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The Impacts of Jute on Environment: An Analytical Review of Bangladesh

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Abstract

The worldwide awareness on environment is the reason for the opportunities of Jute, due to environment-friendly characteristics. The study is to evaluate the impacts of Jute production on environment in Bangladesh. It is taken the data of Production Area, of Jute for 19 years of Bangladesh. The jutes increase the fertility of land, preserve the ozone layer by absorbing CO2 and clean the air by emitting O2. The jute is used as vegetable, geo-textile, biogas, biodegradable products which have impact on the environment. The recommended issues are to use the scientific method of cultivation, to implement the law for using jute rather synthetic, to make jute policy, to enhance the application area of jute, to develop the awareness of Jute as environment friendly fibre, and to develop the research institutions etc.

Keywords: Jute, Environment, CO2, O2, Fertility

1. Introduction

Jute is a natural fibre with numerous environmental advantages. It is an annually renewable resource with a high biomass production per unit land area, and jute products being biodegradable decompose in the soil at the end of product life-cycle. Towards global warming, a concern of much importance in the present world, while the synthetic materials are being considered as the root of many problems, the natural fibre products are proven to be absolutely harmless. (International Jute Study Group, 2011).

Jute, as a natural fiber, has many inherent advantages like luster, high tensile strength, low extensibility, moderate heat and fire resistance and long staple lengths. It is a biodegradable and eco-friendly. It has much advantage over synthetics and protects the environment and maintains the ecological balance. Jute (Corchorus capsularis & Corchorus olitorius), Kenaf (Hibiscus cannabinus) and Roselle (H. sabdariffa var (Altissima) are vegetable bast fiber plants next to cotton in importance. In the trade there are usually two names of jute, White and Tossa. Corchorus capsularis is called White Jute and Corchorus olitorius is called Tossa Jute. In India & Bangladesh Roselle is usually called Mesta. Jute fibers are finer and stronger than Mesta and are, therefore, better in quality. (International Jute Study Group, 2011)
The Kyoto protocol on global climate change has resulted in an acceleration of the transition towards a sustainable and more environmental friendly economy. This transition is mainly realized by a shift in the use of agricultural crops from food to energy and a shift in the use of petrochemicals to renewable resources, such as non-food crops. As a major renewable resource lignocellulosic fibres derived from the structural plant tissues are expected to play an important role in this transition. The markets for fibre crops, such as abaca, coir, jute and sisal have experienced substantial erosion since the introduction of synthetic fibres. However, niche markets have been maintained and a number of new markets are emerging, such as fibre reinforced composites in automotive industries, building and construction materials, and biodegradable geo-textiles, with the ecological image of cellulosic fibres becoming a driving force for innovation and development. (Dam and Boss, 2004)

Consequently, the production of fibre crops has a limited impact on the environment. In the post harvest processing steps, the fibre extraction process consumes fossil energy and water, generates biomass waste. In general, comparative studies on the production phase of fibre crops with synthetic products, or glass fibres, indicate that fibre crops provide environmental benefits in terms of reduced CO2 and greenhouse gas emission levels and consumption of fossil energy. The energy and chemicals requirements for fibre pulping processes for the production of paper, board and cellulosic fibre products is, in general, ecologically advantageous, as compared to wood based pulping. (Dam and Boss, 2004)

The worldwide awareness on environment is the reason for the opportunities of Jute, due to environment-friendly characteristics. Jute, a natural fiber that can be used in many different areas, supplementing or replacing synthetics, has been receiving increasing attention from the industry. The usages of jute are not only traditional uses, but also on the production of other value –added products such as, pulp and paper, geo-textiles, composites and home textiles. Jute is an annually renewable energy source with high a biomass production per unit land area. It is biodegradable and its products can be easily disposed without causing environmental hazards. The roots of jute plants play a vital role in increasing the fertility of thy soil. Jute plants have carbon dioxide assimilation rate and it clean the air by consuming large quantities of carbon dioxide. So, the research aims are to evaluate and review the impacts of jute in Bangladesh in the context of Bangladesh.

