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The Factual Demand and the Possibility of Self-Reliant in Cotton Cultivation in Bangladesh

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Abstract:
The Bangladeshi garment is playing significant role in the country's development from the last decades. Today the garment sectors are providing 82% of the national export and count USD 30 billion revenues these numbers represent the sector as the most important manufacturing industry in Bangladesh. Cotton is the oldest and most important of the textile fibers. It is the back bone of the world's textile trade. Current survey shows that world production are about 25 million tones or 110 million bales annually, accounting for 2.5% of the world's arable land. Cotton is regarded as the golden arm for Bangladeshi textile because about 65% textile fabrics are made from cotton every day. Bangladesh requires 4-4.5 million bales (1 bale=217.7 kg or 480 pounds) of raw cotton which is slightly increasing. But Bangladesh is lack behind fulfilling the demand as Bangladesh are producing 1-2% of cotton requirement through the local production every year which is far behind the need. The remaining 98-99% requirement is fulfilled by the imported cotton mostly from Uzbekistan, India, USA, African countries, Turkmenistan, Australia etc. It is not possible to be self-reliant in raw cotton production as our raw cotton demand is very high and there is a land shortage for cotton cultivation but it can possible of production of initially 10 lac bales and finally 20 lac bales without hampering food production which is 50% of our national demand of raw cotton requirement and can save foreign currency of TK 11000 core per annum.

Key words: Need, Demand, Arable, Area, Potential, CDB

INTRODUCTION

Cotton is like white gold for Bangladeshi textile. The numbers of factories are about five thousand of different sizes and about five million workers are working in these factories [1, 2]. These numbers show the most important fact that are playing the textile sector in the economy of Bangladesh. Bangladesh is on the verge of becoming developing country where textile playing the most significant role and cotton is the most important raw material of these textiles as 65% of products are made from cotton. Bangladesh needs about 4-4.5 million bales annually and most of these cottons are imported from other country. If importation is blocked due to any other reasons then the Bangladeshi garments will fall down. We have to keep that on mind. So we need to produce more cotton as possible. That's why we require cotton arable land to ensure cotton supply in danger when required to save our garments sector as well as our economy.

In this paper, we have tried to gather information about major cotton producer, major cotton consumer, demand of cotton and its condition in Bangladesh with price at the beginning section. The middle section of this paper will give us the importance of cultivation, prospects, production requirement, challenges of production and strategy to overcome. At the end of this paper we will have detailed concept about the growing behavior in divers' area, potential area of cotton

production in Bangladesh, climate change and mitigation strategy, cotton in income generation and the vision of Cotton Development Board (CDB)

LITERATURE VIEW

Cotton

The word "cotton" has come from the Arabian word. It is pronounced by the word "kutan","qutn","qutun" etc. in Arabian language. Cotton is a plumy soft natural staple fiber that grows in a boll or protective case around the seeds of the cotton plants of the genus *Gossypium* in the mallow family *malvaceae.* It is composed basically of a substance called cellulose [3]. Cotton gives food and fiber. Cotton also gives edible oil and seed byproducts for livestock food. The cotton seed can be crushed to extract vegetable oil and protein rich animal food. Cotton is grown - in tropical and subtropical regions which represent 2.5% of the all cultivated land. But among these the major producers of cotton are China, India, USA, Pakistan, Uzbekistan, Argentina etc.

Kinds of Cotton

The plant is a shrub native to tropical and subtropical regions around the world. There are four basic types of cotton species are found that grows different part of the world. They are-

- Gossypium hirsutum is an upland cotton that grows well in Central America, Mexico, the Caribbean, and southern Florida, accounting for 90% of global output. The plant is generally 6 feet long and red in colour.
- Gossypium barbadense, often known as extra-long staple cotton, is endemic to tropical South America and accounts for 8% of global output. Plants range in length from 6 to 15 feet and are yellow in hue.
- Gossypium arboretum- known as tree cotton, grows well in India and Pakistan (representing less than 2% of global need).
- Gossypium herbaceum, often known as Levant cotton, is indigenous to southern Africa and the Arabian Peninsula (less than 2%). The plant's height ranges from 3 to 6 feet and its colour is yellow.
- Among these four varieties of cotton, two are grown in Bangladesh:
- Gossypium hirsutum and Gossypium arboretum, popularly known as comilla cotton.

The Demand of Cotton

The Garments and Apparel sector is the driving force of Bangladesh's economy as Bangladesh is the 2nd position among the world garments production country immediately after china [4, 5]. Most of this garments products are made from cotton fiber rather than other fiber. Bangladesh is in first position for its cotton importation among the other countries in the world. At present there are about 5000 thousand garments industry in Bangladesh where about 5 million people works to earn their livelihood. Here also 446 knit factories [6], 1343 weaving industry and about 3 lakh hand driven loom industry which need more numbers of yarn mostly cotton yarn. There are 425 spinning mills to ensure the supply of yarn for these industries [7]. By considering this above facts, the demand rate of cotton in Bangladesh is high in compare to other country. According to cotton development board, Bangladesh import 55 lakh bales cotton in the year of 2014 where this rate crosses in the year of 2016 when Bangladesh import 60 lakh bales cotton. In 2016-17 fiscal years, Bangladesh imported 1 thousand 361 metric tons cotton. The importance of cotton is increasing day by day. Vietnam is in the 2nd position for cotton importation as they imported 1 thousand 197 metric tons where china is in the 3rd position as they imported about 1 thousand 96 metric tons cotton. By seeing the import rate of cotton, it can easily be realized that cotton is much important

for Bangladeshi garments. H & M, Wal-Mart, Zara, Tesco, Next etc. well known garments merchandiser are related to these. Import of Raw Material for spinning are showed in Table-1 & Demand-supply situation of yarn in Bangladesh is represented in the below figure-1 [7].

