

Condition	Number of Genes Expressed
CTD	160
CONTROL	195

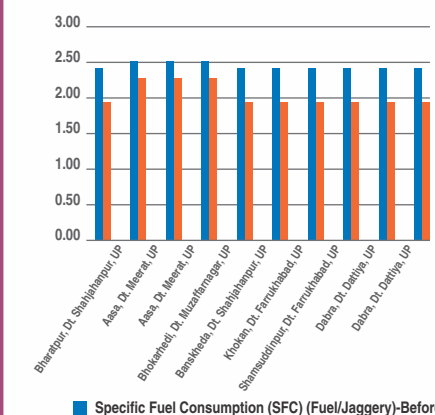
- Installation of energy efficient technologies for jaggery making helped the beneficiaries reduce fuel consumption by 22%. It helped saving 864 tonnes of fuel annually in 18 units.

- Additional incomes of around 1,00,000 INR per annum was generated by the sale of saved bagasse to cardboard and paper industry. This also saved the man hours which was previously required for construction of furnace every season.

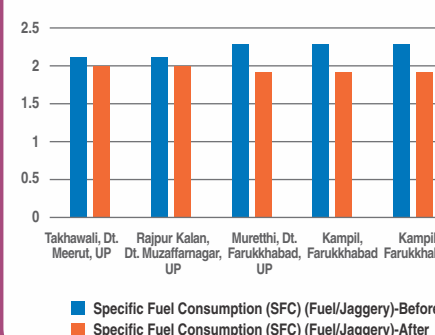
- Specific fuel consumption (SFC) has been reduced as depicted in the graph. In addition to this, 3-pan furnace saves 0.64 tons of CO₂ emission per day and 4-pan furnace saves 0.49 tons of CO₂ emission per day. With the installation of 18 new 3-pan and 4-pan furnace has helped in reducing the carbon emission by 52.8 tons per year per furnace cumulating to a total of 950 tons per year.

- As the technology popularizes, trained masons are receiving more return orders and hence greater stability in the income and livelihood sustenance.

- ### SFC change with adoption of 3 Pan FE furnace



SFC change with adoption of 4 Pan FE Furnace



- The project hits the global objective of bringing sustainable environmental changes. These initiatives involving the grass root communities, have huge impacts and hence these can be replicated and up-scaled at the national level.

- Various temporary technologies lured the community to follow the wrong practices to gain maximum monetary benefits. In this project many jaggery makers in West UP had shifted to a hitherto unknown self-designed 4-pan jaggery furnace. Other units followed them thinking that it would give some added monetary and productivity advantages. Various comparative demonstrations had to be conducted to prove the inefficiency of the temporary model and make people understand the benefits of the authentic technologies.

- Monetary profits involved with the alternate use of bagasse in paper and cardboard industries convinced the jaggery makers to use the crude form of fuel such as sugarcane trash, scrap plastic and even rubber. This step diluted the impact of the project but later on was restrained by community awareness camps and trainings explaining them the disadvantages of the same.

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- A photograph showing the construction of a brick-lined well or cistern. The structure is built with red bricks and mortar, forming a circular or semi-circular shape. A person is visible on the right side, working on the structure. The ground is dry and dusty.

A map of India with the state of Uttar Pradesh highlighted in red. A yellow dot is placed within the red area, indicating the location of the study. The text 'UTTAR PRADESH' is written in black capital letters above the red area.



Climate Change

ENERGY EFFICIENT TECHNOLOGIES

Mitigating Carbon Footprint and Enriching Lives



CEE
Centre for Environment Education



BACKGROUND

Saccharum officinarum commonly known as sugarcane belongs to Poaceae family with it's few varieties indigenous to India. India is one of the largest sugarcane producers in the world. Four million hectares of land is covered under sugarcane farming with the harvest of about 300 million tons of produce annually. As stated in the report of the sugar industry, the estimated sugarcane production is 289.23 million tons for the year 2008-09. Out of all the produce, Uttar Pradesh (UP) alone contributes 50% of the share. There are about 100 sugarcane mills in UP processing about 56 million tons of refined sugar. It has about 25,000 jaggery units and 50 khandsari units. Muzaffarnagar district of UP is the largest jaggery market in the world making UP earn the title of 'Sugar Bowl of North India'. Large quantities of jaggery are also produced in Haryana with minor productions in Punjab and Rajasthan.

The production process of jaggery involves open pan furnace that requires 1.9 quintals of bagasse per quintal of jaggery. This not only results in heavy amount of carbon dioxide (CO₂) emission from the furnace but also a considerable thermal loss due to it's crude construction, inappropriate dimensions and poor combustion that results in high fuel consumption.

Project Title
Technology demonstration and Capacity building in Energy saving rural jaggery making systems in selected clusters of North Indian states using 3-pan systems.

Geographical Areas
8-10 districts in Uttar Pradesh and Uttarakhand. Sample demonstrations in Punjab, Haryana, Madhya Pradesh and Rajasthan.