2. Literature Review

Alim and others (2002) has studied on Effect of Fresh Jute Leaves on Soil and late Jute Seed Production. An experiment was conducted to investigate the influence of fresh jute leaves as a source of plant nutrients on late jute seed production. Fresh jute leaves were collected just after harvest of jute crop and was incorporated to the soil at the rate of 0,1,2,3,4,5 and 10 percent along with a recommended dose of chemical fertilizer (Urea-TSP-MP-Gypsum-Zincsulphate-Borax at the rate of 200-100-40-100-22-10 kg ha-1 Respectively).With the increasing rate of fresh jute leaves pH of the Soil successively decreased from 6.47 to 6.31 and organic matter content of the soil increased from 2.45 to 48.36% and nutrient content of the soil was increased and of N, P, K and were increased up to 47.365300, 62.50 and 55.55 percent respectively. A highly significant increase in number of branch, number of pod and seed yield was obtained with 4, 5 and 10 percent of fresh jute leaves and a spectacular increase was also found with 1, 2 and 3 percent of fresh jute leaves. The seed yield was significantly correlated with number of branches, number of seeds and number of pods per plant.

Haque and others (2001) has analyzed on Retting of Green Jute Ribbons (Corchorus capsularis vor.CVL-1) With Fungal Culture. Isolated fungi of aspergillus clavatus, Rhizopus sp.Zygorinchous sp.,Sporotrichum sp., Trichoderma sp., pennicillium sp. and Curvularia sp. were tested for their retting efficacy on green jute ribbins. In laboratory condition as well as in field condition,Sporotrichum sp. retted green Ribbons in 11 days. In case of retting by Sporotrichum sp., no adverse effect on the fiber bundle strength and fiber yield was observed and according to Pressley Index, fiber strength was found to be 10.82 Ibs/mg and fiber yield was about 2.8 kg out of 40 kg green ribbon.

Rahman and Bala (2009) have studied on Ecological and Environmental Sustainability of Jute Production Systems in Bangladesh: Life Cycle Assessment. Two important studies on jute production systems were conducted through field experimentations for the two consecutive jute growing seasons in 2006 and 2007 to enumerate the ecological sustainability and the environmental consistency indicators of the system. Life Cycle Assessment (LCA) is one of the methods to assess the environmental consistency and ecological health indicators affected by the production systems. LCA of jute production system presents the emissions and extractions of nutrients to and from the soil and water as well as some important biogases to the air considering inputs and outputs to and from the production system boundary to the environment.

Dam and Bos (2004) have studied on The Environmental Impact of Fibre Crops in Industrial Applications. The various systems for assessing the impact of processes and products on the environment and comparison of sustainability of alternatives are diverse and complex, because the weighing factors are of different and incomparable magnitudes and dimensions. Nevertheless, standard protocols and environmental management tools such as LCA have been developed that provide insight in "eco-efficiency" or can discriminate between production systems. The magnitude of the environmental advantage depends obviously on the kind of application. In other words: the environmental gain is usually due to a secondary effect, such as weight saving, and is then not caused by the 'green' origin of the fiber.

3. Objectives

The principal objective of this study is to evaluate the impact of Jute production on environment in Bangladesh. To accomplish this basic objective, following specific objectives are set:

I. To review the existing literature to infer the impact of jute on environment in Bangladesh.

II. To conduct the analysis of impacts of Jute on environment in Bangladesh.

III. To provide the recommendations for development of jute production as a environment friendly plant in Bangladesh

4. Methodology

Source of data

This paper is an analytical one. The secondary data are used to study. Secondary data were collected from the following Sources: International Jute Study Group, Bangladesh Jute Mills Association, Bangladesh Bureau of Statistics, Bangladesh Economic Review, Books and Journal, Internet Website.

Sample design

It is taken the data of Production Area, of Jute for 19 years from the year 1991-92 to 2009-10 of Bangladesh. The contribution of jute on environment is taken from the article of 'Dr. M. Mahbubul Islam (2011)'.