Table-1: A snap shot of import of raw materials for spinning in 2020

Raw Material	Import (In Million Kg)	% of Total Import
Cotton Fiber	1401	89.0%
PSF Fiber	97	6.2%
Viscose Fiber	71	4.5%
Modal Tensile/Liocell Fiber	6	0.4%

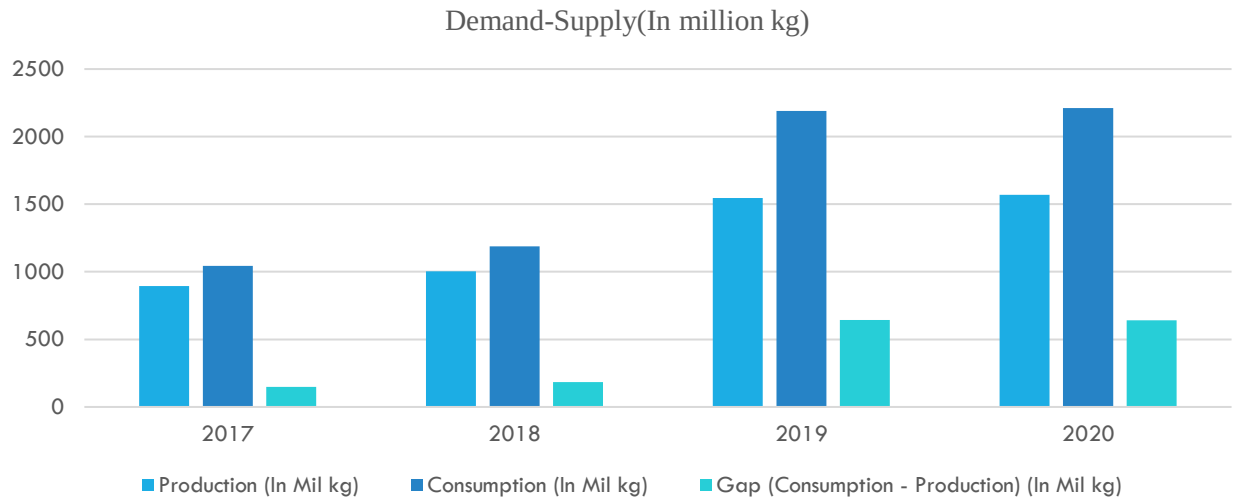

Fig.1- A snap shot of demand-supply situation of yarn in Bangladesh (In Million Kg)

Now the textile industries are taking necessary steps to minimize the water consumption, industrial fuels usage, packaging elements and chemical usage rate as Accord alliance demand to establish themselves in the international level but no measures are taken to save the cotton wastage. At present Bangladesh are importing about 40% cotton from India and 20% are coming from Uzbekistan and West Africa. India is in the top by storing 5879 thousands metric tons cotton every year which are making them economically strong where the China and United State are in the 2nd and 3rd spot.

Raw Cotton Condition in Bangladesh

The spinning mills use most of the imported cotton. In 2011-12 fiscal years Bangladesh produced 103 thousand bales and 2012-13 was 160 thousand bales. Our raw cotton demand is very high thus we can go for production initially 10 lac bales for short time and finally 20 lac tons for long term. This production is possible with the special help of government, policy makers, good research and extension management as well as development of marketing channel among various stakeholders like seed company, private ginner, farmer's input trader and so on. Good partnership between private public sectors needed to be improved. Southeastern zone, middle zone and northern part of Bangladesh are suitable for cotton production. The 33 districts of Bangladesh

mainly Kushtia, Chuadanga, Jhenaidah, Meherpur, Magura,Jesssore,Rangpur, and Thakurgaonetc. are covering that area. The Chinese hybrid cotton is most mentioning factor for the growth of cotton on those districts.

Price of Cotton are Following Upward Trend

Cotton price increased to 85.5 cents per pound, the highest in four years, mainly because of a looming trade war between the US and China, much to the vexation of Bangladesh's apparel makers. Cotton was traded between 83 cents and 84 cents a pound in the international markets. Cotton was traded between 70 cents and 71 cents a pound in November. Since the Chinese government in April announced potential 25 percent retaliatory tariffs on US goods, many in the cotton industry have wondered about the consequences, according to a report by the California Apparel News. If implemented, the tariffs would affect about $50 billion in goods, $16.5 billion of which includes crops and food items the US sends to China. Cotton price rose up in the global markets also because of volatile political situation in the world, currency fluctuation and stockpiling of the raw material by major global traders. "If the price spiral continues, Bangladeshi importers might face troubles as almost all the demand of the raw material is met through import in absence of domestic production. Local growers can meet only 3 percent of the local demand for cotton while 97 percent is imported mainly from India, the US, the Middle Eastern countries and some African countries. Annual cotton imports stand at more than $3 billion. Bangladesh is the largest cotton importer in the world as China stopped importing the widely consumed white fiber. Bangladesh's cotton import will creep up to 7.1 million bales in 2017-18, further consolidating its position as the world's largest importer of the fiber, according to the United States Department of Agriculture [8].

