India's sugarcane cooperative model for rural livelihood, bioenergy and rural development

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Technical consultation

"*How to design, implement and replicate sustainable small-scale livelihood-oriented bioenergy initiatives*"

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PROJECT NAME: Pravaranagar Sugar Cooperative

PURPOSE & OBJECTIVES :

- Ensure regular market and remunerative prices for their crop to small and marginal sugarcane farmers
- Increase sugarcane farm productivity
- Promote local food and livelihood security in drought-prone region by developing alternative irrigation systems for crop diversification
- Promote farm value-addition through processing of sugarcane and industrial use of byproducts leading to improved incomes of small farmers
- Invest cooperative income from value-addition and industrial diversification to improve living standards of the local community by establishing health care, education, credit and transport infrastructure

TIME PERIOD, BUDGET:

Established nearly 60 years ago with a *budget of approximately Rs. 2,26,000 (cost of machinery). By 1993 the capital investment increased to Rs. 600 million and more than eight times by 2009.*

LOCATION & RURAL LIVELIHOOD CONDITIONS :

Located 70 km north of Ahmednagar district in India's western Maharashtra state in the Pravara region which lies in the arid "rain shadow" belt; average annual precipitation of 10 to 12 inches; drought and near famine conditions common before cooperative was set up; a large water canal ran through the Pravara region since 1910 but was not used by small farmers.

Small and marginal farmers worked on sugarcane plantations run on their land by joint stock companies which held long-term cultivation leases on the land at nominal rates. Private sugar factories set up by the joint stock companies paid very low prices to the sugarcane farmers working on the leased lands; lease condition did not oblige factories to purchase the full crop and farmers were known to often burn the unsold crop, resulting in large-scale indebtedness.

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INITIATED BY WHOM & WHY

Three local community leaders - Late Vitthalrao Vikhe Patil, Late Vaikunth Bhai Mehta and Late Dhanjayrao Gadgil - to end the exploitation of the mainly illiterate small and marginal sugarcane farmers by the joint stock companies and promote rural living standards through agricultural diversification, agro-processing and agro-industrial diversification.

ORGNIZATIONAL SETUP AND PARTICIPATORY MECHANISMS

- Farmers' cooperative with small and marginal farmer members from 44 villages pooling financial resources backed with financial support from Maharashtra State Cooperative Bank to set up sugar factory run on cooperative principles with democratic member participation

ACCESS TO PRODUCTION, RESOURCES & SUPPORT SERVICES

The Pravara Nagar Sugar Cooperative Factory is located in one of India's main sugarcane growing and processing regions

Although a largely arid region, there has been a large canal since 1910; however, sugarcane farmers were not using the canal water for irrigation; another canal in a nearby area was being used for commercial flower cultivation and this inspired the founders of the Pravara Nagar cooperative to establish irrigation facilities for the cooperative sugarcane farms

Cooperative had access to MSCB other technology institutions.

TYPE OF BIOENERGY PRODUCTION

1. Biogas

- First biogas plant was set up by cooperative sector in India in 1977; initial generation capacity was 24,000 cubic metres has grown to 40,800 cubic metres a day generating 362.5 cubic metres of gas a day
- Biogas used to power sugar factory's large-scale distillery that in turn uses molasses from the sugarcane crushing; distillery established in 1970 was formerly using thermal energy – coal burning
- Has cut down environmental pollution in factory and contributes to greenhouse gas reduction
- Surplus biogas piped to 196 households in worker residential complex near sugar factory to meet home cooking energy needs

2. Ethanol

- 50,000 litres per day capacity installed in 2002
- Has ready market in petroleum companies which need it to meet national government mandate for petroleum blending with 5% ethanol and earns good revenue for factory; also sold to pharmaceutical companies
- Over 11 million litres produced during 2008-09 of which 3.2 million litres was sold earning cooperative about Rs 29 million

PROCESSING TECHNOLOGY

BIOGAS

- Treating of effluents from sugar industry and ancillary units – composting of effluent residues and press mud; compost manure based on treated distillery spent wash and press mud; residue is rich fertilizer distributed to farmers for better yield

ETHANOL

- From molasses with estrification technology
- Daily production capacity of 50,000 litres is made from molasses based on hydroids alcohol using two methods:

  - 20,000 liters through Azeodropic Distillation
- - 30,000 liters using molecular sieve

LIVELIHOOD IMPROVEMENT OUTCOME

Employment: 1,444 technicians and villagers directly employed in sugar factory and about 5,000 rural people find work on sugarcane farms in crop harvesting and transport to factory.

Agricultural development: Irrigation - 39 percolation tanks with 153 million cubic feet capacity irrigating 1,480 ha and also recharge ground wells; 5 K.T. weirs on Pravara canal water 2,925 ha; substantial reduction in soil salinity and improved ground water level; improved productivity – well-equipped research & extension centre

Rural economy & transport: 2,565 km rural roads built; farm, 175-non-farm livelihood cooperative enterprises; credit cooperatives were promoted.