Analysis of data

The data have been analyzed with the help of different statistical techniques. The study has used percentage, mean, growth, etc. for analysis of data and drawing inferences.

5. Environment friendly Impacts of Jute in Bangladesh

The Jute has many positive impacts on the Environment. It is an environment friendly fibre in many aspects. The fibre is environment friendly and its products are also environment friendly and better than the synthetic fibres. It has others indirect role on the economy by impacting on environment. The green leaf is the source of vegetable and dry leaf enhances the fertility of the land. The root of jute increase the fertility and leaf and root act as pesticide. The stick of jute use as a particle and composite and it reduce the dependency on the wood as a fuel which reduces the deforestation. According to the environmentalist, there should be 25% forest area in a country but unfortunately, only 8% to 9% forest in our country. The Jute, fast growing plant can cover the gap in some extent. The jute absorbed the Carbon dioxide from the air which helps the ozone layer from destruction. It also emits oxygen to the atmosphere which is helping the livelihood.

Form the table -1, the area of lute production of Bangladesh which is taken from the International Jute Study Group and the table-2, the contribution of jute on environment which is taken the article of 'Dr. M. Mahbubul Islam (2011)', the table -3 is calculated for study.

From the table -3, the figure-1 is drawn. The explanation of the figure is described below in details.

5.1 Jute Plant purifies the air

Jute plants absorb carbon dioxide (Co2) from and emit Oxyzane(O2) to the air which causes the purification of the air. From the table -1, it is seen that the jute plants absorb average 7302.38 thousand tones CO2 from and emit 5309.91 tones O2 to the air per year. From the figure-1, it is depicted that the trend of Co2 absorb and O2 emission is steady with fluctuating manner over the periods.

5.2 Fertility of land

The leaf and root of the jute are rotten in the land which increases the fertility of the land. From the table -1, The jute plants have average 956.38 thousand tone leaf and 423.4 thousand tone root per year which are rotten and mix with the soil. This increases the fertility of land by giving Urea, TSP, MP, Zipsam, Dolomite, Ferrous Sulfate, Magnesium Sulfate, Zink sulfate to the soil. From the figure-1, the trend of leaf and root of Jute is steady over the periods with slight fluctuation. In table -1, the jute fibre, stick, dry leaf emits the N, P2O2, and K2O of its percentage.

Table 1: Estimated amounts of N, P, and K in fibre, sticks and

Leaves as % of total dry weight of products

Type of product nutrients	Dry fibre (%)	Dry sticks (%)	Dry leaves (%)
N	0.43	0.21	3
P2O5	0.19	0.09	.37
K2O	1.65	0.75	2.2

Source: IJSG, 2003 and Dempsey, 1975.

5.3 Biological Efficiency

Jute as a fibre crop is a fast-growing one that takes only 4 to 5 months to mature. The production of the fastest

growing wood plant necessitates at least 10 to 14 years from the plantation to harvest. The usages of jute in place of wood to make paper pulp will reduce the cost of production. From the table-1, average production of jute stick is 2480.62 thousand tone per year and from he figure-1, the trend of jute stick production is steady over the years. The huge amount of jute sticks are used for pulp and paper and household fuel which reduce the cutting down of trees that preserve the nature.

5.4 Impact of other corps

Jute plants need small amount of fertilizers for cultivation and jute plant leave root and leaf which increase the production of other crops and reduce the usages of fertilizers. From the table-2, it is observed that the jute leaf and root preserve in the soil.

5.5 Vegetable

Jute leaf is used as vegetable. It has the quality of nutrition and harbal medicine. Jute leaves provide vitamin-c, iron, calcium and it used for harbal medicine for gastric, dysentery, fever, etc. (Dr. Mahbubul Islam, 2011). Since the jute grows all over the country, it can fulfill the demand of vegetable.

5.6 Geo- textile

Geo-textiles are used to prevent the erosion of landscape for engineering field at lower cost. It has the characteristics of degradation but synthetic will remain in the soil for long periods of time. It can be used for river embankments, road construction, dam etc. as a cheap and environment friendly products.