The Importance of Cotton Cultivation

Bangladesh aims to produce 1 million bales of cotton by the end of 2025, as the largest cotton importing country meets its total requirement from imports at present [9]. Currently, Bangladesh grows about 180,000 bales of cotton a year, which is just 1 percent of total demand in a year. Bangladesh spends more than $3 billion to import cotton a year. A bale equals 480 pounds or 218 kilograms. Three major local groups -- Ispahani, Amber and Square began contract farming of cotton in different districts, mainly to minimize dependence on cotton imports. Many farmers in upland areas in different districts have already left tobacco leaf cultivation and are now growing cotton, which rakes in more profits for them, he. Of the annual import of cotton, majority percent comes from India as the neighboring country can supply quality cotton at affordable prices. "However, we must not rely on one or two sources as importers sometimes face challenges in case of any inconvenience in the supplying country. In order to reduce dependence on India, cotton imports from African countries increased significantly recently. Local spinners and traders import more than two million bales of cotton from African countries like Burkina Faso, Benin, Lesotho, Sudan and Chad. The import of cotton from the Commonwealth of Independent States like Uzbekistan will have to be stopped, as some major western garment retailers have embargoes on the use of cotton from Uzbekistan due to forced or child labor in cotton cultivation and harvesting. Australia and the US are also turning into big cotton sources for Bangladesh due to better crop quality. On future trends in cotton production and price, yield was good in different cotton producing countries; prices increased by 15 to 20 percent. There are 430 spinning mills at present in the country, which need more than 10 million bales of cotton. However, the spinning mills cannot run at full capacity due to an inadequate supply of energy and power. $50 billion apparel export target by 2021 can be met if local spinners and weavers can supply yarn and fabric on time to the apparel makers. Cotton consumption in Bangladesh rose 4.91 percent year-on-year to 6.4

million bales in 2016 due to higher demand from spinners and garment makers, according to the US Department of Agriculture. Bangladesh has become the largest cotton importer in the world, as China stopped importing the fiber in recent years [10]. Bangladesh is fulfilling only 1% of our demand and to improve this to 10% Government is working collaborate with the Cotton Development Board. International Cotton Advisory committee presage that though production will increase but store rate of cotton will decrease in the universe this year. These premonitions encourage the trader to store the cotton in greater number for which the price increased. ICAC recently published cotton available and demand related premonition for the year 2017 to 2018 which show there will be decrease in the store of cotton for the 3rd time. This time the store will be 1 core 71 lakh 30 thousand tons which is least in number compare to the last 6 year. But there is a happy news that production will increase in the next season where the production will be 5% greater than now covering the 3 core 6 lakh hector area for cultivation. The ICAC optimist that the cultivation rate will increase in 7% in India includes 1 core 12 lakh hector area. The Indian farmer encourage in the production for increasing the cotton price. Beside India the production also increase in the USA in 2017-18 which includes 4% more than earlier as the production will 40 lakh tones. This time there is a possibility to cultivate cotton in 42 lakh hector land which will 10% greater than this season. In china cotton store rate will decrease including 1 core 71 lakh 30 thousand tons which will 50 lakh tones less than highest storage. Cotton crop not only provide fiber for the textile but also plays a role in the feed and oil industries with its seed, rich in oil (18-24%) and protein(20-40%). An estimated a large number of people are engaged in cotton production either on farm or in transportation, ginning, baling and storage.

Prospects of Cotton Cultivation

1. Huge domestic requirements of cotton
2. Production per unit area is higher than the world average
3. Good quality fiber should be produced
4. Profitable than other crops
5. Cash crops
6. Contribute in food security
7. Contribute in employment generation and income generation
8. Profit can get at a time
9. Improve soil fertility, adaptive to climate change,
10. Saline and drought tolerant and multipurpose use;
11. Edible oil, oil cake, particle board etc. [11].

