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Scoping and Sustainability Analysis of Sugar Sector

The sugar sector network basically comprises of the sugar cane farms, the local harvesters, the sugar mill, the local transporters, the distilleries/breweries, the co-generation units, small paper and pulp industries, the Khandsari units and the press mud bio-compost manufacturing units. In a given micro-region (area of the micro-region can vary from 15 to 35 Kms) these units may operate independently or in collaboration with each other thereby forming a network.

Each individual link of the network leaves its environmental footprints in the form of desirable or undesirable effects on the environment. This chapter shall try to assess the sustainability as well as the unsustainability aspects of the sugar sector.

The various sustainability and unsustainability aspects of the sugar sector network and their environmental foot-prints are discussed below:

Economic Sustainability

- **Sugarcane farming:**

Most of the Indian farmers diverted towards the sugarcane farming. In this year production of sugarcane is more as compare to last year. Farmers plant the sugarcane to make profit; it gives high yield/acres of land. In India sugar is an essential item of mass consumption and the cheapest source of energy, supplying around 10% of the daily calorie intake. With rising incomes of the farmers, India's sugarcane cultivation area is 4-4.5 million hectares (ha) that is around 2.7% of India's cropped area.

- **Driver for revenue generation:**

During harvesting season different service providers like harvesters, transporters get engaged into the activity and get benefited economically.

- **Contribution towards national economy:**

Estimated production of 18.6 MT(metric tonnes) in year 2006 that is around 10-12% of world's sugar production and therefore Indian sugar industry sector is the second largest sugar producer in the world (after Brazil) and considered for around 1% of GDP of the country during financial year 2005. Sugar sector contributes an estimated Rs. 17 billion annually to national exchequer and treasuries of various state governments by way of excise duty and purchase tax on sugarcane.

- **Value added products:**

Sugar industry supports downstream industries thus producing value added products like electricity, alcohol, industrial chemicals, branded and compost manure which is the major source of revenue for the micro-region

Economic Unsustainability

- **Variation in supply of sugarcane due to dwindle in payment paid to the farmers:**

The Indian sugar industries follow predictable cycle of atleast 4-5 years. Shortage of sugar leads to an increase in prices. Mills pay higher prices for cane which tempts the farmers to switch to sugarcane. This result in a glut in both cane and sugar and this depress sugar prices. Cane payments to farmers get dwindled and delayed as inventory buildup, farmers switch to other cash crop which leads to a fall in sugarcane production and sugar production.

- **Old technology & low prices offered for sugarcane:**

Most of the co-operative sugar mills operating in India are plagued by the problems of obsolete technology and financial constraints. They are not the preferred suppliers for the sugarcane farmers due to the low price offered for the produce. Therefore other than the mandatory quota of sugarcane that has to be supplied to a cooperative operating in a given region, the farmers supply rest of the produce to the private sugar mills in their region. This results in the co-operatives functioning well below their crushing capacity and producing low and inferior quality sugar that does not command a high price in the market. But, there are few instances, like Warana cooperative sugar mill, operative in Western Maharashtra where, backed by strong member support the cooperative is robust and has contributed in a major way to the social and economic upliftment of the micro region.

- The Khandsari units often operate from the backyards of the farmers growing sugarcane and unlike sugar it is not subject to the stringent regulations by the government. The Khandsari and Gur are rich in iron content and used to prepare many traditional sweet dishes. Khandsari operating in the region is the main reason for diversion of flow of sugarcane. This builds up a pressure on to the sugar mill and can be seen during the fall in sugar cane production.

Environmental Sustainability

- Sugarcane is a renewable, natural agricultural resource because besides sugar, it provides biofuels, fiber, fertilizer and variety of by products/co-products with ecological sustainability.
- Sugarcane, a perennial grass-plant is one of the most efficient plant in converting carbon dioxide & sunlight into carbohydrate and storing energy through photosynthesis. It is important to note that each acre of sugarcane removes 33 tonnes of excess carbon dioxide from the air and, returns 21 tonnes of fresh oxygen annually.

- The local transporters play an important role in transferring the harvested sugarcane from the farms to the sugar mills. The mode of transfer that is usually used is bullock carts, trailers and trucks. Bullock carts are the most preferred means as they do not emit any air emissions but can be used for transportation only over short distances or within the micro-region.
- 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 have 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 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. The co-generation units producing electricity using bagasse as the feedstock in the boilers instead of coal save a huge amount of money, as the bagasse is usually obtained from the nearby sugar mills for a pittance as compared to the coal. On the other hand these units contribute electricity to the local grid or alternatively supply it to the sugar mill or distilleries thereby earning revenue as well as contributing to the upliftment of the region due to generation of electricity at a local level with reduced dependency on the state supplied electrical energy.
- Small paper and pulp units use bagasse as a raw material in the manufacture of paper. Depending on the size of the unit, bagasse can either be used as an add-on raw material or a substitute raw material. This helps in conserving the raw material bamboo to a certain extent and also puts bagasse which is a waste to good use. The quality of paper produced is the only drawback as the paper produced is of inferior quality.
- The press mud comprising of the impurities that are separated during the sugar manufacturing process is used to produce bio-compost and sold either to the sugarcane farmers or in the local market as such in the form of fertilizer. In other cases, some chemical additives are added to the bio-compost to prepare a chemical fertilizer having enhanced nutrient value for the plants.

