

# Indian Sugar Sector Network Report

## Network Overview

Within the initiative

Sustainable Industrial Networks and Its applications on Micro  
Regional Environmental Planning (SINET)



**Partner  
Organizations**



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**Asia Pro Eco Programme**

Is a five years programme launched by European Union in 2002, The main target is to adopt policies, technologies, and practices that promote cleaner, more resource efficient, sustainable solutions to environmental problems in Asia. The programme provides support through grants to policy reinforcement, operational and practical dialogue, diagnostic studies, technology partnership and demonstration projects, in the field of environment. The programme supports non profit organizations from EU and Asia.

**About SINET**

The aim of sustainable industrial network and its application on micro regional environmental planning is to interpret and adapt an understanding of the natural system and apply it to the design of the man-made system, in order to achieve a pattern of industrialization that is not only more efficient, but which is intrinsically adjusted to the tolerances and characteristics of the natural system. An industrial system of this type will have built-in insurance against environmental surprises, because their underlying causes will have been eliminated at the design stage. A micro-region is a distinct territorial unit with clearly marked boundaries below the regional level, but above the village level. Micro-regional environmental planning attempts to coordinate the planning activities of the various actors within a limited territorial unit.

The project will look at analyzing and documenting various success and failure stories of industry networks from Sweden/Europe and India/Asia, and to ascertain their impacts on environment and sustainability aspects of the respective micro regions. Emphasis will also be placed on creating awareness on the influence of industry network (key economic activity) on the micro region's environmental and sustainability aspects.

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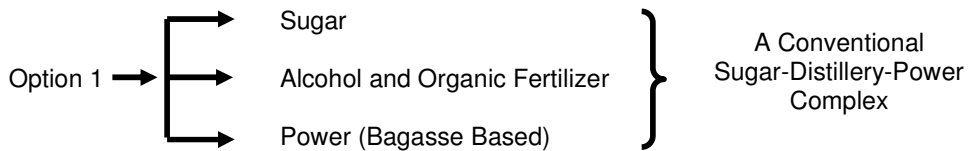
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## Sector Network:

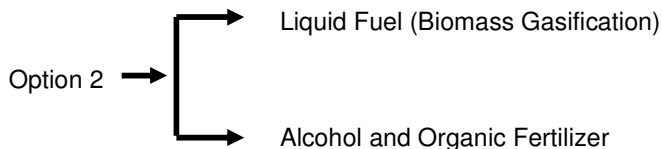
A sugar complex is a multi-product complex revolved around the sugarcane. The sugarcane is one of those agricultural commodities, which fixes maximum of solar energy per acre, releasing the same for human benefits in many forms therefore; the potential of a sugar industrial network should be harnessed fully. Cane leaves lop and tops during cane harvesting while manufacturing the sugar leaves bagasse, press mud (or filter cake) and molasses as waste products. The simplest concept of sugar industrial network is to use these wastes fully to make the network more sustainable.

On the basis of wastes generated and the available technologies several options for network configurations are available today some of the options are given below.

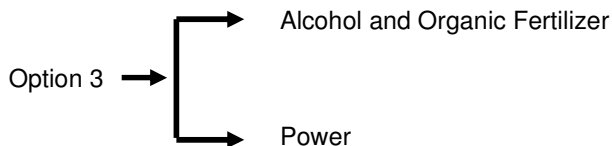
- **Network Configurations**



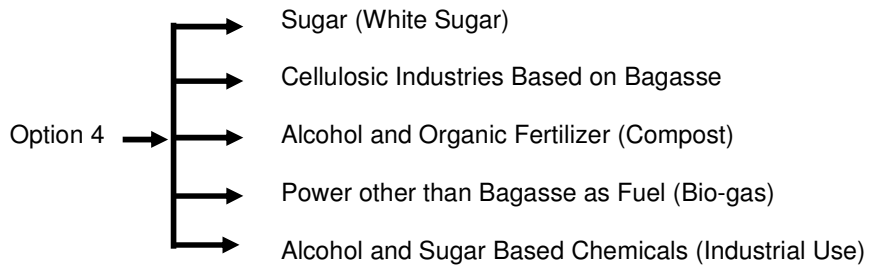
Option first is widely practiced in India most of the sugar factory in India having distillery complex attached to it which gives a remarkable flexibility and also improves the financial viability. The power production both thermal and electrical makes the option self sufficient at some extent in terms of energy requirement.