Cotton Production Requirement

Cotton cultivation requires a long frost-free period, enough sunshine, and a moderate rainfall from 60 to 120cm. cultivation up to 1000m from sea level. Temperature for germination of seed is 16 to 30 degree with a minimum of 14 degree and maximum of 40 degree Celsius. For early vegetative growth, temperature must exceed 20 degree with 30 degree Celsius desirable. For proper bud formation and flowering the day time temperature should be higher than 20 degree and night temperature should be higher than 12 degree but should not exceed 40-27 degree respectively. Temperatures between 27 to 32 degree are optimum for boll development but above 38 degree are not expectable. Continuous or heavy rainfall and strong or cold winds seriously affect the cotton growth. Soils usually need to be fairly heavy although the level of nutrients doesn't need to be exceptional. Soil should be water holding and has retention toward moisture. Medium loams to sandy loam fertile soil are best for cotton production. Acid or dense sub soils

limit root penetration. The P^H range is 5.5 to 8 The crop tolerant to soil salinity. The plant propagation by seed [12]

Challenges of Cotton Production

Bangladesh prevail favorable weather for cotton production. Though 2.42 lakh hectares of land are suitable for cotton cultivation in Bangladesh 1 lakh hectares of land are available for cotton cultivation but cotton production are not increasing considerably due to many constraints related to research, marketing & management. The following are the major problems of cotton production in Bangladesh-

Scarcity of Land:

The lands suitable for growing cotton have been declining due to urbanization, industrialization, housing and other purposes. Also farmers are intended to grow three or more crops from the same land in a year. But due to long duration cotton can't be fixed in the existing cropping pattern.

Competition With Other High Value Crop: Cotton is highly competitive with other high value crops like- vegetables, spices, flowers, banana & other fruits. Farmers are migrated from cotton to these high value crops.

Lack of Short Duration, High Yielding & Pest Tolerant Varieties:

CDB released 10 varieties for American Upland Cotton & 2 varieties for Hill Cotton. Out of these varieties, the farmers in Bangladesh cultivate only five varieties. Only CB-5 & CB-9 are hairy varieties which are slightly tolerant to sucking pests like jassids. None of the existing varieties are resistant to bollworm. Duration of all the varieties are about 6-7 months & law yield capacity compared with other countries.

High Input Cost:

High input cost, particularly fertilizer and pesticides. This is because of the heavy reliance on pesticides for cotton pest management.

Insect Pests and Diseases of Cotton:

The major insect pests of cotton in Bangladesh include the chewing insect namely American bollworm & spotted bollworm and the sucking insects namely the Jassids, Aphids & Whitefly. Farmers have to give more attention to the management of these pests & spent about 40% of the total production cost.

Weakness in Cotton Research:

Adequate infrastructure & human resource facilities for cotton research is very limited within the Cotton Development Board. Most of the Scientist working under Cotton Development Board are junior in service and don't have much experience in research. Linkage between other Research Organizations is very low & inadequate facilities for human resource development [13].

Is Cotton Production Viable for Bangladesh while we have Limited Land?

First of all, the yield of cotton in Bangladesh has improved significantly in recent years from 5-6 Mon per Bigha to 15-18 Mon per Bigha with the good work of Cotton Development Board and active leadership of current Executive Director.

This effort of improved yield needs to be carried out in future to double the productivity to 30 Mon per Bigha (Say; 25 and 30 Mon per Bigha during 2022-2030 and 2031-2041, respectively) from the current level that would add to the long term viability of cotton farming in Bangladesh.

As per USDA January 2022 report 1 hector of land produced 2,217 kg, 1,976 kg, 1,804 kg and 1,720 kg of cotton in Australia, China, Turkey and Brazil, respectively, in 2020/21 while Bangladesh can produce only 900 kg of cotton which is better than many other countries like; India (462 kg), Pakistan (445 kg), etc.

The quality of our cotton is good and very much suitable for ring yarn where our average count is Ne 30/s and major count range of Ne 6/s-12/s, Ne 20/s-40/s and Ne 16/s-40/s for denim, knit and woven yarn.

Secondly, in order to secure raw material for the export oriented spinning mills, having domestic production of 24% (2.4 million bales of cotton production per year) is not a bad option if it is viable. Major spinning countries are having their own raw material; i.e. China, India, Pakistan, Turkey, except Bangladesh and Vietnam.

Thirdly, if we don't focus on domestic cotton production, we would be spending roughly USD 4 billion (8-10 million bales) annually to import cotton.

If we can substitute 24% of our cotton use with domestic production by allocating total 11 lac Bigha land for only six months for cotton cultivation (Say; 5.5 and 11 lac Bigha, respectively during 2022-2030 and 2031-2041, respectively) to produce 2.4 million bales of cotton, we can save USD 1.27 billion at the same time add the same amount in Gross Domestic Product (GDP).

In addition, we would get edible oil, cottonseed oil cake, firewood, fertilizer, and create employment and business opportunity in the rural areas.

Fourthly, Global cotton production and consumption is confined within 120-126 million bales (Around 127,000 MT). So, fundamentally cotton is limited while 89% of raw material of our spinning mills is cotton.

Fifthly, considering per capita domestic fiber consumption @ 2 kg local consumption of cotton for 18 crore people is 1.6 million bales per year.

Strategies to Face the Challenge

Cotton remains the chief raw material for textile industry. The demand for cotton textile products is increasing every day due to increasing global population. To meet the challenges ahead, viable strategies are need to be designed. These can be classified under the following heads.