Comprehensive health and education infrastructure: set up with cooperative's income resulting in significant improvement in social indicators – 20% increase in literacy to 83 %, reduction in child and maternal mortality from 7 and 4% to 3.5 & 1.8% respectively; crude birth rate decline from 2.3 to 2%.

POTENTIAL FOR REPLICATION

1. **Ethanol and electricity production using non-farm feedstock to sugar factory**

- **Bagasse, a major residue of sugarcane juice extraction can be utilised as fuel for biogas, ethanol and electricity production. It is estimated that the bagasse produced by India's over 517 sugar factories including the cooperative sector (135 in Maharashtra state alone) has potential of generating 5,000 Mw electricity; only 1,155 Mw production by 2009. Cogeneraion licenses granted to 31 cooperative sugar factories and many more in pipeline.**
- **Favourable policy environment for bagasse-based power generation, Good budgetary allocation of Central/state Govts. for renewable energy, etc.**
- **The Pravara Nagar Sugar Cooperative factory's 35 Mw cogeneration plant may commence electricity production shortly and is set up with a leading private sector partner; project to meet all electricity and steam needs of the cooperative's large industrial complex and surplus power to be sold to the state grid.**

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2. Using alternative farm feedstock as fuel to produce ethanol and electricity.

Pravara Sugar Cooperative plans to cultivate sweet sorghum as an alternative feedstock for electricity generation and ethanol production; the 44 villages in the cooperative have a potential sorghum cropping area of about half a million hectares; sugarcane farmers plant different crops on one-third of their land every year as rotation to restore soil fertility affected by chemical fertilizers

Even after using 75% of sorghum crop residue for animal feed,, there is enough for power generation and ethanol production; many sweet sorghum varieties have 42% higher sugar content than sugarcane; only 4,000 cu mt water are needed to produce 1,000 tonnes of bio-ethanol from sorghum against 36,000 cu mt needed to produce same amount from sugarcane

Strategy :

(a) Survey of crops, sugarcane area and type of rotational alternative crops grown for improving fertility of sugarcane fields and return from such crops

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(b) Analyse village-wise rotational area, organise farmers self-help groups willing to cultivate new crop; educate local community of social, economic and environmental benefits – improved livelihoods, value addition by sugar cooperative (ethanol), energy security, improved supply of farm manure and reduced green house gases emissions.

(c) Prepare schedule of alternative crops to ensure supply

(d) Train producer members, unemployed youth and rural labourers in (i) sorghum cropping – sowing period, water management, harvesting period; (ii) segregation of fodder from bionergy feedstock; and (iii) transport schedule to sugar factory for energy/bio-ethanol production

(e) Monitoring mechanism for entire system to be managed through existing cooperative centre and transport cooperative society operating in the area to carry sorghum from field to factory site.

RISKS

- Despite favorable policy environment and availability of financial support, only 1,155 of 5,000 Mw power generation potential of sugar factories realised by 2008-9. The main reasons appear to be procedural delays in obtaining clearances from authorities; difficulty in obtaining funding from Banks and finance institutions and links of cooperative sugar factories with political parties.

- The main concern of the Pravara Sugar Cooperative factory is shortage of raw material (sugarcane) due to frequent drought conditions

- Under BOOT partnership with private sector, land for plant and bagasse to be provided by factory and private partner to give free power to meet factory's need and sell surplus to grid. But in this arrangement, energy production only during crushing season.

WHAT HAS WORKED & WHY

Policy/legal environment

- Favourable policy and legal environment for renewable energy generation – new policy allowing private participation in power generation has allowed Pravara Sugar Cooperative to tap large-scale capital resources of Rs. 15,000 million

Institutional setup

- Cooperative organization underpins the success of the scheme as it allows for participatory, democratic and equitable decision-making and sharing of benefits and enhances social solidarity; loyal and dedicated cooperative members

Practical issues

- Sugarcane farming is a traditional rural livelihood activities
- Both farm and non-farm feedstock sources readily available
- Availability of financial support from state institutions for renewable energy development
- Demand for ethanol by oil companies for blending mandates and by pharmaceutical companies; demand for electricity

WHAT HAS NOT WORKED/WHY NOT

Policy/legal environment

- Procedural delay in obtaining clearances from government departments

Institutional setup

- Negative perception of cooperatives as politically controlled institutions has made it difficult to access finances from commercial lending institutions and banks
- Slow decision-making by cooperatives due to democratic set-up

Practical issues

- Sugarcane production declining due to frequent drought conditions, severely affecting capacity utilisation of sugar cooperatives to meet commitments

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- Government control/levy prices on molasses causing heavy losses to sugar factory.
- Fragmented land holdings and increased soil salinity
- Fluctuating oil prices
- Renewable energy buy-back tariffs not consistent across states, leads to conflict by sugar mills.