Option two is biomass gasification with alcohol and organic fertilizer unit. But in India this configuration is very exceptional because India is one of the biggest consumers of sugar and sugar is considered as essential commodity.



Option three is a distillery instead of sugar factory but the difference is that the preliminary aim while crushing sugarcane is to reduced sugar extraction and increased molasses production. Wherein the juice would be directly used in the fermentation and bagasse used in the power generation.



Option four is the extension or blend of above three wherein sugar could be the main product following to the bi-product based down stream industries. Bagasse can be used in the paper industry (Cellulosic industry), molasses use to produce alcohol, and waste material would be converted into Bio-gas and which further used as fuel in boiler to produced power. There could be the alcohol and sugar based chemical complex which is value addition to the network

The whole sugar network is basically divided into two levels individually consist of various activities

- 1) Farming of sugar cane (farm level activity)
- 2) Production of sugar & By-product utilization

- ***Farming of sugarcane (farm level activity)***

Sugarcane holds a prominent position as cash crop in sugar producing region and therefore most of the farmers cultivate it to make a profit. In this sector, most of the farmers and the labourers are involved in the activities, which are directly or indirectly related with sugar production. Sugarcane-crushing season is for six months in this period most of the peoples are employed in harvesting, loading and transportation activity.

Almost all sugar mills depend for their supplies of sugar cane on large number of independent farmers. If the yield per hectare is improved, the benefit goes to the growers while if the cane is rich enough in sugar content; it becomes profitable to the mills. Therefore cane growing and milling are essentially a joint enterprise where growers and millers are equally benefited.

Sugar cane is an essential commodity under the essential commodity act, 1955 as such the government is empowered to control its production, distribution and supply. The government regulates its supply to sugar factories under the sugar cane (control) order, 1966. The power of regulation of cane supplies has been delegated to the state government. Under the above order, the government is empowered to reserve the area for a factory having regard to the crushing capacity of the factory, availability of the sugarcane in the reserved area and the need for production of sugar; with view to enabling the factory to purchase the quantity of

sugarcane required by it. The cane growers in the reserved area are required to enter into bond with the sugar factory. For supply of specified quantity or percentage of sugarcane grown by him. The growers are not allowed to supply cane to any factory outside the reserved area unless he obtained a permit for this purpose. The factory is also under the obligation to crush the entire cane which is bounded by the growers.

The harvesting season ranges from 2 ½ months up to 11 months the harvested sugar cane should be crushed within 24 hrs. to get a good recovery of sugar. Transportation facility, conditions of road, distance of the farm from the mill e.t.c. plays an important role and therefore every sugar mill has provided transportation and harvesting facility to the farmers on nominal charges.

The group of harvesters under the supervision of the agriculture development officer (ADO) of the company will harvest the crop and then load on to the vehicle in presence of the crop owner (Farmer). Sugarcane cutting is a hard and dirty job harvesting is done either by hand or by a machine. Some times sugarcane cut by machine is chopped into short lengths but is otherwise handled in a similar way as hand cut cane. Machines can only be used where land conditions are suitable and the topography is relatively flat to move the machine easily. Sugarcane cut at about ground level, the top green leaves are chopped off and then the stalk is bundled, once a complete bundle has been assembled it is remove from the field with the help of labourers because it is not possible to use vehicles or a light cart due to the soil being wet this will then be transferred to a larger vehicle for transport to the mill.