(a) Net productivity increase
(b) Quality improvement
(c) Resistance to biotic and abiotic stresses
(d) Utilization of genetic engineering procedures

Net Productivity Increase:

The productivity increase sought may be in terms of seed cotton yield or lint yield. Manipulation of boll number, boll weight and sympodial branches provide opportunities of increasing

productivity. In cotton, source is not a problem but sink is a constraint. Genetic variability for boll retention has to be exploited along with balance between boll number and boll weight. Fiber yield increase can be achieved through increasing ginning out turn. The possibilities of upgrading ginning out turn up to 39 per cent in G. hirsutum has been demonstrated by varieties like Sahara in South Zone.

Quality Improvement:

Quality in terms of fiber properties and seed cotton oil are gaining importance. Innovations in spinning technology, such as open-end spinning, jet spinning etc., require higher levels of fiber strength. Hence, high priority to breeding cotton for increased strength and maturity assumes impotence. The potential of improving fiber properties especially length and fineness, of diploid cultivated cotton needs to be exploited. The presence of gossypol in the oil is a negative attribute in terms of edible quality. The processing cost to remove gossypol from oil can be eliminated if the seeds have no gossypol glands. But gossypol is the main trapezoid aldehyde which imparts resistance against insects.

Abiotic Stresses*:*

Drought stress affects crop in rain fed areas and salinity in irrigated areas. Hence, resistance sources for both environments have to be utilized appropriately. Diploid cultivated cottons, which have stress tolerance capacities, occupy a sizable (27 lakh ha) area under rained conditions. Genetic improvement of these diploids (G. *arboretum* and G. *herbaceum)* needs to be given high and urgent priority so that these important genetic resources are not lost. Resistance breeding for salinity is as yet an untouched area. Under the biotic stresses, insects, like bollworms and diseases like CLCuV need urgent consideration for sustainable cotton production. Resistance to whitefly, which is the vector of CLCuV, provides solution to two problems simultaneously. Search for characters in wild *taxa* is ideal for breeding against biotic stresses. Transfer of palisade layer from G. *arboretum* to G. *hirsutum* is the best option for developing resistance to sucking pests.

Utilizing Genetic Engineering Procedures*:*

Though *Bt* cottons are already in the field, they are associated with threats of insecticide resistance development against bollworms and instability in their bio efficacy. Hence, use of alternate sources of insecticidal proteins like *tea* complexes of *P. luminacence* and *multiple gene constructs* (of Cry genes) can be thought of, to overcome the negative points of *Bt* cotton technology. Sucking pests may also be brought under the umbrella of biotechnology, to build resistance in cotton genotypes. Exploitation of *chitinase* gene against diseases is another good option for breeding fungal disease resistance. Antisense technology can be employed to construct varieties resistant to leaf CLCuV disease.

Miscellaneous*:*

To achieve "Total Natural Fiber" concept, breeding naturally colored cotton deserves consideration. Increasing spin ability of the colored cottons in addition to enhancing their productivity and range of colors are good areas for future work. Cotton is mostly cultivated as sole crop but area under cotton-based cropping system is also large. Development of genotypes suitable for different cropping system under different soil conditions deserves attention for increasing the net income per unit area. The concept of ultra-narrow spacing is the talk of the day. Short compact genotypes amenable for machine picking are important. These genotypes not only reduce dependence on labor for cotton picking but also fit in various cropping systems.

Accelerated efforts have to be made for the overall improvement of cotton to reach at least the world average of productivity [13].

Growing Behavior of Cotton in Diverse Area

Thrust areas for cotton farming are needed to be analyzed and allocated 5.5 and 11 lac Bigha of land during 2022-2030 and 2031-2041, respectively like;

Drought Area:

Cotton is considered as drought tolerant crop as the plant requires very minimum water as it has vertical tap root that provides resilience against drought and it has Compensatory growth' Cotton responds to loss of fruiting parts (buds, flowers, bolls). Based on those characters cotton could be successfully grown in drought area. As we know rice is considered as highly water consuming crop and it requires 3000 liters of water to produce 1 kg rice. The farmers of those area get yield of 5-6 maunds per bigha which is not profitable for them. But to grow cotton it requires only one or two irrigation for the whole duration of crop. Last couple of years CDB has conducted many adaptive trials in Godhagari, Porsha and Neyamatpurupazilla to see the performance of cotton production in those areas. Farmers have gottenmaunds per bigha which is highly profitable for the farmers of that area. Under high barind area there is two lac ha of land which is suitable for growing cotton. From that area at least 50000 ha land we want to take under cotton production[14].

Cotton in Hill Area:

Cotton has been growing in three hill districts since time immemorial with jhum cultivation in the hill slope. Jhum is an old age method of mixed cropping where 10-12 crops have been cultivating in hill slope and yield is very low due to competition of many crops and varieties of all crops including cotton are indigenous. The cotton species which is grown in jhum is non- spinning, short staple length and low market price. As it is grown in jhum with many crops, it gives very low yield and less economic benefit. Several adaptive trial conducted by CDB in the hill slope, rice cotton intercropping an alternative option has developed which provide more yield and income for the hill farmers. There are about 550000 ha of hill slope which is suitable for rice cotton intercropping. There is some plain land between two hills and beside the hill which is called hill valley is now under tobacco cultivation. These types of plain lands are found Dighinala and Panchari of Khagrachari district and Lama and Alikadam of Bandarban districts. The tobacco could be replaced by cotton in the hill valley. There is also an area 52000 ha which could be taken under cotton cultivation and increase the income of tribal farmers of three hill districts [15].

