 105^{0}C.

Required heating surface= $Q*C_j*2.303\log (t-t_i/t-t_o) = 5.267m^2$

The sulphated juice heater is made up of high quality stainless steel & the estimated cost is around 1.35 Lakh.

Clear Juice Heater

In clear juice heater the juice extracted after the sulphation process is sent to continuous clarifier for settling. During this the juice is left for the 1.5 hours for the settling of mud at the bottom of the clarifier.

Required heating surface are $= Q* C_j*2.303\log [(t-t_i)/(t(-t_o)] = 4.124m^2$

The clear juice heater is made up of mild steel & the estimated cost will be around 1.65 Lakh.

Settlers & Filters

The juice from the clarifiers is sent through a series of filtering mesh which are made up of aluminum and steel alloys. The settlers are tubular in shape & are made up of mild steel & the estimated cost will be around 4.00 Lakh

Evaporation system

This consists triple effect systems, which consists of 3 boilers are of conventional type. The first boiler is of a 100 m^2 area where the juice is heated for partial evaporation & next sent the 3rd of 50 m^2 is adopted. Last boiler is connected with condenser in which juice is condensed for further process.

Shell thickness	4.5 mm
Calandria Height	3441 mm

In evaporation system the body & the tube are made up of stainless steel & the estimated cost is around 7.00 Lakh.

2.2.1.2 Syrup Treatment

Syrup which condensed in condenser is treated with liquefied sulphur dioxide gas. Treated Syrup is stored in a storage tank

2.2.1.3 Vacuum Pans

From storage tank syrup is transferred to vacuum pans. In vacuum pans syrup is mixed with sugar seeds for the crystallization of the syrup. As soon as vacuum is created the crystallization of the syrup takes place because sugarcane juices naturally have the crystalline structure. Then the mixture is air cooled. Vacuum pan is manufactured from quality raw materials these ensure durability and trouble free operation. The dimensions of vacuum pan required are: pan inside diameter = 1882 mm; number of tubes = 126 mm ; tube diameter = 718 mm; tube length = 622 mm.

The vacuum pan consists of 2 components i.e. body & tube. The body is made up of mild steel & tube is of stainless steel. The estimated cost of the vacuum pans will cost around 6.00 Lakh.

2.2.1.4 Crystallizer

For a mini sugar plant two crystallizers of three 5 tons capacity are required these are open type crystallizer. The crystallizers are made up of mild steel and the estimated cost will be 1.50 Lakh.

2.2.1.5 Centrifugal Separator

From vacuum pans the crystallizer's sugar with molasses is sent to continuous type centrifugal machine with a capacity of 2 tonnes per hour. Here the mixture is rotated in a perforated container. Due to centrifugal action, the crystal sugar comes out of the perforated wall, where as the heavy molasses is left in the container flows down to the collecting tank for further purification process this molasses is further treated and purify for max extraction of sugar and the left over molasses is sent to the distilleries. The centrifugal separator is available in 2 models i.e. is one is of mild steel & the other is made up of stainless steel. The estimated cost will be around 5.00 Lakh.

Table 2. Total estimation of equipments

Equipment	Capacity	Cost (Lakh)
Cane crusher	150 TCD	15.00
Clear juice heater	6.5 Hexa liters	1.65
Juice heater	5 Metric tones	1.65
Sulphated juice heater	6.5 Hexa litres	1.35
Vaccum pans	2 no's of 5 metric tonnes	6.00
Settlers	Tubular construction	4.00
Crystallizers	Two crystallizers of 6 tonnes	1.50
Evaporators	3 m3	7.00
Centrifugal separators	2 No's of continuous type of two tonnes per hour	5.00
Sugar dryers	Multi tray mesh	2.00
Miscellaneous	Conveyors etc.,	4.85
Total		**50.00**

2.2.1.6 Sugar Dryers

The simple multi tray which consists of mesh in order to separate packable and non-packable sugar is provided. Thus packable sugar is weighed and packed and stored.

The sugar dryers are made up of stainless steel & the estimated cost will be 2.00 Lakh.

Thus the total estimated cost of equipments for a 150 TCD mini sugar plant will be around 50 Lakh. This amount could be invested by group of sugarcane growers. They can borrow loans from Government of India, sugar development fund, promoters; capital subsidies can also be obtained. This estimated cost does not include land required to set up the plant. To set up a mini sugar plant the land area required is 2 to 3 acre. Farmers themselves can lend their land to construct sugar industry.

2.3 Advantages of Mini Sugar Plant

- Formers will get more returns for their crops
- It can be easily accessible since the units will be distributed within the districts near the sugarcane fields
- Mini sugar plants also provide employment opportunities to local people
- This also paves way for welfare of the rural area & also economically strengthens the individuals.

2.4 Disadvantage of Mini Sugar Plant

- Requires skilled labor for the processes involved in sugar making

3. Conclusion

Mini sugar industry can be setup near the sugarcane fields.

- The sugarcane field owners can setup a mini sugar industry individually or in a group.
- By setting up mini sugar industry farmers can become self-reliant.
- Farmers can also produces baker for which the process is less complicated. Thus getting more returns.
- Ethanol is generally available as a byproduct of sugar production. It can be used as a biofuel alternative to gasoline, and is widely used in cars in Brazil. It is an alternative to gasoline, and may

become the primary product of sugarcane processing, rather than sugar. One hectare of sugar cane yields 4,000 litres of ethanol per year. Government should take proper steps in this direction.

- Electrical generation from bagasse could become quite important, particularly to the rural populations of sugarcane producing nations. Bagasse is usually burned to produce steam, which in turn creates electricity. Current technologies produce over 100 KWh of electricity per tonne of bagasse.
- A greener alternative to burning bagasse for the production of electricity is to convert bagasse into biogas. Technologies are being developed to use enzymes to transform bagasse into advanced bio-fuel and biogas.
- It is also necessary to encourage more people to use jaggery. Unfortunately people are not aware of the usefulness of jaggery. Mechanization of jaggery plant is also necessary to overcome labor problem and also to get quality jaggery.

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