The cane is taken to the company mostly by tractors (single & doubled trolley), bullock cart, and trucks. There are service providers like third party contractor for harvesting and transportation. The company provides vehicles required to transporting sugarcane from field to the mill and only manpower has to be employed by the transporting contractor. The owner of the vehicle mostly from the operational area. Weighing is located near to the crushing center. Once the weighing has being carried out, company officials will note down the entry of the crop weight, name of crop owner and the vehicle number, for further procedure. The payment of the crop will directly be deposited in the account of each farmer in the co-operative banks of the society or can be paid directly to the farmers.

### **Trends**

- Now days most of the farmers diverted towards the sugarcane farming, this year in India the production of sugarcane are higher as compare to earlier. In recent years most of the farmers plant the sugarcane to make profit; it gives high yield/Acres of land which assures the good amount to the farmers.
- Pesticides and chemical fertilizer are widely used in the sugarcane farm claimed to be the main reason why most of the soil in the western Maharashtra and some part of Uttar Pradesh are facing problems like high pH, alkalinity, and decrease in the yield.

- Sugarcane is a water intensive crop, mostly planted in an area where water table is high and surface irrigation schemes are more like canal, lake, lift irrigation etc. but now a day in some areas where the water table is low. farmer is practicing the drip irrigation.

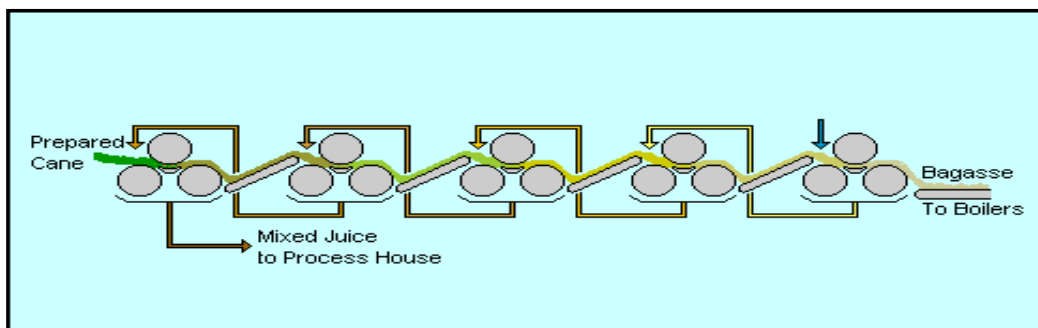
- **Production of sugar & By-product utilization**

The second level starts when the collected sugarcane is then conveyed to the cane leveler where it is cut and chipped. The cut cane blanket is then fed to tandem of mill, wherein it is crushed and the juice is extracted.

The sugarcane needs to process the cane as soon as possible to avoid the sugar losses. Typically, cane is processed within 24 hours after harvesting. The various steps involved in the manufacturing of sugar are as follows.

**Extraction of Juice:** -The cane from the field is brought in bullock carts, tractors, trollies, trucks etc., which is then unloaded in the cane carrier by manual labour or mechanical unloader. It is then conveyed to the cane leveler where it is cut and chipped. The cut cane blanket is then fed to tandem of mill, wherein it is crushed and the juice is extracted.

The extraction is actually conducted as a counter-current process using fresh hot water at one end being pumped in the opposite direction to the cane. The more the water is used, the more is the sugar extracted but the more dilute the mixed juice, hence the more energy will be required to evaporate the juice. In many factories the cane is crushed in a series of large roller mills similar to a mangle [wringer] the sweet juice is extracted. Generally juice looks pretty dirty, because contamination of soil particles from the fields, small fibers and the green extracts from the plant.



There are several important aspects to extraction which involve the energy balance of the company, the efficiency of extraction and therefore ultimately the profitability of operations. The fibrous cane material after the extraction of juice, called the bagasse goes to the boiler, wherein the same is burnt producing steam. The excess bagasse is baled and stored or can be sold to the paper industry.

**Clarification:** -The extracted juices are then heated to 60-65°C in juice heater and passed to a reaction tank where the liming and sulphitation takes place. This limed and sulphited juice is pumped back to a 'clarifier' after heating to 100°C which remains there for about 3 hrs. During this stage in the clarifier, the heavy insoluble impurities, mostly soil and mud are precipitated which is then pumped to a vacuum filter which removes the liquid portion from the mud, while the solid muddy portion is taken out of the company building. This waste is used as manure or can serve as raw material for the extraction of crude wax.

