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FUTURE SCOPE OF BIOENERGY IN BHIWANI DISTRICT (HARYANA)

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ABSTRACT

Bioenergy is "energy derived from recently living material such as wood, crops, or animal waste." Bioenergy crops are defined as any plant material used to produce bioenergy. These crops have the capacity to produce large volume of biomass, high energy potential, and can be grown in marginal soils. Bioenergy can contribute to reducing the overall consumption of fossil fuels. It can take the form of solid material (biomass) for combustion or liquid products (Biofuels) that can be used to power vehicles. Bioenergy crops can help to fulfill the requirment of rural industries and boost up the rural economy. Present s tudy emphasis on the Future scope of bioenergy in Bhiwani District (Haryana).

Keyword: - Bioenergy , Biomass, Fossil Fuel, Rural economy

Introduction

Bioenergy consists of organic matter derived from trees, plants, crops or from human, animal, municipal and industrial wastes (Meshram and Mohan, 2007). It can take the form of solid material (biomass) for combustion or liquid products (Biofuels) that can be used to power vehicles. Both biomass and Biofuels can be derived from dedicated energy crops, agricultural coproducts or waste materials. Switchgrass (Panicum virgatum L.), elephant grass(Pennissetum purpureum Schum.), poplar (Populus spp.), willow (Salixspp.), mesquite (Prosopis spp.), etc. have been touted as the crops with the most widespread promise (Dipti and Priyanka 2013).

Historically, biomass has been a major source of households energy in India. Biomass meets the cooking energy needs of most rural households and half of the urban households

(Shukla,1996). Despite significant penetration of commercial energy in India during last few decades, biomass continues to dominate energy supply in rural and traditional sectors. Estimates of the share of biomass in total energy in India varies from nearly a third (36%) to a half (46%) of total energy (Ravindranath and Hall, 1995). Biomass energy constitutes wood fuels (including charcoal, wood waste wood), crop residues (such as bagasse, rice husk and crop stalks) and animal dung (including biogas). Wood fuels contribute 56 percent of total biomass energy in India (Sinha et. al, 1994). According to the report of the National Council for Applied Economic Research (NCAER, 1985), biomass fuels contributed 90% energy in the rural areas and over 40% in the cities. According to this report, twigs accounted for 75% of household energy needs. The household energy consumption thus appears scarcely a cause of deforestation. Biomass energy is used by over a two thirds of Indian households.Bioenergy can be used to produce fuel for the transport sector or through biomass combustion to produce heat and/or power. Biofuels appear to be the most viable low carbon transport fuel option in the short to medium term. With rising energy costs and uncertainty of fossil fuel reserves, it's important to oversee cheaper, safer, and more renewable forms of bio-energy. As a supplemental alternative energy to coal, bio-energy crops could play an important role as environmentally safe and economically profitable.Energy crops act as filter systems/ supplemental crops for pollution control as they remove pesticides and excess fertilizer from surface water before it pollutes groundwater or streams/rivers. They can protect a stream's bank and water from erosion, siltation, and chemical runoff and can still be harvested for energy.Research has also shown that energy crops have increased soil stability, decreased surface water runoff, decreased transport of nutrients and sediment, and increased soil moisture, in comparison to traditional crops.