Project Time Period
2015-2017

SGP Grant Amount
₹ 23,58,000

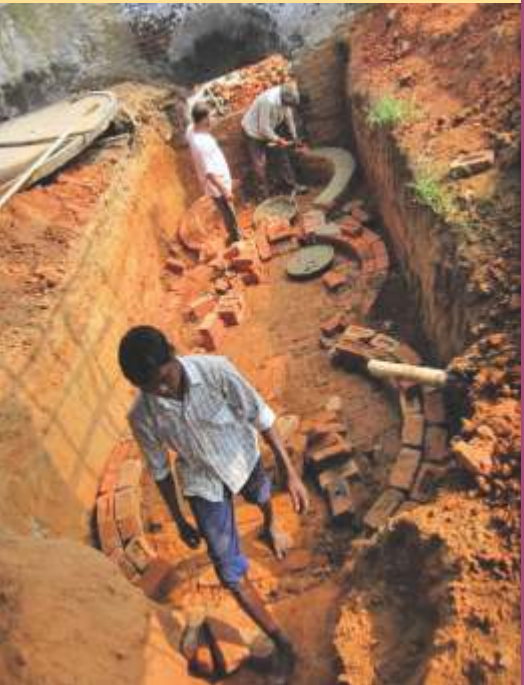
Co-Finance
Cash ₹ 9,20,822
Kind ₹ 16,74,959

GEF Thematic Area
Climate Change

To manage the current scenario, GEF-UNDP SGP funded the project and CEE- the national host institute along with SESS-CTD guided and implemented it at the grass-root level. It involves dissemination of improved energy-efficient 3-pan and 4-pan furnace technology in Western UP. It saves 22% of the sun-dried bagasse as fuel and reduces CO₂ emissions by 52.8 tons per year per furnace. The completely redesigned furnace geometry, with the strategic use of insulating materials in the design of 3 and 4 pan furnaces through an early project supported by Department of Science and Technology in the northern India. Disseminating technology and influencing the locals for adopting the technology are the primary goals to be achieved with the help of this project. As a promotional measure, the project provides around 50% of the cost of the new furnace and remaining 50% is met by the beneficiaries.

OBJECTIVE

- To install 50 improved Energy-saving 3-Pan Jaggery furnace as demonstration units in existing or new rural jaggery units in geographically well-distributed locations in different districts of Western UP, Uttarakhand, Haryana, parts of Punjab and Rajasthan where 3-Pan systems are in vogue.
- To build capacities of local NGOs and young entrepreneurs in the construction of Energy-saving jaggery furnaces for income generation and wider technology dissemination.
- To substantially increase incomes of rural jaggery makers, improve work conditions in rural jaggery units and recycle saved bagasse for other economically useful purposes (such as paper/cardboard), thus saving considerable energy and greenhouse gas emissions.



APPROACH

A low cost dissemination strategy has been adopted. The cost of setting up the furnace is borne equally by the beneficiary and funds from GEF SGP. The additional technical support (in the form of training and capacity building of masons) in setting up the furnace is extended by CTD. Once the potential beneficiaries are identified, the synergistic scope both in the form of labour or raw material is identified and leveraged to lower the cost further. In addition to the cost-sharing, some beneficiaries have offered to get a new design furnace installed at their farms as a demo unit. Jaggery-makers from surrounding villages are brought to these demonstration installations to see the benefits for themselves and discuss them with the project beneficiaries, CTD experts and amongst themselves. This spurs the demand and catalyzes widespread adoption of the new furnace in the region. Local masons, entrepreneurial youth and local NGOs are trained during the project to construct the new furnace and avail the opportunity presented by the envisaged demand for them.



PROJECT ACTIVITIES

Installation of Demonstration Units

To install 50 improved energy saving 3-pan and 4-pan jaggery furnaces as demonstration units in existing (retrofitted) or new rural jaggery units in geographically well distributed locations in different districts of western UP, Uttarakhand, Haryana and relevant neighboring parts of Punjab and Rajasthan. These furnace units serve to popularize energy saving jaggery system by showcasing its benefits through show and tell programs. 18 energy efficient furnaces have been installed in Muzaffarnagar and neighboring districts.

Community Mobilization

The project targets the individual beneficiaries. For mobilization of the 'jaggery makers' community, meetings were held either individually or in the presence of influential people that attracted a larger audience. To enhance the process further three local NGOs and two local entrepreneurs were identified. Such linkages not only helped in enabling beneficiaries and cluster identification but also in conducting workshops at ground level for creating awareness. The installation of 3-pan and 4-pan furnaces has helped to increase the technical know-how of the community members in the villages creating awareness about degradation of air quality due to old jaggery furnaces and also improving their overall capability and productivity.

Training and Capacity Building

The project aims at building the capacities of local NGOs and young entrepreneurs in construction of energy saving jaggery furnaces for income generation, wider technology dissemination and popularization. This step would help in making the task self-sustainable. The technical capacity of the local masons was developed, so they can act as technical experts in the design and the geometry of the furnace for different number of pans and fuels used. 16 local masons have been trained till date and CTD aims to familiarize them with the procurement of insulating bricks.

Linkages

The project aims to establish linkages with Petroleum Conservation Research Association (PCRA) to obtain support for further dissemination and subsidies for the beneficiaries in the long run in all the target regions. Further linkages were established with BMR Academy, Gurukul Jaryanpur, Haryana Vigyan Manch and Bharat Gyan Vigyan Samiti for technology popularization support. Linkages were established with State Councils for Science and Technology and also financial support for constructing new furnaces.