WHAT TO CHANGE, IF IT HAD TO BE DONE AGAIN

Policy/legal environment

- More favourable policy and legal framework for small-scale bioenergy production and marketing by cooperative sector

Institutional setup

- Reduce bureaucratic delays to facilitate cooperative sector's access to state clearances and financial institutional support
- Improve perception of cooperatives by private sector institutions; reduce political interference in working of cooperatives
- Speed up decision-making in cooperative without compromising democratic participatory structure

Practical issues

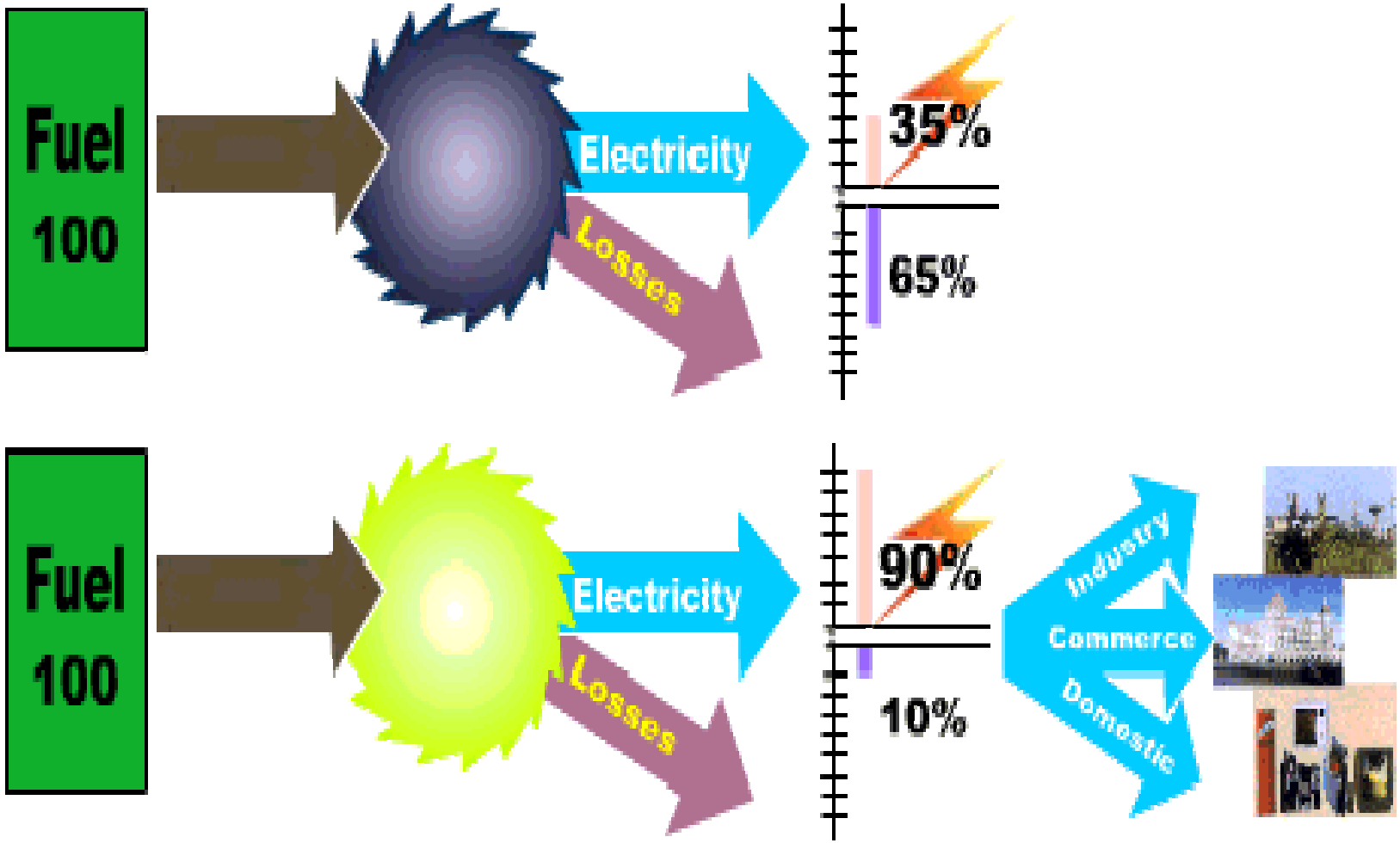
- More sustainable farming practices – sugarcane farming being water-intensive; alternative feedstock
- Improved, more affordable processing/conversion technologies

ESSENTIAL INGREDIENTS FOR REPLICATING SUCCESS

- Policy/legal environment
- Policy/legislative support to more active participation by cooperative sector in small-scale, community-level bioenergy feedstock production, processing and marketing
- Institutional setup
- Facilitate cooperative sector's access to financial and technical support
- Speeding up cooperative decision-making
- Practical issues
- More efficient and cost-effective feedstock processing/conversion technologies
- Assure remunerative prices for cooperative enterprise products; preparedness for market contingencies

Module of Organised Biomass

Cogeneration, also known as combined heat and power or CHP, is simultaneous production of electricity, heating and/or cooling, from a single fuel input, with an overall efficiency normally exceeding 70%

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