Replacement of Tobacco:

Tobacco cultivation has negative impact on soil health which kills the soil microorganism and it is also create health hazard for the farmers but farmers grow tobacco as they get some special incentives from the tobacco company but they want to replace tobacco if they get the suitable crop which is profitable for them. Cotton is one of the important alternative options for tobacco replacement. There are 70 thousand ha of land in different area like Kushtia, Meherpur, Rangpur etc. which is under tobacco cultivation and gradually we can replace this tobacco area under cotton cultivation. The replacement of tobacco has already started in Daulatpur of Kushtia and Rangpur, Thakurgao as well as in three hill districts[15].

Cotton in Saline Area:

Cotton is also considered as 2nd saline tolerant crop after barley among all crops. Many countries of the world cotton are cultivated cotton in saline area where other crops are not grown. Only

seedling stage of cotton plant is sensitive to salinity but other stage of the crop is not sensitive to salinity. The salinity level of up to 11 ds /me has no effect on yield and after that yield will be affected. So, in the saline area of Bangladesh easily we could take under cotton cultivation. In Bangladesh there are 5000 ha of land under saline area from that area we want to take 2000 ha under cotton cultivation Cotton in Char area Cotton is a deep rooted crop and uptake nutrients from subsoil and adds biomass to the top soil by their big leaves and improves the soil fertility. The char area where the land is not inundation in the month of July December-that chars easily could be taken under cotton cultivation. Last couple of years we have been conducting research and development in the char area and successfully cotton has grown with reasonable yield. In Bangladesh there are 100,000 ha of land under char area from where we could take 20000 ha of land for cotton cultivation [15]

Cotton in Agro-Forestry:

Cotton is grown in high land where water stagnation is not occurred. This land is also suitable for fruit orchard like mango, litchi, jujube and mehoghoni wood lot. At the beginning of the establishment of orchard there is a big space between the plants where easily cotton could be successfully grown with good yield. Last couple of years we did many experiments in different orchard and found successful production of cotton.

