SAHYOG BIOMASS INVENTORY

Presented by:

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India

SEVENTH FRAMEWORK PROGRAMME

Department of Biotechnology
Ministry of Science & Technology
Govt. of India

Objectives of SAHYOG

- **To bring together leading organisations in the field of biomass production and bio-waste conversion research, carried out within EU research programmes and related programmes by Indian national institutions.**

- **Inventories of biomass and biowaste potential and research projects** are planned to be elaborated and analysed within SAHYOG.

- **These inventories will be the basis for the joint Strategic Research Agenda (SRA) finally leading to a Roadmap for policy makers and researchers.**

- **SAHYOG will ensure wide-range networking of relevant industries and scientific communities and establish linkages between on-going research and innovation projects from EU and India.**

Need for Biomass Inventory…..!!

- To assess the biomass potential of India, under various biomass sources like agriculture, fisheries, industrial biomass and MSW.

- Since there is no updated information on the availability and utilization of various Biomass and Biowaste, inventorization will help in addressing the missing links.

SAHYOG Partners in India

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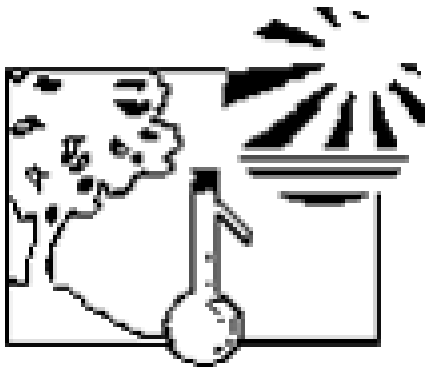

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Methodology for Biomass inventory

Data Collection:

- **Collection and compilation of information on biomass (last five years duration).**

- **Visits to Agricultural Universities, State Agricultural and Forest Departments, Central and State Research organizations and several Institutes of National importance.**

- **Collection of data from various sources (Reports, manuscripts , reviews, books, relevant online sources, Universities/ Institutes library and resource persons).**

On the basis of the methodology followed, states were distributed amongst the Indian partners

JNU - Rajasthan, Haryana, Himachal Pradesh

TERI - Punjab, Municipal waste (India), Forest residue (India), Pan India

GBPUAT - Gujarat, Uttarakhand, Uttar Pradesh

ARTI - Maharashtra, Chhattisgarh, Madhya Pradesh ,Goa

TU - North East Region

IICT - Andhra Pradesh, Karnataka, Tamil Nadu, Kerala

POINTS FOR CONSIDERATION FOR FINALIZING THE COMMON INVENTORY SHEET

- Use of common Units for amount of biomass.
- Availability of vast varieties of biomass both in India and EU.
- Large areas under biomass cover both in India and EU.

- To ease out the compilation and comparison of information of both India and EU.
- To include all the possible data reported from relevant sources
- To compile the most recent data available in the sheets.

The final sheet was designed in a way to provide a common platform for comparison of Biomass between EU and India.

Sources of Pan India Biomass Inventory

The following sources were taken into consideration for compiling the data:

