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## BIOMASS ENERGY GENERATION IN RAJASTHAN: A STUDY OF POTENTIAL AND DEVELOPMENT IN DESERT ECOLOGY

### Doctoral Dissertation Abstract (2012)

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Sustainable energy means use of resources in a manner that provides ongoing energy to meet the needs of the current population without compromising the requirements of the future generations. To achieve this balance, energy must be replenished, environmental harms must be minimized and cost must be affordable. Renewable energy forms the basis of sustainable development. It aims to preserve quality of environment and the world natural resource base for future needs and thus preserves the earth's life support system.

Considering the energy crisis around the world and in India, now there is an urgent need for transition from petroleum based energy system to renewable resources in order to decrease reliance on depleting reserves of fossil fuels and to mitigate climate change.

#### **Aims and Objectives**

A few specific objectives of the study are:

- To find out the potential of biomass energy resource and their quantitative and qualitative spatial variation in Rajasthan.
- To exploit the possibilities of utilizing agro-waste, cow-dung and non-edible oil seeds of *Jatropha* for bio-electricity, biogas and bio-diesel production respectively.

- To analyse the impact of these bio-energy sources on the sustained socio economic development of Rajasthan.
- To suggest a suitable and useful way to solve the existing problem of power crisis in the state through bio-energy sources.
- To highlight constraints and future prospects of development of renewable energy resources in Rajasthan.

#### **Data Base and Methodology**

The study is based on the collection of secondary and primary data. Secondary data have been collected from concerned department and offices such as RREC, Agricultural Department of Rajasthan, Jaipur Municipal Corporation and Biofuel Authority in Rajasthan etc.. Census reports and statistical abstract of Rajasthan were also used to collect information.

The primary data were collected through field survey work. Case studies of the biomass based power plants have been done. A questionnaire has been prepared for interviewing the entrepreneurs. The questionnaire filled by the unit members has provided the systematic knowledge of various activates related to the power plants.

The collected data have been computed

by different statistical methods and results are drawn to find out the potential and development of energy generation in Rajasthan through biomass. Geographical tools like maps, statistical diagrams and table have been used to interpret the results.

The study is divided into seven chapters. The thesis starts with the introduction which throws light on the various types of energy resources and also gives the gist of biomass energy potential in Rajasthan. After this it comprises the hypothesis, objectives of the study, data base and methodology adopted to test the hypothesis.

The first chapter provides the detailed overview of the renewable energy scenario in India. It described the potential and development of various renewable energy sources including wind energy, solar energy, geothermal energy, small hydro power, tidal energy and bio-energy.

The second chapter comprises the renewable energy scenario in Rajasthan. The chapter covers the geographical background of the state which entails the location and extent, physiography, climate, rainfall, drainage pattern, various types of soil and natural vegetation of the region. The chapter also deals with the various government policies and planning for renewable energy development.

The third chapter deals with the bio-energy and application of various biomass resources in sustainable energy development. Various technologies used for bio-energy generation have also been discussed in this chapter.

Chapter four presents the potential use of crop residue for bioelectricity generation in Rajasthan along with technological principles and locational demands. Development and future prospects of bioelectricity in Rajasthan have also been mentioned with the case study of biomass power plant.

Chapter five analyses the potential of

biogas as a renewable energy resource in Rajasthan by assessing the availability of animal waste (cow dung), municipal solid waste (MSW) and human waste (Waste water and Night soil). Case studies of the gobar gas plant, sewage treatment plant and night soil based biogas plant have also been described in the chapter.

Chapter six shows the potential of biodiesel from *Jatropha* on the wastelands of Rajasthan. A comparative analysis of biodiesel production in eastern and western part of Rajasthan has been done due to varied agro climatic conditions for *Jatropha* cultivation in these regions. A Bio diesel plant located at Jhamarkotra Mines in Udaipur has also been mentioned in the chapter as a case study.

The final chapter seven is the concluding chapter for showing the potential and prospects of bioenergy in Rajasthan. It also views them as means for energy conservation and sustainable development. The chapter also includes the justification of hypothesis undertaking for the research work.

The NULL HYPOTHESIS undertaken for testing the main hypothesis has been nullified (rejected) as Rajasthan is quite rich in various biomass resources in the form of cow-dung, agricultural-residue and wasteland for *Jatropha* cultivation.

### **Future Prospects**

Bio-energy can play a major role in reducing the reliance of Rajasthan on fossil fuels by making use of various biomass conversion technologies. There is utmost need to adopt a holistic approach to elevate the bio-resource status in Rajasthan. It requires sound planning considering the agro-climatic, social, economic and technological aspects. Apart from meeting the rural energy demand, such programmes generate local employment (production and processing of wood feedstock,



operation of biogas and producer-gas systems), promote self-reliance, and improve the quality of life, especially of women and rural poor. Even though bio-energy provides significant environmental and social benefits, large-scale shift towards this option cannot be realized in the absence of a whole range of policy measures.

A well-established network between the government, local people, NGO's together with technical expertise and financial backup will help in building a society sustaining on bio-

energy. The government should provide a facilitating environment and infrastructure to the farmer, bio-fuel enterprises and researchers so that eventually the nation can move towards energy independence.

There is no reason to believe that if so desired why the 'Desert State' cannot touch the heights of development and can make a place for itself in the galaxy of other developed states of the country with the development of Green Bio-energy.