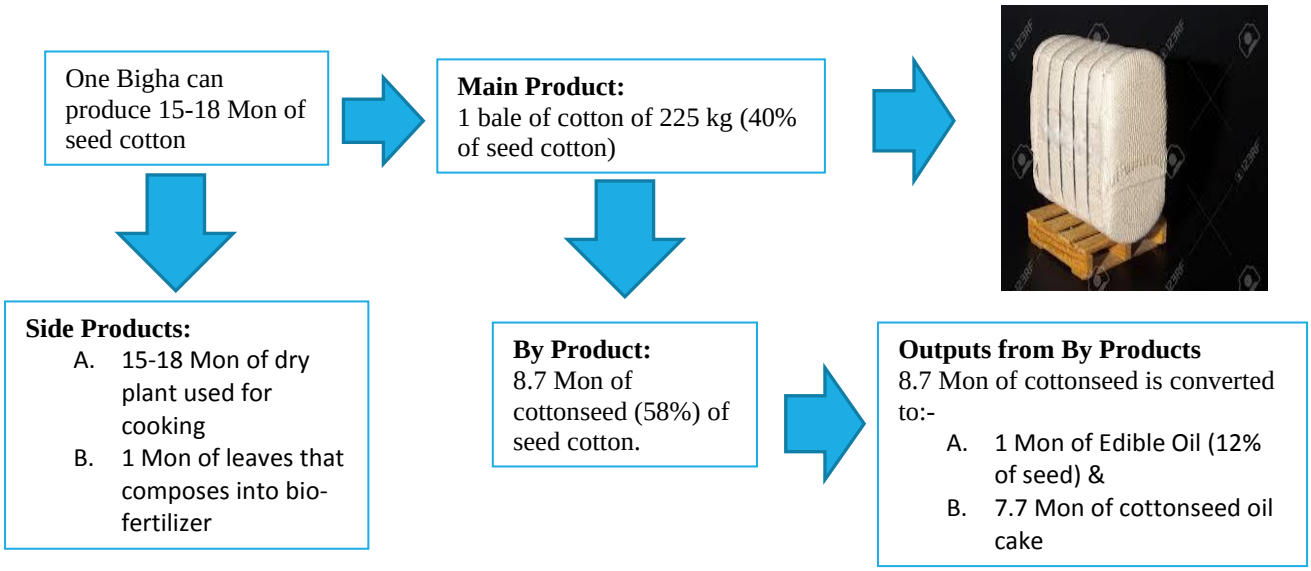

Fig.-2: Yield of seed cotton and conversion to raw cotton in bale

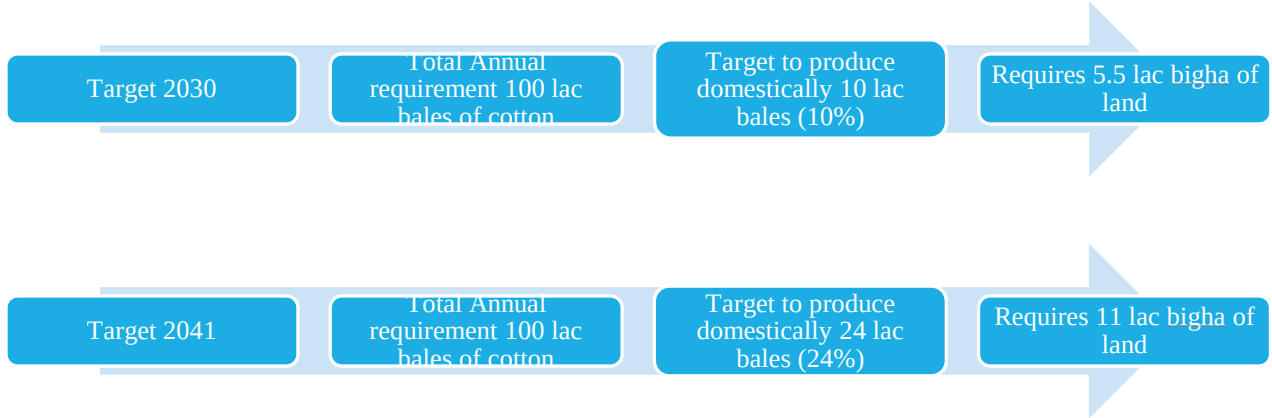

Fig-3: Targeted domestic raw cotton production of 10% by 2030 and 24% by 2041 to feed spinning mills in Bangladesh

This method of cultivation is called agroforestry. In Bangladesh there are about 5000 ha areas of land under agro-forestry; from that agroforestry land easily 2000 ha area could be taken under cotton cultivation [15]. Seed cotton production & conversion to raw cotton in bale is shown in figure-2. Targeted cotton production by year 2030 & 2041 is shown in figure-3.

RESEARCH METHODOLOGY

This descriptive research was conducted to focus on the importance of cotton production and to identify different potential areas in Bangladesh for cotton production. To prepare this research study, the current practices of the garment and textile sectors were evaluated and practical experience and mixed method was used to identify the gap. So this paper is mainly prepared by thorough analysis of different documents and articles like export policy of 2021-2024, import policy of 2015-2018, rules and regulations of NBR (National Board of Revenue), books on organization development, lecture sheet, garment manufacturing industry annual report, BGMEA (Bangladesh Garment Manufacturers and Exporters Association) yearly report and files, different journals and newspapers etc. Finally, all the information from different sources was grouped together to produce this unique paper.

RESULTS AND DISCUSSION

Cotton Production in Bangladesh

In order to achieve Bangladesh's goal of 50 billion apparel export within 2021 and further goal to take global leadership position in textile and apparel, sustainable and strong backward linkage Primary Textile (mainly spinning) Sector (PTS) is a must. As the textile industry is mostly cotton based industry, Bangladesh cannot think a single moment in the field of spinning industries without uninterrupted continuous supply of cotton fiber. As Bangladesh doesn't produce cotton much, the second largest cotton based RMG exporter country is almost totally depended on cotton import. In spite of being agriculture dependent country, Bangladesh can meet up only 1% of its cotton demand. Understanding the importance of cotton as cash crop, Bangladesh Cotton development board (CDP) is trying to improve the cotton cultivation scenario day by day.

In fiscal year 2016/17 though, planted area levels were unchanged still the production revised up by 5 percent to 125,000 bales. In 2017/18 also, cotton will be planted at 43,000 hectares (HA) unchanged, but production is forecast to rise to 130,000 bales as because of increasing use of the long staple American Upland variety. It can produce 1 million bales of cotton in 200,000 hectares of land adding that this can save 10 percent to 15 percent import costs. Bangladesh primarily produces American Upland (*Gossypium hirsutum*) and Tree (*Gossypium arboretum*) cotton that represent 95 and five percent of total production, respectively. Upland cotton is cultivated in the southwestern, northern, and central region, and tree cotton is grown in three southeastern hill districts. The average length of Upland cotton is greater than 28 millimeters (mm); Tree cotton is less than 10 mm.

Contacts believe American Upland cotton will be planted in hilly areas instead of other non-food crops. Bangladesh Cotton Development Board (CDB) received approval from the National Committee on Biosafety to initiate a contained trial of eight Bt Cotton hybrid varieties. Mahyco Seed Company Ltd. is supplying Bt cotton seed containing Bollgard II double Bt genes Cry1Ac and Cry2Ab. CDB is planning to start trials during the next cotton season (July 2017). Previously CDB

found that field trials conducted on Bt Cotton variety Bt hybrid HSC-4 produced unsatisfactory results [16].