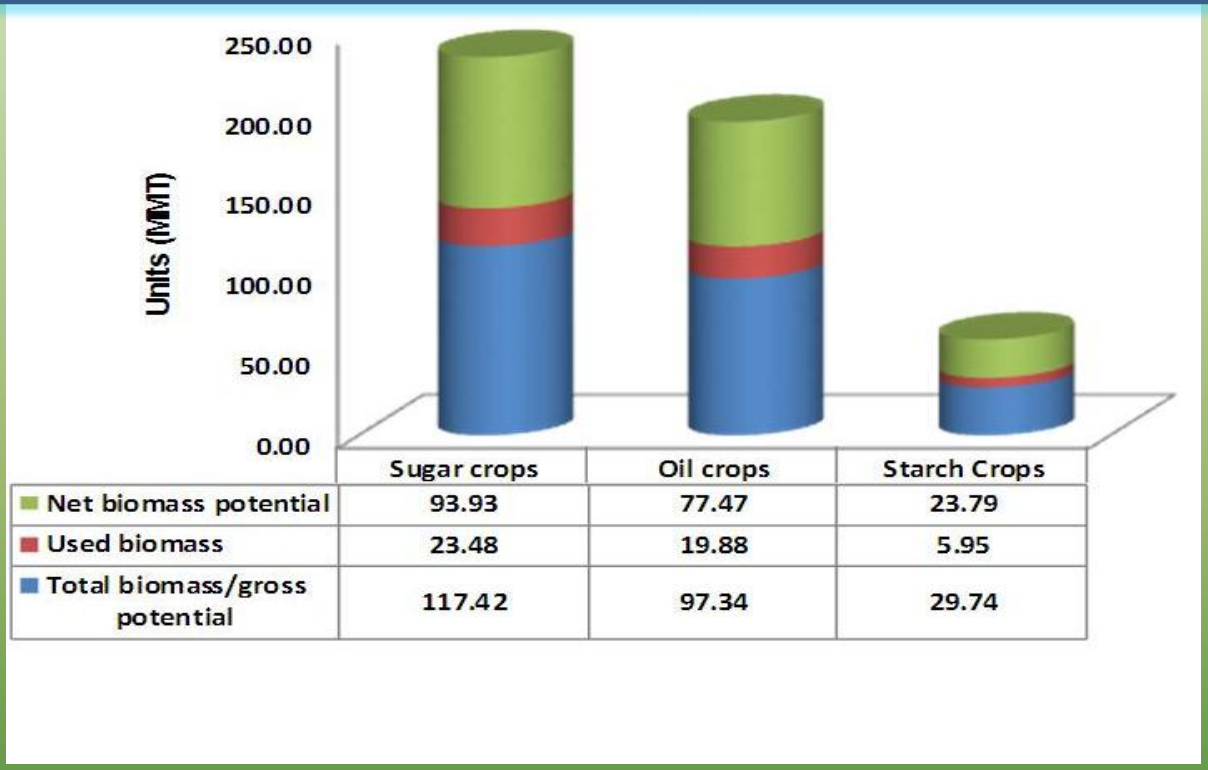
- **Indiastat website (www.indiastat.com)**
- **RBI database**
- **Directorate of economics and statistics (http://eands.dacnet.nic.in)**
- **TIFAC (2009 report) (provided information on biomass availability, surplus biomass etc. but was based on extrapolation from primary production data of 2007-08).**
  (Technology Information, Forecasting and Assessment Council)

Final Biomass Inventory Sheet

Biomass source		Total biomass/gross potential		Used biomass		Net biomass potential[2]		Energy content[3]			Conversion process	Geographical location	Source/link	Reference year	Notes
		Tons[1]	m^3	Tons	m^3	Tons	m^3	MWh	TJ	Ktoe					
A) Biomass from forestry															
	1) Direct supply of wood biomass from forests and other wooded land for energy, materials and chemicals production														
	2. Indirect supply of wood biomass for energy, materials and chemicals production														
B) Biomass from agriculture and fishery															
	1. Agricultural crops and fishery products directly provided for energy, materials and chemical production														
	2. Agricultural by-products / processed residues and fishery by-products for energy, materials and chemicals production														
C) Biomass from wastes															
	1. Biowastes														
	2. Biodegradable fraction of industrial														
	waste (including paper, cardboard,														
	pallets)														
	3. Sewage sludge														
	4. Landfill gas														

Results of Biomass Inventory:

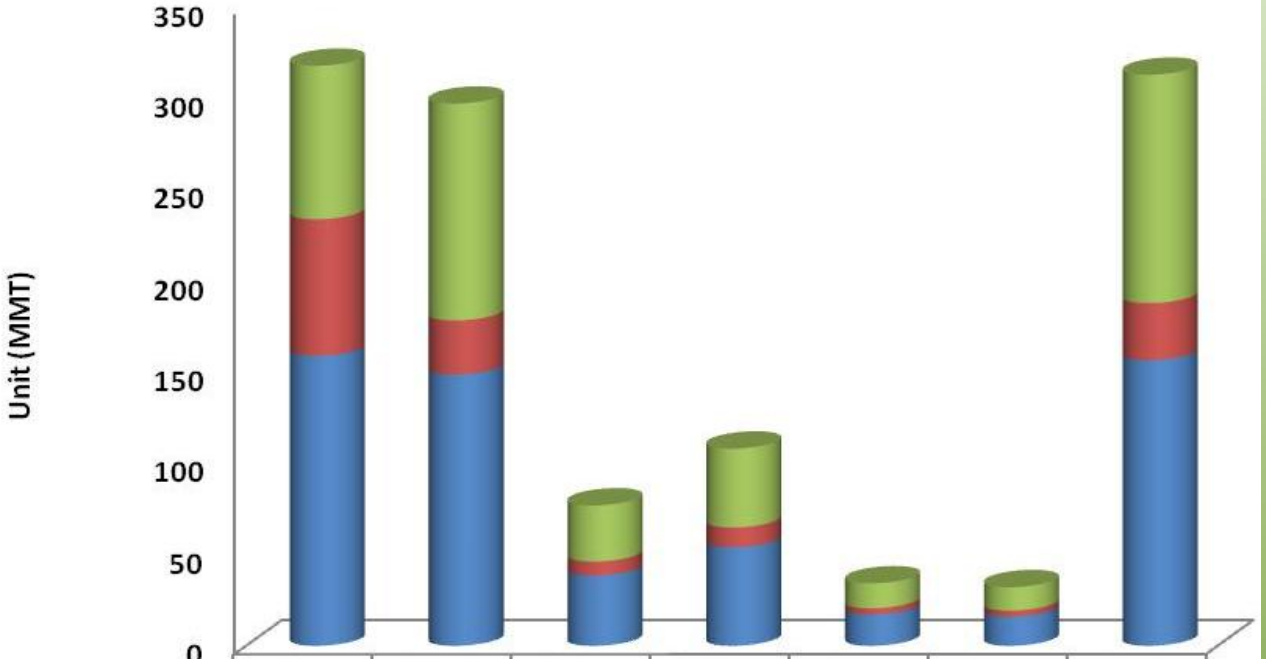
Biomass from Sugar crops, Oil crops and Starch crops