Energy crops may also protect natural forests by providing an alternative source of wood, which can be grown on farm or pasture land that is no longer suitable for traditional row crops. Bioenergy-driven restoration of degraded ecosystems can alsoincrease terrestrial carbon sequestration due to large biomass production and root residues as well as slowing decomposition of soil organic materials under no-till conditions.Biomass produced from fields consists of residues (straw tops etc.) and specifically cultivated crops (for example, Poplar, rapeseed, maize). Not all residues are available for bioenergy production because they are needed for livestock feed and litter and to maintain soil fertility Biomass is a heterogeneous aggregation of different feedstock's, conversion technologies, and endues with different traditional and connotations in different parts of the world. Traditional biomass provides 38±**10** EJ/yr as fuel wood, manure, and other forms(Smeets et al., 2007). Estimates of the bioenergy production potential vary from 33 to1135 EJ/yr due to the uncertainty of land availability and yield of bioenergy crops (Hoogwijk et al., 2009). The grand challenge for biomass production is to develop crops with a suit of desirable physical and chemical traits while increasing biomass production by a factor of 2 or more (Lal, 2008a). Crop residues and dedicated bioenergy crops together constitute 3 – 9 EJ of bioenergy potential. Conventional grain and oilseed crops and crop residues, perennial herbaceous and woody crops, perennial oilseed crops, halophytes, and algae, among others, are candidate bioenergy crops and are expected to combat global climate change (Eisenbies et al., 2009).On the basis of biomass production and their use as energy crop they are classified As Traditional Bioenergy crops, First generation bioenergy crops (FGBECs), Second generation bioenergy crops (SGBECs), Third generation bioenergy crops (TGBECs), Dedicated bioenergy crops (DBECs). DEC has been proposed as a strategy to produce energy without impacting food security or the environment. Their Genetic resources requirements for biological, chemical or physical pretreatment are more environmentally friendly and will contribute more to global climate change mitigation (Petersen, 2008). They are beneficial in providing certain ecosystem services, including Carbon sequestration, biodiversity enhancement, salinity mitigation, and enhancement of soil and water quality. crops include trees and shrubs such as Eucalyptus(*Eucalyptus* spp.), Poplar (*Populus* spp.), Willow (*Salix* spp.), and Birch (*Betula* spp.); sweetSorghum (*Sorghum bicolor*);and non-edible oil crops such as castor bean (*Racinus communis*), Physic nut (*Jatropha curcas*), oil radish (*Raphanus sativus*), and Pongamia (*Pongamia* spp).

STUDY AREA

The study is conducted in Bhiwani district Haryana. It is located between latitude 28°19' N and 28° 15 N and longitude 75° 28' E to 76° 28E'. The area is bounded in north by Hisar district in the East by Rohtak district in the South by Mohindergarh district of Haryana and Jhunjhunu district of Rajasthan. Bhiwani district has a total area of 5140 sq.km. (12% of Haryana). The amount of rainfall in Bhiwani District is about 483 mm mainly in the month of July and August. Soil of this district is loamy in North region and Sandy in South West region. The district does not have any seasonal and perennial river. The main source of the water is the canal net work of Bhiwani District. This area is semiarid. The vegetation is scattered and irregular in the age and density. The common plant species are *Acacia nilotica* (kikar) and *Delbergia sisoo* (shisham). Strip forests are present in this area. In Bhiwani district xerophytes vegetation in present. According to the champion and Seth 1968 bone pioneer of revised survey of the forest type of India. Acc. to this survey we categorized the forest of Bhiwani into tropical Dry

Deciduous forest category 6B.Vegetation of Bhiwani district is scattered and Patchy (Sharma, Yadav, Parwari and Hooda 2013, Champion and Seth 1968).

MATERIAL AND METHOD

The present work depend upon the survey and observation. The observation taken with the help of natives and ethano botanical knowledgeable persons.Study was conducting during July 2014-April 2015 . The survey for bioenergy crops were conducted in the Bhiwani during the different seasons through regular field visits. D,uring our field visits plant sample were collected from agriculture lands, natural habitat ,wastelands,roadsides,railway track,park,ponds and relevent localities to cover almost all the district in a systematic manner. Identification was done with the help of various floras(Mishra and verma 1992) and live specimens in field itself.