5.7 Biogas emission

Methane emitted during retting has been estimated to be 1-2 m3 kg-1 of solid material, which on computation gives an average of 1.428 kg methane per kg of jute fibre (International Jute Study Group, 2011) .It, can be used for household purpose.

5.8 Biodegradability

Jute products are 100 percent biodegradable and recyclable. So, it can be disposed with an environment friendly way. So, Jute can hold the priority over the synthetic fibre.

6. Recommendations

i. To develop the jute policy: The “Jute Policy” needs to be reviewed and revised, and in this context the government’s initiative to design a new jute policy is a well-timed initiative. The idea of an independent “Jute Board” may be considered in this regard, where there will be representation of major stakeholders.

ii. To use the bio-technology: The inherent negative surface characteristics of jute fibres like itching problem, comfort characteristics, etc, can be modified through bio-technology and scientific techniques.

iii. To enhance the application area of jute: The application area of jute need to be enlarged, ie, jute should be used in new areas like agro-textile, geo-textile, technical textile as well as home textile.

iv.To develop the marketing strategy in both domestic and global market: Marketing and promotion of jute has been a major problem, and so the government and industry should come forward and take adequate steps in this direction like highlighting its eco-friendly and biodegradable characteristics.

v. To develop the research institutions: Jute Research Association such as JTRL, IJIRA, and Institute of Jute Technology should come forward for better utilization of resources like jute raw material, manpower and machinery and equipment for the betterment of jute industry.

vi. To ensure Law for using jute: Government rules on restriction of manufacturing and marketing of polythene products should be strictly maintained.

vii. To develop the jute products: Diversified Jute products should be developed and to familiar to people is required.

viii. To make availability of quality seed to farmer for better production

ix. To introduce the scientific cultivation methods rather than traditional method to get the high yield and preservation system should be increased.

x. To develop the awareness of Jute as an environment friendly fibre.

xi. To increase the commercial production of jute as a vegetable to fulfill the huge demand of vegetables.

7. Concluding Remarks

The protection of environment is a vital issue in the world. The demand of jute is raised for environment friendly features instead of synthetic fibres. This factor motivates to conduct this research for benefit to the country and the mankind as whole. The jute plants absorb average 7302.38 thousand tones CO2 from and emit 5309.91 tones O2 to the air per year and the trend of Co2 absorb and O2 emission is steady with fluctuating manner over the periods. The trend of Co2 absorbs and O2 emission is steady with fluctuating manner over the periods. The jute plants have average 956.38 thousand tone leaf and 423.4 thousand tone root per year which are rotten and mix with the soil. This increases the fertility of land by giving Urea, TSP, MP, Zipsam, Dolomite, Ferrous Sulfate, Magnesium Sulfate, Zink sulfate to the soil. The trend of leaf and root of Jute is steady over the periods with slight fluctuation. The jute is used as vegetable, geo-textile, biogas, biodegradable products which have impact on the environment. There are lots of scopes for future research in this economy and environment friendly issue.

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Appendix

Table 1: Area of Jute Production of Bangladesh (000' hectare)

Year	Area of Jute Production	Year	Area of Jute Production
1991-1992	586.8	2001-2002	519.6
1992-1993	500.2	2002-2003	436.2
1993-1994	521.3	2003-2004	499.8
1994-1995	567.8	2004-2005	418
1995-1996	519.2	2005-2006	466
1996-1997	547.6	2006-2007	500
1997-1998	647.5	2007-2008	500
1998-1999	477.5	2008-2009	408.1
1999-2000	414.8	2009-2010	485.8
2000-2001	448		

Source: Food and Agriculture Organization (FAO)

Table 2: Contribution of Jute on Environment

Contribution of Jute	Amount(Tone/hectare)
Fibre Production	1.98
Jute Stick	4.94
Leaf	1.92
Rotten Water	1.07
Root	0.85
Carbon-Oxide Absorbed	14.66
Oxygen Emission	10.66

Source: Islam, M. Mahbubul Islam(2011).Importance of Jute in Bangladesh, Krishi Khota. Dhaka, Ministry of Agriculture.