**Boiling:** - The raw juice is now clarified and is called the clarified juice. It is then passed through a set of evaporator which boils the excess water under vacuum concentrating it gradually, as it passes from one evaporator to another. Finally concentrated juice called the sugar syrup is sent to the pan floor wherein the final crystallization takes place, under vacuum. The evaporation is carried out under vacuum.

**Crystallization:** - A viscous solid mass consisting of sugar crystals and mother liquor is dropped in crystallizer and it then passes through the pug mills to centrifugals machines. Due to very high gravity factor, the viscous mother liquor passes through the opening in the liner and the sugar is retained on the screen and the sugar is then dropped into the hopper.

**Grading & Packaging:** -The sugar is then passed on to a unit called grader, which grades the sugar in different grades and in different sizes as per the Indian sugar standards. The sugar is bagged in the pre-stamped empty gunny bags, weighed; the grades and number marked on the bags and these bags are stored in godowns and are finally sold. The transportation of sugar from mill to market is mostly carried out by road. Though the Indian sugar industry is more concentrated in rural parts of India but it is well connected with most of the metropolitan cities of the country.

**By- product utilization:**-The waste and by-product generated from the production of sugar are sent to the by-product based industry. The fibrous cane material after the extraction of juice, called bagasse goes to the boiler, wherein the same is burnt producing steam and electricity that powers the mill to process sugar from cane juice and alcohol in distillery industry. The excess bagasse is baled and stored or can be sold to the paper industry.

Molasses, generated from sugar manufacturing finds its way to the distillery industry where it is use as a raw material to produce various industrial chemicals, alcohol, power biofuels. Alcohol is an important basic feed stock for manufacture of various chemicals. It is a good substitute for petrochemicals and petrol based chemicals in India. Waste material coming out of the sugar and distillery industry namely press mud and spent wash. Press mud is used as a filler material for bio-composting compost manure will be sold to the farmers. Anaerobic digester is used to process left-over effluent i.e. spent wash and, to clean the wastewater which makes up 80% of the cane stalk to produce biogas, food grade CO<sub>2</sub>, and fertilizer.

Cleaned water is recycled for on-site use, sent back to the river or used to irrigate the cane-farms.

Like wise the network revolves around the sugarcane farm and plays the important role in the rural economy of the area. Thus, effectively managed through environmental point of view, Sugar network is a closed loop network, where all the waste from production process is utilized for the byproduct manufacturing.