	Sugar crops	Oil crops	Starch Crops
Net biomass potential	93.93	77.47	23.79
Used biomass	23.48	19.88	5.95
Total biomass/gross potential	117.42	97.34	29.74

- The major biomass sources which come directly from agricultural land consist of Sugar crops (117.42 MMT) followed by Oil crops (97.3 MMT) and Starch crops (29.74 MMT)

Biomass from Other crops (Pulses, cereals, cash crops)



	Rice	Wheat	Maize	Pulses	Bajra	Jowar	Cash Crops
Net biomass potential	84,118	118,816	30,765	43,216	13,693	12,862	125,154
Used biomass	74,772	29,704	7,691	10,804	3,423	3,216	31,288
Total biomass/gross potential	158,890	148,520	38,456	54,020	17,116	16,078	156,442

- **The other crops which mainly constitute for high biomass are Rice (158.89 MMT), Wheat (148.52 MMT) and Cash crops (Cotton, coconut, tea, coffee) (156.44 MMT). Also crops like pulses and cereals (Maize, Bajra and Jowar) contribute significantly.**

Data on Forest Biomass:

According to the State Forest Report (2012), in India, there has been a decrease in the forest cover from 6414 Million cu m in 2003 to 6098 Million cu. m in 2009, as a result of deforestation, urbanization and industrialization.

Thus, there are legal implications for usage of forest biomass as a substrate for its conversion to bioenergy by Ministry of Environment and Forests, India.

Biomass scenario in india

- According to BIOENERGY INDIA-Ministry of New and Renewable Energy, Government of India, Issue 7 – January – March 2011, the availability of biomass in India is estimated at about 500 million metric tons per year.

- Ministry of New and Renwable Energy (MNRE) has estimated biomass availability at about 120-150 million metric tons per annum covering agricultural and forestry residues corresponding to a potential of about 18,000 MW. In addition to this, about 5,000 MW additional power could be generated through bagasse based cogeneration in the country's 550 sugar mills.

- **According to MNRE, India generates nearly 700 million tons of biomass agri-residue every year, of which about a fifth can be used to generate up to 17 GW of power. MNRE estimates that another 34 GW can be produced from forest residue and waste land energy plantations.**

- **In India, sugar industry has been traditionally practicing cogeneration by using bagasse as a fuel.**

- **About 32% of the total primary energy use in the country is still derived from biomass.**

