
Availability and Utilization of Rapeseed Mustard stalks and Groundnut stalks Biomass Residues as Renewable Source of Energy

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ABSTRACT

Biomass is an important renewable energy resources for generation of energy as a fuel. It is accounted about 14% share of total world's energy. Agricultural residues are the most commonly used biomass and its generation is gradually increasing from the agricultural production. Study of various sources of biomass and availability of biomass within the Rajasthan state. Different types of major biomass are identified with the study area. The major biomass are available such that Rapeseed & Mustard stalks, Ground Nut stalks for energy generation. It was found that, the biomass generated from agricultural activity is 54,52,10,000 Tonnes/ year in India and 5,10,20,686 Tonnes/year in Rajasthan State. Contribution to 2.44 % of Rapeseed & Mustard and 3.13 % of Ground Nut biomass generation from agricultural activity in India. And 11.76 % of Rapeseed & Mustard and 3.33% of Ground Nut biomass generation from total agricultural activity in Rajasthan State.

KEYWORDS: *Biomass, Utilization, Mustard Stalks, Ground Nut shell.*

INTRODUCTION

A recent study shows that agricultural biomass residues are the most possible considering their quantitative availability [1]. the biomass is available in different forms like rice husk, cotton stalks, mustard & rapeseed stalks, ground nut shell and stalks, wheat stalks, barley stalks, jawar stalks, maize stalks, soyabean stalks, pluses stalks, gaur stalks etc.[2]. This crop residues has been valuable source of fuel energy all over the world in rural as well as the sub urban areas. Biomass is one of the major alternative source of energy as fuel accounted for 14% of the world energy's. On other hand, biomass corresponds to the important form of renewable energy which becomes of increasingly attentiveness since it is examined as playing an important role in reducing global warming and securing fuel supply [3]. This available agricultural biomass residues convert into useful fuel energy using different technics such as combustion, pyrolysis, gasification etc. raw biomass residues convert into briquette as solid fuel by different methods. Loose raw biomass material has a few disadvantages like lower energy density, low calorific value, large volume required for storage and problem in transportation. To improve the characteristics of loose raw biomass residues by using densification process [4].

BIOMASS GENERATION AND AVAILABILITY IN INDIA

Study of various sources of biomass generation in India. Crop residues are form major portion of biomass generation are Rice, Jowar, Bajra, Maize, Ground Nut, Rapeseed & Mustard, Soya Bean, Gram, Wheat, Cotton etc.[5].

Table 1 Average Cultivated Area and Production of Crop in INDIA (2015-16)

S. No.	Name of Crop	Cultivated Area ⁵ (in Million Hectare)	Production ⁵ (in Million Tonnes/year)
1	Rice	39.27	89.72
2	Jowar	2.53	2.85
3	Bajra	8.16	9.56
4	Maize	7.35	16.70
5	Pulses	10.76	6.16
6	Ground nut	5.22	7.41
7	Soya bean	10.64	12.37
8	Cotton	12.03	34.63
9	Wheat	30.17	91.53
10	Gram	8.84	8.32
11	Rapeseed & mustard	6.32	7.39

Table 2 shows the residue to crop ratio provided by Indian Institute of Science, Bangalore. The residue to crop ratio is Kg of residues to Kg of crop [6]. This data has again been vetted in the field by not only gathering details from landowner, but also by field measurement. The average yield is calculated from given data of cultivated area and production of crop in table 1. average yield of crop is ratio of production of crop to cultivated area per year of each crop

Table 2 Biomass Residues Generation in Tons per Ha per Year in INDIA (2015-16)

S.NO.	Crop	Biomass	Yield(in Tonnes/year/Hectare)	Residue to Crop Ratio ^{6,7,8}
1	Rice	Rice stalks	2.285	1.53
2	Jowar	Jowar stalks	1.126	2.40
3	Bajra	Bajra stalks	1.172	2.63
4	Maize	Maize stalks	2.272	2.30
5	Ground nut	Ground nut stalks	1.420	2.30
6	Soya bean	Soyabean stalks	1.163	1.70
7	Cotton	Cotton stalks	2.879	3.80
8	Wheat	Wheat stalks	3.034	1.50
9	Gram	Gram stalks	0.941	1.10
10	Rapeseed & mustard	Rapeseed & mustard stalks & husk	1.169	1.80
11	Pulses	Pulse stalks	0.572	1.32

Calculate the biomass generation from agricultural activity in table 3 using the production of crop and residue to crop ratio given that in table 2.

