

2. Bio-energy potential from crop residues

Aim

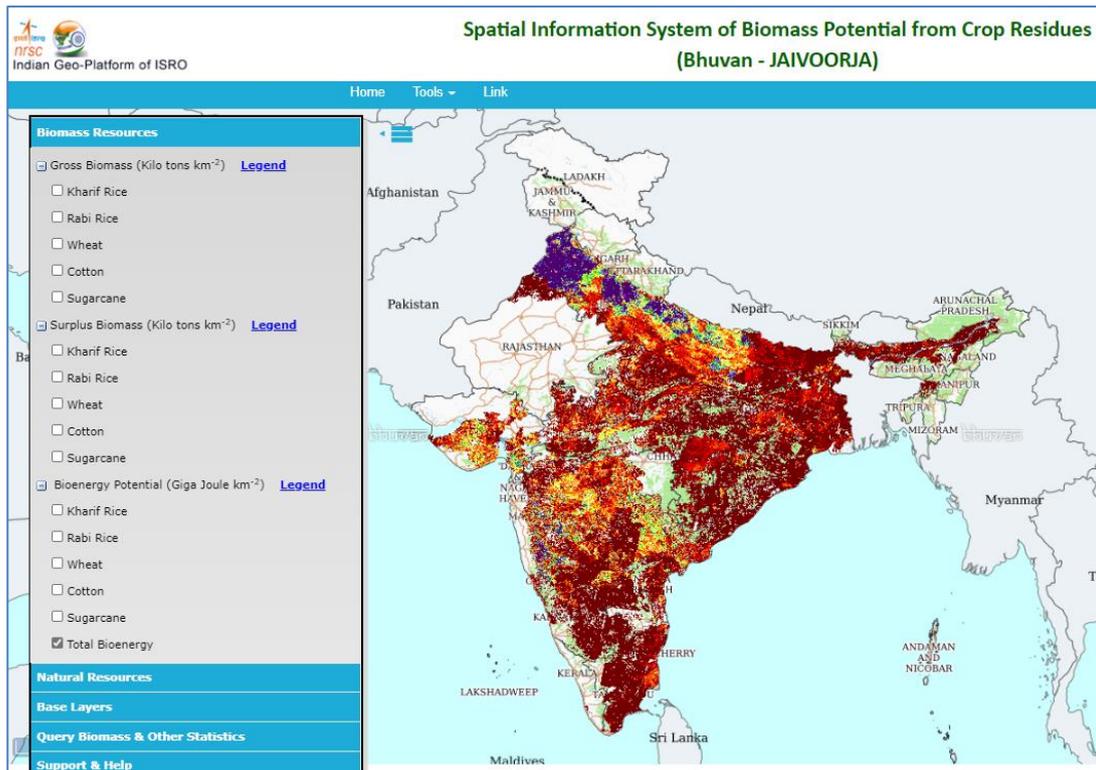
As per COP26 commitments, India would reach 500 GW of non-fossil energy capacity by 2030 and achieve net zero emissions by 2070. Agriculture residues are an essential source of renewable energy. Besides sugar-based ethanol generation, residues from different crops rich in cellulose and hemicellulose are used for producing 2-G ethanol through an enzymatic process. With a gross cropped area of 195 M ha covering multiple crops, a large pool of residue biomass is available across India. Effective utilization of such biomass leads to a sustainable, secure, and economically-stronger future in providing domestic clean energy, reducing fossil fuel imports, and creating new employment opportunities in rural India. However, energy from crop residues has yet to be effectively utilized in India due to information gaps on its availability causing supply chain issues, land use constraints, policy incentives, etc.

NRSC (ISRO), in collaboration with Technology Information Forecasting and Assessment Council (TIFAC), DST has generated a systematic geospatial database on biomass residues from four major crops and created a digital platform to visualize, annotate, delineate and query towards informed decision-making.

Scope

Satellite-based crop maps, primary productivity, secondary data on crop production estimates, and biomass utilization patterns were ensembled using a data fusion technique in this endeavor. Maps of gross and surplus biomass residues and the bioenergy potential of four crops (rice, wheat, cotton and sugarcane) were generated at a scale of 1 km. A unique spatial information system called BHUVAN-JAIVLOORJA has been developed using the information generated and other thematic data, along with the administrative layers, for the stakeholders in the biofuel/ biomass-based industries (<https://bhuvan-app1.nrsc.gov.in/bioenergy/home/>).

The query module of BHUVAN JAIVLOORJA provides information on crop residue biomass availability over a location from its fetch area defined by the user. A brief report on the proposed site can be generated, detailing all the above information in tabular and pictorial form. Such a report provides comprehensive information on biomass availability and associated infrastructure, logistics, etc., for decentralized planning and optimal utilization of biomass resources. A video file demonstrating the web-portal and query module is available at https://bhuvanapp1.nrsc.gov.in/bioenergy/documents/bhuvan_jaivoorja_tutorial.mp4, enabling user-friendly navigation into the portal.



Current constraints/challenges

- The current database includes only four dominating crops in India.
- Year-to-year variability due to changes in cropping pattern or climatic perils is not accounted for.
- The database is static and represents the potential surplus biomass available from the growing area. The calorific values of the crop and residue production ratios are taken from the published sources/literature.
- The physico-chemical properties of the crop residues are not accounted for in the present form.

Expected Outcome

The biomass maps can be used by the concerned departments and industry developers to assess the availability of crop residues over an area. Identifying prospective areas/zone for setting up industries can also be done. Provision for the amount and type of crop residues (rice, wheat, cotton, and sugarcane) over an area will help to set up tailor-made biofuel plants. Geospatial information on wasteland/water bodies/fallows for industry use and infrastructure details like major road networks, railways, and petrol pump locations will support the logistics.

Timeframe

Upscaling the study to include more crops will take 3-4 years.