Environmental Unsustainability

- Agrochemicals and sediments can pollute nearby watercourses.
- Siltation and Eutropication of nearby surface water bodies due to soil erosion due to flood irrigation and over irrigation.
- Sugarcane is a deep-rooted crop and can have a great impact on river flow as it reduces run-off from the catchment into rivers and draws heavily on ground water resources.
- Burning of cane to speed harvest causes air pollution and increases erosion
- Erosion is a significant issue in areas under sugar cane or beet cultivation, since erosion rates in tropical agro-ecosystems are usually greater than the rate of soil formation
- Cane harvesting can cause a significant removal of soil with the roots. Declining soil quality is associated with cane and beet production, due to soil compaction, loss of organic matter, salinization and acidification.
- Conventional tillage commonly promotes erosion by exposing soil aggregates to rainfall. Conventional tillage i.e. deep ploughing, also drastically changes soil structure.
- Acidification is also more prevalent in cane than beet growing areas, largely due to the use of inorganic nitrogenous fertilizers such as urea and ammonium sulphate.
- Most of the farmers still use the flood irrigation pattern which results in huge wastage of water, electricity and results in salinization of the soil which is another important cause of lower productivity.
- Sugarcane milling generates bagasse (Fibrous waste produce during the milling of cane) as fuel in boilers, which produces particulate matter, nitrogen oxide and sulphur. Pollution control equipment is not installed, fly ash escape to the atmosphere and can affect the population with irritation in eyes, nose, throat and lungs and can damage crop.
- Most of the time it is observed that the sugar industries discharged their wastewater i.e. spent wash during the rainy season in the nearby rivers and other surface water bodies resulting in severe contamination of the surface water resources.
- Bagasse, which is commonly used as fuel in boilers, produces fly ash, which escapes to the atmosphere and can affect the population with irritation in eyes, nose, throat and lungs, and can damage crops.
- The distilleries that use the molasses produced during the manufacturing process of sugar to produce potable alcohol or other chemicals like spirit, fuel alcohol, etc also produce some waste during their manufacturing process. There are also some air emissions that spread foul odour in the vicinity of the distillery. Ideally the distilleries should ensure proper treatment of liquid and gaseous emissions which is the major part of their environmental footprints.

Social Sustainability

- **Employment generation:**

Sugar factories located in rural areas supports huge economic activity, with about 45 million sugarcane farmers, their dependent and large group of agriculture labors being involved in sugarcane cultivation, harvesting and ancillary activities. This figure constitutes 7.5 % of the total rural population. Besides, about 0.5 million skilled and semiskilled workers mostly from the rural area are engaged in the sugar industry.

- **Contribution to public infrastructure/health care/education:**

Sugar Industry has been a focal point for socio-economic development in the rural areas by way of mobilizing rural resources, generating employment, providing higher income opportunity, and transport and communication facilities. Further, many sugar factories have established schools, colleges, medical centers and hospitals for the benefit of the rural population.

- **Secondary industry/business:**

Some of the sugar factories have diversified into byproduct based industries and have invested and started distilleries, organic chemical plants, paper and board factories and cogeneration plants. The industry generates its own replenishable biomass and uses it as fuel without depending on fossil fuel.

Social Unsustainability

- **Impact on the ground water:**

Sugarcane being a cash crop offers an attractive proposition to the farmers for cultivating it. But, sugarcane farming can be sustainable only if it is done in the high yielding areas where the soil suitability and availability of adequate water offer conditions conducive for growing sugarcane. Cultivating sugarcane in water scarcity areas will worsen the availability of surface and ground water to the local population for other essential uses. This may affect the social life of the community.

- **Change in the cropping pattern:**

It is essential to follow the proper cropping pattern/ crop rotation according to the agro climatic condition to improve the biophysical properties of the soil and reduction in pest incidence, but in case of sugarcane production because of its high value as cash crop most of the farmers has started to take the advantage. But this affects fertility of land by reduction in the production of biomass for livelihood which could affect the social life.

- **Health impact due to burning of bagasse:**

The unburned particles come out of the stack contains silica which is very harmful. It may create a serious health related problems. If pollution controls equipment being not installed, fly ash

escapes to the atmosphere and can affect the population with irritation in eyes, nose, throat and lungs and can damage crop. The burning of leaves also causes severe air pollution. The cane leaves can be an excellent source of fodder if not burnt

- **Poor working condition:**

Sugarcane harvesters are usually the farm labourers in addition to the local unemployed youth who during the harvest season find temporary employment to harvest the standing crop of sugarcane. They harvest the cane manually with little or no protective gears and many times face severe cuts and bruises to their hands due to the rough leaves and stumps of the cane. In addition they are also exposed to the dust and ash that is generated when the leaves are subject to controlled burning for faster harvesting.

- Sugarcane is a deep rooted crop and uses a lot of water; it is very sensitive to soil water deficits. In many areas it is usually from 100% of water by irrigation, although in other areas it is rainfed. The crop can have a great impact on the river flow and the ground water. WWF ranks sugar as the third “Thirstiest” commodity crop, typically requiring 1500-3000 liters of water per kg of crop. Being cash crop sugarcane has given a special attention by the farmers.

- The distilleries are seen as a source of addicting the men folk of the region.

Summarizing the above, it can be concluded that the sugar sector comprises of sustainable as well as unsustainable characteristics from the point of view of economical, environmental and social aspects. To have sustainable industrial networking in the sugar sector, more synergies should be developed among the existing units to reach to the zero waste discharge levels that are very much a possibility within this sector network.