**Trends:-**

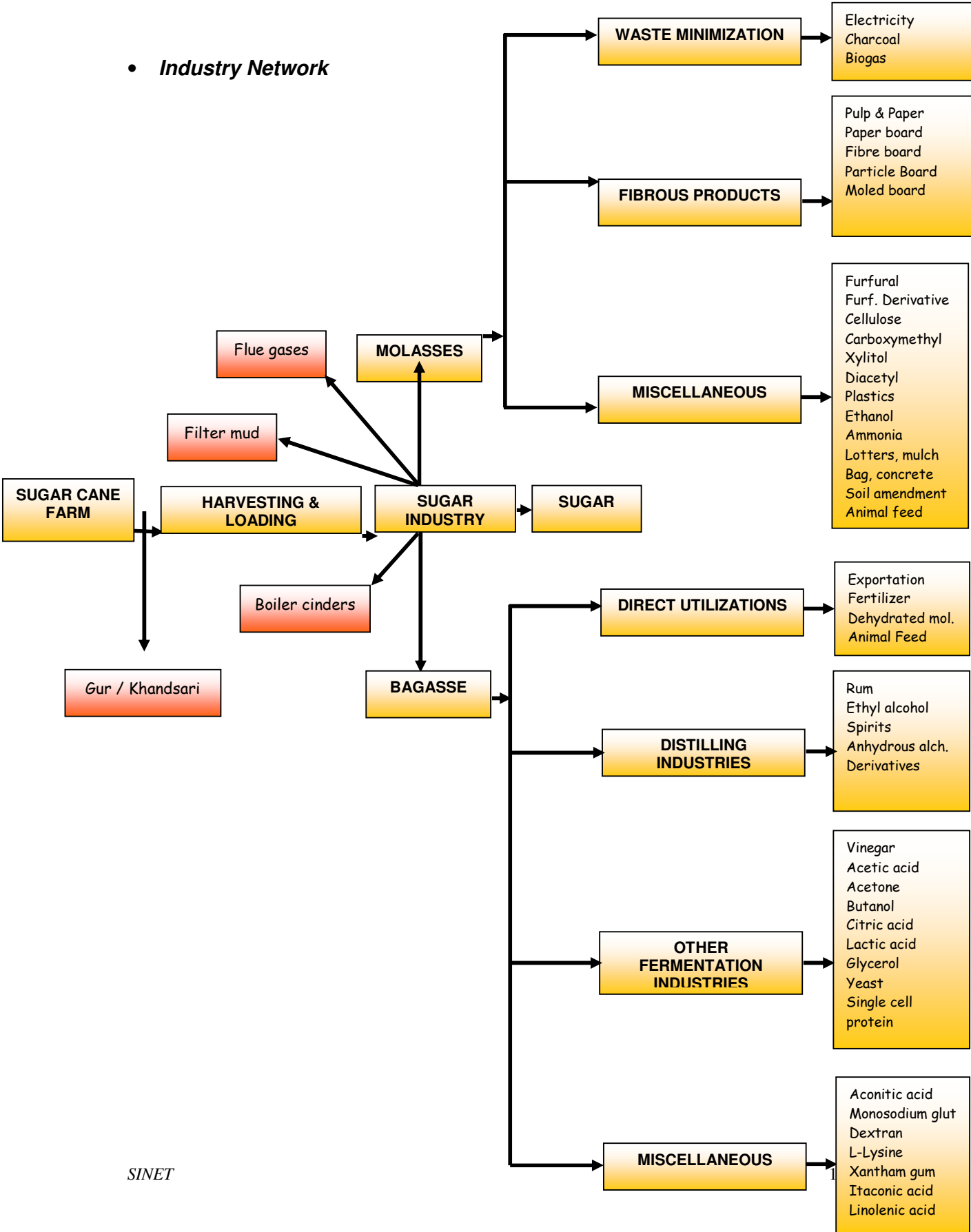
- Indian sugar industry sector is well organised and also associated with traditional cottage industry like Gur/Khandsari. Recently the fuel ethanol concept has been introduced which is being widely practiced in Brazil, but in India there are some sugar factories which has started producing power alcohol. Government has now resolved that with effect from the year 2003, 5% ethanol-doped-petrol will be supplied in the following nine States including four contiguous Union Territories:

**States:** Andhra Pradesh, Gujarat, Haryana, Karnataka, Maharashtra, Punjab, Tamilnadu, Uttar Pradesh, Chandigarh

**Union Territories:** Damman and Diu, Dadra and Nagar Haveli, Goa, Pondicherry

- Most of the Clean Development Mechanism (CDM) projects are coming up in the sugar sector; as it has a huge potential for carbon credit. Most of the sugar industries are becoming self sufficient in terms of their energy requirement, and excess amount of energy is supplied to the grid.
- This year, to stop the day by day decrease in the sugar price, sugar commissioner has given an order to all the sugar factories to not to sell the sugar below the price 1,387 Rs. / quintal. This continuous decrease in the sugar price even in the international market is because of the higher production of sugarcane, which ultimately increases the sugar production. Sugar M30 can be sold with the price 1,387 Rs. / quintal, but as the rates for sugar S30 are always lower by 30-100 Rs. than sugar M30, sugar manufacturers can not sell S30 with the same rates. In this case, storage is the only alternative for all the sugar factories, but to store a large quantity of sugar for a longer time is a difficult task for the private and small sugar producing units, which may lead to face them some problems

• Industry Network



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