DISCUSSION

India, being the second highest populated country in the whole world, has about 16% of the world's total population concentrated in slightly more than 2% of the world's land area, a population which is growing annually at a rate of 2.3%. The land to man ratio and forest to man ratio have rapidly declined with the radical demographic changes. The per capita forest area had been reduced from about 20 ha in 1951 to 0.11 ha in 1981 with further trends of reductions in subsequent years. The remnant forests have come under relentless pressures of encroachment for cultivation, and unsustainable resource extraction rendering the very resource base, unproductive and depleted of its biodiversity. The unsound development strategies have led to increasing threats to biodiversity resources by way of illegal encroachment of 0.07 million ha of forest, cultivation of 4.37 million ha and diversion of forest for river valley projects (0.52 million ha), industries and townships (0.14 million ha), transmission lines and roads (0.06 million ha) and an additional 1.5 million ha for miscellaneous purposes (TERI, 1999).Forest Department Bhiwani (2006) conducted studies on two biofuel species. One is Pongam oil tree or Badam Paparhi (***Milletia pinnata***) (=***Pongamia pinnata)*** and other is *Jatropha curcas*. Later was planted over an area of 6 hectares at Jhumpa Research Station in Bhiwani district in the year 2006. ***Jatropha curcas*** plants here as well as in other parts of Haryana have been severely affected by frost during winter. All plants die as a result of frost bite followed by dieback disease. Every year new shoots emerge from the ground following the summer season. On the basis of poor seed yield, diseases and other parameters we have concluded that *Jatropha* cultivation is not economically viable in Haryana.However, large-scale bioenergy, if not done carefully, could lead to a further degradation of land, water bodies, and ecosystems. For the large-scale use of commercial biofuels to be consistent with sustainable development goals will require a concerted move towards sustainable agriculture. It will also require that markets be redesigned to benefit the rural poor in the developing world to provide more employment opportunities and better terms of trade.

RESULT

Haryana is an agricultural rich State with a potential abundance of crop residues and processing residues available for generation of productive energy both for captive industrial use and for grid supply of surplus electricity. Biomass can be produced from crop residues, agro industries residues, waste from barren un-cultivable land and forest.This biomass can be used for generation of steam & electricity through cogeneration technology. Co-generation as a technology has been in existing for over several decades now, but was not given due attention by the industrial sector as cheap power and fuel were abundantly available. However, after the 1970, the energy crises has forced industries to adopt energy efficient technologies and reduced excessive dependency on external energy supply. Co-generation has a significant role to play not only because it is an energy efficient and environmentally sound technology but also because of the large untapped potential in the Industry. Biomass cogeneration is the most economic viable proven technology to fulfill thermal and electric requirement of industries using locally available biomass. This technology is most suitable for the State like Haryana where Biomass is available in abundance being the agriculture rich state. HAREDA is promoting this technology by creating awareness among the industries by organizing seminars and workshops. Ministry of New & Renewable Energy, Govt. of India is also providing Central Financial Assistance @ Rs. 20.00 lacs per MW capacity. It is estimated that, 16 MT gross residue is available in Bhiwani on annual basis from the 20 crop residues generated by 11 crops. Out of this, 12 MT is contributed by cereals, oilseed, pulsed sugarcane crops together; and 4 MT by cotton. At crop group level, cereal contributes the highest amount of 8 MT followed by Oilseed and Pulses 4 MT . At individual crop level, Wheat contributes the highest amount of 2.5 MT gross residues followed by Bajra (2MT). Considering the surplus portions of residues available from the selected crops, annual potential is only 5.4 MT, *i.e.* 34% of gross residue generated in Bhiwani is available as surplus. Cereals group contribute the highest amount of surplus residue (3 MT) followed by oilseed and pulses (1.7 MT) and Cotton (0.7 MT).Bioenergy potential from the surplus portion of residue in the country would be 4.15 EJ per annum. This is approx. 17% of primary energy consumption in India (as per the estimation of IEA in 2011, total primary energy consumption in India is about 24.91EJ). Cereals contributes 1.49 EJ followed by sugarcane (1.11 EJ), others (0.83 EJ), horticultural (0.41

EJ), oilseed (0.23 EJ) and pulses (0.08 EJ). At individual crop level, the highest contribution comes from sugarcane residue (1.11 EJ).