Biowaste scenario in India

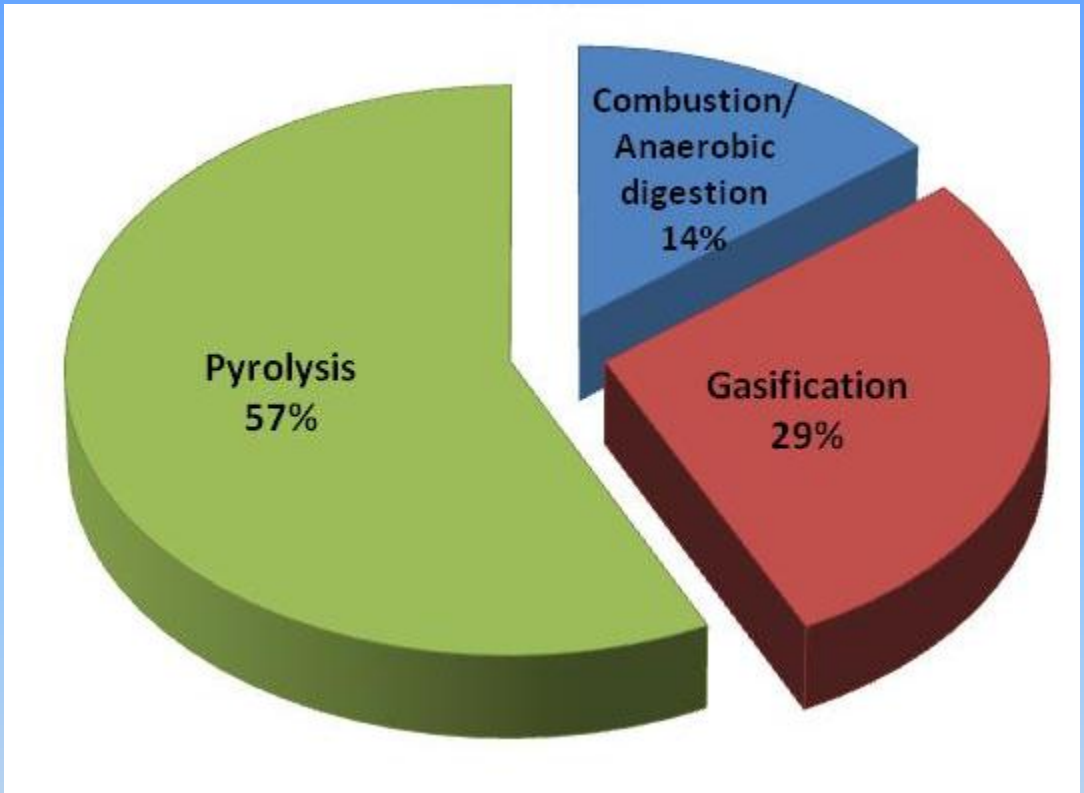
- **Amongst the four geographical regions in India, Northern India generates the highest amount of MSW (40,500 Tons per Day (TPD) or 14.8 million Tons per Year (TPY) constituting around 30% of total MSW generated in India.** **(Cental Pollution Control Board, CPCB report: CUPS/70/2009-10).**

- **Amongst the other states, Maharashtra (22,200 TPD or 8.1 million TPY) tops the list.** **(A report on Sustainable Solid waste Management in India by Ranjith Kharvel Annepu, Columbia University Sponsored by the Waste-to-Energy Research and Technology Council (WTERT), 2012).**

Biowaste Pan India data Included in the Inventory

- **Total available biodegradable fraction of waste that can be generated from the country was estimated at 25542726.84 TPY.** (Source: A report on Sustainable Solid waste Management in India by Ranjith Kharvel Annepu, Columbia University Sponsored by the Waste-to-Energy Research and Technology Council (WTERT), 2012)
- **Total sewage sludge generated in India is 1420.8126 TPD and its expected Power potential estimated as 226.94 MW.** (source: Cental Pollution Control Board Report)

Types of conversion processes



The type of conversion processes used for conversion of biomass to energy as identified in India are Pyrolysis (57%), Gasification (29%) and Combustion / Anaerobic digestion (14%).

However now-a-days, greater emphasis is on the Anaerobic digestion and biorefinery methods.

Bottlenecks of Biomass inventorisation

- For agricultural data, the total amount of residues (actual biomass) was calculated using CRR (crop to residue ratio) but the data for used and surplus residues (net biomass) was not available.

- TOF (Tree outside forest) data is present in scattered form and no information on its consumption is found with the ministry or on web.

- Short rotational forestry and energy plantation has been reported from some regions (eg. North East Region) but there is no Pan India data base available (State Forest Report, 2012).

Bottlenecks continued…

- Data for industrial waste generated is not available since there is no reported data indicating the actual amount of industrial wastes from the entire country.

- Since the amount of MSW generated in whole country was not available, thus extrapolations were done on the basis of population. (Source: A report on Sustainable Solid waste Management in India by Ranjith Kharvel Annepu, Columbia University Sponsored by the Waste-to-Energy Research and Technology Council (WTERT), 2012).

  For more details on Biomass inventories, please visit http://www.sahyog-biomass-database.eu.

CONCLUSIONS

1. The Biomass inventory has been compiled reflecting the major sources of biomass in India as agricultural crops, oil crops and agricultural residue like husk, straw, stover and cob.
2. There is no information on forest biomass as there are legal implications on its utilization/exploitation. This needs to be explored in future.
3. Proper maintenance of records of the waste generated from all the sources like agriculture, MSW, sewage sludge and industries is lacking. Segregation of different types of waste will help in proper utilization of biomass and technology implementation.

Thank You

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