Table 3 Biomass Generation from Agriculture activity in INDIA (2015-16)

S.NO.	Crop	Biomass generated (million tonnes/year)		%
1	Rice	Rice stalks	137.272	25.15
2	Jowar	Jowar stalks	6.840	1.25
3	Bajra	Bajra stalks	25.143	4.61
4	Maize	Maize stalks	38.410	7.04
5	Ground nut	Ground nut stalks	17.043	3.13
6	Soya bean	Soyabean stalks	21.029	3.86
7	Cotton	Cotton stalks	131.594	24.14
8	Wheat	Wheat stalks	137.295	25.18
9	Gram	Gram stalks	9.152	1.68
10	Rapeseed & mustard	Rapeseed & mustard stalks & husk	13.302	2.44
11	Pulses	Pulses stalks	8.131	1.49
Total			545.21	100

BIOMASS GENERATION AND AVAILABILITY IN RAJASTHAN STATE.

Study of various sources of biomass generation in Rajasthan state. In table 4 shows that last six year from 2010 to 2015 average cultivated area and production of crop in Rajasthan state. Crop residues are form major portion of biomass generation are Rice, Jowar, Bajra, Maize, Pulses, Seasamum, Gaur, Ground Nut, Rapeseed & Mustard, Soya Bean, Gram, Wheat, Barley, Cotton etc.[9].

Table 4. Last Six Years Average Cultivated Area and Production of Crop in Rajasthan.

S. No.	Name of Crop	Cultivated Area ⁹ (in Ha)	Production ⁹ (in Tonnes/year)
1	Rice	142520	274824
2	Jowar	653376	384205
3	Bajra	4719170	4490570
4	Maize	1018354	1627163
5	Pulses	3901665	2113852
6	Seasamum	361097	132231
7	Ground nut	412784	735308
8	Soya bean	929081	1135908
9	Cotton	458444	215117
10	Gaur	3816452	1871231
11	Wheat	2992125	9949452
12	Barley	298323	867660
13	Gram	1422441	1159119
14	Rapeseed & mustard	2514129	3334296

Table 5 shows the residue to crop ratio provided by Indian Institute of Science, Bangalore. The residue to crop ratio is Kg of residues to Kg of crop[6]. This data has again been vetted in the field by not only gathering details from landowner, but also by field measurement. The average yield is calculated from given data of cultivated area and production of crop in table 1. average yield of crop is ratio of production of crop to cultivated area per year of each crop.

Table 5. Last Six Years Average Biomass Residues Generation in Tons per Ha per Year in Rajasthan.

S.NO.	Crop	Biomass	Yield(in Tonnes/year/Hectare)	Residue to Crop Ratio ^{6,7,8}
1	Jowar	Jowar stalks	0.588	2.40
2	Bajra	Bajra stalks	0.952	2.63
3	Maize	Maize stalks	1.598	2.30
4	Seasamum	Seasamum stalks	0.366	1.50
5	Ground nut	Ground nut stalks	1.781	2.30
6	Soya bean	Soyabean stalks	1.22	1.70
7	Cotton	Cotton stalks	0.469	3.80
8	Gaur	Guar stalks	0.490	1.80
9	Wheat	Wheat stalks	3.325	1.50
10	Barley	Barley stalks	2.908	1.30
11	Gram	Gram stalks	0.815	1.10
12	Rapeseed & mustard	Mustard stalks & husk	1.326	1.80
13	Rice	Rice stalks	1.928	1.53
14	Pulses	Pulses stalks	0.542	1.32

Calculate the biomass generation from agricultural activity in table 6 using the production of crop and residue to crop ratio given that in table 5.

Table 6. Last Six Years Average Biomass Generation from Agriculture activity in Rajasthan

S.NO.	Crop	Biomass generated (tonnes/year)	%	
1	Jowar	Jowar stalks	922092	1.81
2	Bajra	Bajra stalks	11810199	23.15
3	Maize	Maize stalks	3742475	7.33
4	Seasamum	Seasamum stalks	198346	0.40
5	Ground nut	Ground nut stalks	1691208	3.33
6	Soya bean	Soyabean stalks	1931043	3.79
7	Cotton	Cotton stalks	817445	1.60
8	Gaur	Guar stalks	3368215	6.60
9	Wheat	Wheat stalks	14924178	29.25
10	Barley	Barley stalks	1127958	2.21
11	Gram	Gram stalks	1275030	2.50
12	Rapeseed & mustard	Mustard stalks & husk	6001733	11.76
13	Rice	Rice stalks	420480	0.82
14	Pulses	Pulses stalks	2790284	5.47
Total			51020686	100

CONCLUSION

It was found that, the biomass generated from agricultural activity is 54,52,10,000 Tonnes/ year in India and 5,10,20,686 Tonnes/year in Rajasthan State. The major portion of wheat stalks, barley stalks, paddy hay, jowar stalks, bajra stalks, maize stalks are consumed by animal as fodder and these biomass should not be used as a fuel per the Policy 2010, so we considered 100% for consumption. Rapeseed & mustard stalks biomass and ground nut shell residues are available in large quantity of generation of energy fuel. Future scope of using biomass residues as a renewable and alternative fuel by making briquette.

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