



Sugar's Pressmud for Green Energy Production

For Prelims: Sugar's Pressmud for Green Energy Production, Compressed Biogas (CBG), [Ethanol Biofuel](#), [Biomethanation](#), Anaerobic digestion.

For Mains: Sugar's Pressmud for Green Energy Production, Indian Economy and issues relating to planning, mobilization of resources, growth, development and employment.

Source: DTE

Why in News?

India is viewing **Pressmud**, a residual byproduct of **Sugar**, as a valuable resource for green energy production by creating [Compressed Biogas \(CBG\)](#).

- India holds a key position in the worldwide sugar economy, emerging as the **foremost sugar producer** since 2021-22, surpassing Brazil. Additionally, it stands as the **second-largest sugar exporter** globally.

What is Compressed Bio-Gas (CBG)?

- CBG is a [Renewable](#), **environmentally friendly gaseous fuel** derived from the anaerobic decomposition of organic materials. It is produced through a process called [Biomethanation or anaerobic digestion](#), where various organic sources such as agricultural waste, animal manure, food waste, sewage sludge, and other biomass materials are **broken down by bacteria in the absence of oxygen**.
- The resulting biogas primarily consists of **methane (usually over 90%)**, carbon dioxide, traces of hydrogen sulfide, and moisture.
- To convert biogas into CBG, purification steps are employed to remove **impurities such as carbon dioxide, hydrogen sulfide, and moisture**.
- The purified methane gas is then compressed to a high pressure, typically around 250 bar or higher, hence the term "Compressed Biogas."

What is Pressmud?

- About:**
 - Pressmud, also known as filter cake or press cake, is a **residual byproduct in the sugar industry** that has gained recognition as a valuable resource for green energy production.
 - This byproduct offers Indian sugar mills an **opportunity to generate additional revenue by utilizing it as a feedstock for biogas production through anaerobic digestion**, leading to the creation of Compressed Biogas (CBG).
 - Anaerobic digestion is a process through which bacteria break down organic matter—**such as animal manure, wastewater biosolids, and food wastes**—in the absence of oxygen.
 - Typically, the yield of pressmud ranges from 3-4 % by weight with the **input sugarcane**

processed in a unit.

Note

Pressmud has the potential to yield approximately 460,000 tonnes of CBG, valued at Rs 2,484 crore, considering the minimum guaranteed price set by the central government's [Sustainable Alternative Towards Affordable Transportation scheme](#) (SATA)

▪ Advantages of Pressmud Utilization for CBG Production:

- **Fewer Complexities:** Its advantageous qualities include consistent quality, simplicity in sourcing, and **fewer complexities compared to other feedstocks**.
- **Simplified Supply Chain:** It eliminates the **complexities associated with the feedstock supply chain**, as found in the case of agricultural residue, where biomass harvesting machinery is required for harvesting and aggregation.
- **Single Sourcing:** The **feedstock is sourced from one or two producers or sugar mills**, as opposed to agricultural residue, which involves **multiple producers / farmers** within a narrow window of 45 days per year.
- **Quality and Efficiency:** Quality consistency and higher conversion efficiency, requiring **less feedstock quantity compared to alternatives** like cattle dung.
 - Approximately 25 tonnes of pressmud are needed to produce a tonne of CBG. In comparison, cattle dung requires 50 tonnes for the same gas output.
- **Cost-effectiveness:** Lower cost (Rs 0.4-0.6 per kilogramme) compared to other feedstocks like agricultural residue and cattle dung. It eliminates **pretreatment costs as it lacks the organic polymer lignin**, unlike agriresidue.

▪ Challenges Faced by Pressmud Utilization:

- Pressmud faces challenges such as **escalating prices**, competition for usage in other industries, and **storage complexities** due to gradual decomposition, necessitating innovative storage solutions.
 - As an organic residue, **it is sought after in sectors like animal feed, bioenergy production** (for biogas or biofuels), and agricultural soil amendments. This competition can sometimes **limit its availability or increase its cost for specific applications**.

What is India's Pressmud Production landscape?

▪ Production Statistics:

- In the fiscal year 2022-23, India's sugar **production reached 32.74 million tonnes, generating about 11.4 million tonnes** of pressmud.

▪ Sugarcane Growing States:

- The primary sugarcane-growing states, notably Uttar Pradesh and Maharashtra, contribute **significantly, covering approximately 65 % of India's total sugarcane cultivation area**.
 - Key sugarcane-producing states include Uttar Pradesh, Maharashtra, Karnataka, Tamil Nadu, and Bihar, accounting for a substantial portion of India's overall sugarcane production.

Way Forward

- To harness the full potential of pressmud for CBG production, various interventions are crucial:
 - **State-level Policies:** Implementation of supportive bioenergy policies by states, streamlining approval processes and offering incentives.
 - **Price Control Mechanisms:** Establishing mechanisms to control pressmud prices and encouraging long-term agreements between sugar mills and CBG plants.
 - **Technological Advancements:** Research and development for efficient pressmud storage technologies to prevent methane emissions and minimize gas loss.
 - **Training Initiatives:** Conducting training sessions for CBG plant operators on plant

operations, scientific equipment handling, and feedstock characterization.

UPSC Civil Services Examination, Previous Year Questions (PYQs)

Q.1 The Fair and Remunerative Price (FRP) of sugarcane is approved by the (2015)

- (a) Cabinet Committee on Economic Affairs
- (b) Commission for Agricultural Costs and Prices
- (c) Directorate of Marketing and Inspection, Ministry of Agriculture
- (d) Agricultural Produce Market Committee

Ans: (a)

Q.2 With reference to the current trends in the cultivation of sugarcane in India, consider the following statements: (2020)

1. A substantial saving in seed material is made when 'bud chip settlings' are raised in a nurse, and transplanted in the main field.
2. When direct planting of setts is done, the germination percentage is better with single budded setts as compared to setts with many buds.
3. If bad weather conditions prevail when setts are directly planted, single-budded setts have better survival as compared to large setts
4. Sugarcane can be cultivated using settlings prepared from tissue culture.

Which of the statements given above is/are correct?

- (a) 1 and 2 only
- (b) 3 only
- (c) 1 and 4 only
- (d) 2, 3 and 4 only

Ans: (c)

Exp:

- Tissue Culture Technology
 - Tissue culture is a technique in which fragments of plants are cultured and grown in a laboratory.
 - It provides a new way to rapidly produce and supply disease-free seed cane of existing commercial varieties.
 - It uses meristem to clone the mother plant.
 - It also preserves genetic identity.
 - The tissue culture technique, owing to its cumbersome outfit and physical limitation, is turning out to be uneconomical.
- Bud Chip Technology
 - As a viable alternative of tissue culture, it reduces the mass and enables quick multiplication of seeds.
 - This method has proved to be more economical and convenient than the traditional method of planting two to three bud setts.
 - The returns are relatively better, with substantial savings on the seed material used for planting. Hence, statement 1 is correct.
- The researchers have found that the setts having two buds are giving germination about 65 to 70% with better yield. Hence, statement 2 is not correct.
- Large setts have better survival under bad weather but single budded setts also give 70% germination if protected with chemical treatment. Hence, statement 3 is not correct.
- Tissue culture can be used to germinate and grow sugarcane settlings which can be transplanted later in the field. Hence, statement 4 is correct. Therefore, option (c) is the correct answer.

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