Table 2: Biomass Potential in Haryana

Biomass Class	Area (kHa)	Crop Production (kT/Yr)	Biomass Generation (kT/Yr)	Biomass Surplus (kT/Yr)	Power Potential (MWe)
Forest & wasteland	294.7	NA	393.3	259.6	36.3
Agro	5007.8	14174.7	26338	8942.1	1120.8
Crop	**Residue**	**Area (kha)**	**Crop Production (kT/Yr)**	**Biomass Generation (kT/Yr)**	**Biomass Surplus (kT/Yr)**
Paddy	Straw	1061.6	2710.6	4065.9	3252.8
Wheat	Stalks	2324	9550.6	14325.9	2865.2
Mustard	Stalks	396.2	540.9	973.7	778.9
Wheat	Pod	2324	9550.6	2865.2	573
Mustard	Husk	396.2	540.9	486.8	462.5
Paddy	Husk	1061.6	2710.6	542.1	433.7
Bajra	Stalks	598.8	648.2	1296.5	259.3
Bajra	Cobs	598.8	648.2	213.9	107
Oilseeds	Stalks	404.1	551.4	1102.8	110.3
Bajra	Husk	598.8	648.2	194.5	48.6
Gram	Stalks	70.6	40.7	42.7	21.4
Barley	Stalks	26.7	71.2	92.5	9.3
Maize	Stalks	13.5	30.5	61	6.1
Maize	Cobs	13.5	30.5	9.1	4.57
Jowar	Stalks	105	23.2	39.5	3.95
Jowar	Cobs	105	23.2	11.6	2.32
Jowar	Husk	105	23.2	4.64	2.32
Pulses	Stalks	7.5	7.5	9.7	0.97
Cotton	Stalks	486	103	40	5
Total		5493.8	14277.7	26378	8947.1

Use of wheat straw as animal feed is also reported to be common in the all parts of Bhiwani. Top of sugarcane is also used as animal feed in some villages. Burning of the cereal residue is prominent over all in Bhiwani District, whereas rice straw burning is limited and wheat straw burning is almost absent. Beri *et. al.* (2003) estimated that 22% of rice straw and 10% of wheat straw are burned *in-situ* in Uttar Pradesh. The use of maize residue and other crops varies over the regions but also provide important feed sources. Chauhan (2010) reported that out of the 25 MT crop residues generated annually in the state of Haryana, 71% is consumed in various domestic and commercial activities within the state.

It is expected that state as well as well crop level bioenergy potential assessment made in this study will help in policy decisions and regional bioenergy planning of the country

CONCLUSION

The Haryana Government has signed a Memorandum of Understanding (MoU) with four independent power producers for setting up five bio-mass power projects of 51 MW capacity involving an investment of Rs. 230 crore.

Moreover, projects of one MW had been set up by Ashoka Distillery and Chemicals at Hathin and three MW by Globus Spirit at Samalakha respectively to produce electricity from distillery waste.

Also, 11 projects of 24.95 MW capacities through cogeneration route had been set up in the industries for generation of power from agricultural waste.

Under the Jawahar Lal Nehru National Solar Mission, eight projects of 7.8 MW capacity had already been commissioned which included seven projects of one MW each at village Nandha (district Bhiwani), Badhour (district Panchkula), Balsamand, (district Hisar), Panchaota (district Mahendergarh), Sarakpur(district Panchkula), Kumthala(district Sirsa), Nigana (district Rohtak) and 0.8 MW Project in village Silarpurmehta (district Mahendergarh).

Regarding Bioenergy, it is clear that there is an enormous untapped potential for energy generation from agriresidue. What is required is an immediate and urgent intensification of dedicated efforts in this direction, with a view to bringing down the unit energy cost and improving efficiency and reliability of agriwaste production, conversion and utilization,

Leading to subsequent saving of fossil fuels for other pressing applications.

The new initiatives in national energy policy are most urgently needed to accelerate the social and economic development of the rural areas. It demands a substantial increase in

Production and consumption of energy for productive purposes. Such initiatives are vital for promoting the goals of sustainability, cleaner production and reduction of long-term risks of environmental pollution and consequent adverse climatic changes in future.

Finally, there is a shimmering promise that the whole process of harvesting, collection,

Transport and economic processing and utilization of agriwaste can be made technically and economically more viable in future. Thus, the foregoing parts amply highlight the value of agriresidue as energy cropping a prospective source of electric power, particularly for supplementing the main grid during the lean supply periods or peak load hours and also for serving the remote areas in the form of standalone units. Its economic viability seems to be positive in view of its potential contribution to our economic and social development.

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