Table 3: Environmental Impact of Jute of Bangladesh

Year	Leaf(000' tones)	Root(000' tones)	Absorbed Co_2(000' tones)	Emission O_2 (000' tones)	Stick(000' tones)
1991-1992	1126.66	498.78	8602.49	6255.29	2922.26
1992-1993	960.38	425.17	7332.93	5332.13	2491.00
1993-1994	1000.90	443.105	7642.26	5557.06	2596.07
1994-	1090.18	482.63	8323.95	6052.75	2827.64

1995					
1995-1996	996.86	441.32	7611.47	5534.67	2585.62
1996-1997	1051.39	465.46	8027.82	5837.42	2727.05
1997-1998	1243.20	550.375	9492.35	6902.35	3224.55
1998-1999	916.80	405.875	7000.15	5090.15	2377.95
1999-2000	796.42	352.58	6080.97	4421.77	2065.70
2000-2001	860.16	380.8	6567.68	4775.68	2231.04
2001-2002	997.63	441.66	7617.34	5538.94	2587.61
2002-2003	837.50	370.77	6394.69	4649.89	2172.28
2003-2004	959.62	424.83	7327.07	5327.87	2489.00
2004-2005	802.56	355.3	6127.88	4455.88	2081.64
2005-2006	894.72	396.1	6831.56	4967.56	2320.68
2006-2007	960.00	425	7330.00	5330.00	2490.00
2007-2008	960.00	425	7330.00	5330.00	2490.00
2008-2009	783.55	346.885	5982.75	4350.35	2032.34
2009-2010	932.74	412.93	7121.83	5178.63	2419.28
Average	**956.38**	**423.40**	**7302.38**	**5309.91**	**2480.62**

Source: Calculated from appendix-1&2

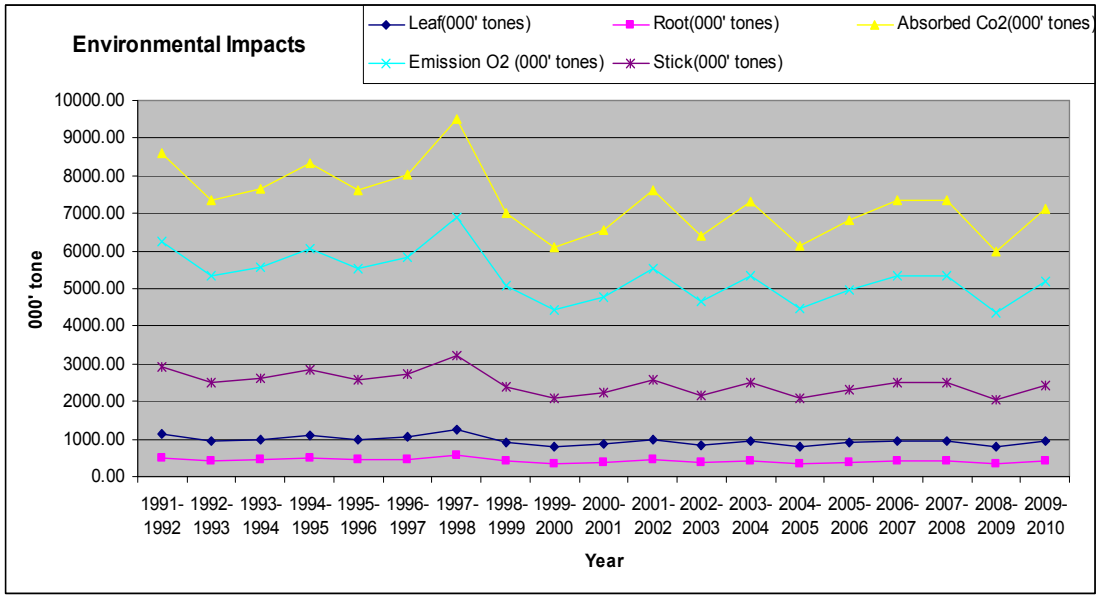

Figure 1: Trend of Environmental Impact of Jute of Bangladesh