Potential Cotton Production Region in Bangladesh

Barendra Area:

According to Bangladesh Cotton Development Board (BCDB), there are about 1, 50,000 hectares of unused land in Barendra area in North Bengal while 60,000 hectares are being used for tobacco cultivation. "Bangladesh can produce nearly 2.0 million bales of cotton locally which can meet one third of the demand the country has for the apparel industry. As the second largest consumer, Bangladesh consumes 61 lakh cotton bales, of which 1.5 lakh are produced locally. It would like to replace tobacco cultivation with that of cotton as the country has a huge demand for it. The cotton cultivation has no bad impact, which, on the other hand, exists in tobacco farming. The reason why farming cotton in northern area is advantageous is its geographical feature, i.e. char area, and dry weather, plus congenial atmosphere to agroforestry. We have a litany of farmers and the government is providing financial support for them." Long growing period, high input cost, climate change impact, especially erratic rainfall, price volatility, lengthy return of investment, lack of grading system and dependency on a handful of private cotton-ginners are challenges towards boosting cotton cultivation. Farmers present urged the government to invent such a variety of cotton that takes shorter period of time to grow and harvest, or else initiatives will end up in failure. The cotton development board is working on introducing a high-yield variety to bring benefits to the growers [17].

Rajshahi:

Cotton production in the region is bright as its topography and climatic condition suitable for the cash crop, reports BSS. Cotton farming has been gaining popularity among farmers as they are getting more money from the cultivation than any other crop. Acreage of the crop is gradually increasing in the region comprising Rajshahi, Naogaon, Natore and partly in Pabna for the last couple of years. Farmers have started replacing paddy and sugarcane cultivation with cotton farming because it requires less investment and less labor. Most of the farmers cultivate varieties like CB-12 and three hybrid varieties- Rupli-1 and DM 1 and 2. Cotton Development Board help the cotton farmers in procuring seeds, making land, nurturing of crop. In last 2015-16 fiscal year, 6,736 bales were harvested from 145 hectares of arable land. Considering the demand of the country's textile industries, the local cotton growers can meet only 3-5% of the annual demand and the rest is met through import. [18].

Jesshore:

Cotton farmers can reduce import dependency. The prospect of cotton cultivation across the southwestern part of Jessore is giving new horizons. Cotton is grown in around the country from one and a half to two hundred thousand bales. The concerned people are expected to produce 10 lakh bales of cotton in the next 5 years. This will save the country's huge foreign currency in textile sector. Against this huge amount of imported cotton, the foreign currency (dollar) is counted in millions of dollars. Authorities claim, the yield of high yielding (hybrid) cotton cultivation is going to be more than doubling - which can be done by the farmers in the desired cotton house. These information was found from the responsible sources of the Bangladesh Cotton Development Board.It is known that about 13 thousand farmers have planted cotton in 21 units under the district of Jessore of Southwest District. Agricultural exhibitions continue to be free of agricultural fertilizers, fertilizers, irrigation, pesticides and other agricultural inputs.[19].

Jhalakathi:

Cotton cultivation is expanded in Jhalakathi. The field is filled with white cotton in the season. And it is going from the garden to the Chuadangacouton mill. The price is too good to match Cotton cultivation seems to be a new possibility for the farmers of this region. A cotton cultivation of Rpali 1 variety started in 2011, with the help of the cotton development board of Jessore, is now spreading in a little more than 5/6 years in the village of Dhanasiri Union of Sadarupazila. Many farmers have leaned cotton cultivation due to cotton prices being fairly good. A kind of Gulmatti tree is full of flowers in the Kartik month. From the flower to the month of Chaitra, the farmers collected cotton from the field. Bighas produce 10 cotton cotton growers. New possibilities for farmers of cotton cultivation. There is less risk of losses. Jhalokathi has been helping farmers in cotton cultivation in various ways [20].

Mymensingh:

Cotton cultivation has increased in greater Mymensingh district. The target for cotton production has been set to 10 thousand 943 bales. The farmers of greater Mymensingh districts have become interested in cotton cultivation as a profitable crop.The training and materials provided by the Board for providing training to the turtles have been provided. These assistance to be helpful in increasing the yield. Due to favorable weather, cotton cultivation of more land has been done [21]

Chittagong Hill Tracts:

Cotton cultivation has become popular in Khagrachari and three hill districts. The offices of the Cotton Development Board have been established in Khagrachari. Cotton Development Board officials are encouraging farmers to cultivate cotton in scientific method. The cultivation of CB-12 and Rupali-type hybrid cotton are low and the yield is also good. Besides, it is sold at good prices. Cotton crops are also cultivated. The target is 150 to 200 metric tons. In addition to traditional varieties of zoom, they are cultivating hybrid varieties of cotton. Cotton production to be increased to 600 to 700 metric tons in the next five years. There is a demand for cotton in the country 42 lakh (five tons) in one sack. The possibility of loss of farmers in cotton cultivation is very low.[22].

Kushtia:

Farmers of Tacca have been dreaming to be financially benefited by hybrid cotton cultivation. The target of cotton cultivation in the greater Kushtia district has been estimated at 8, 190 hectares. It has been cultivated in 2,472 hectares of land, yielding high yielding hybrids has been cultivated on 385 hectares of land. Of these 815 hectares in Chuadanga district, 849 hectares in Meherpur district and 702 hectares in Kushtia district. Now the target for cotton production is 19 thousand tones. Kushtia zone region is particularly suitable for cotton cultivation. Due to lack of proper planning, the cultivators of cotton in the region have been left with other crops except cotton cultivation due to lack of proper yield and cotton prices. In the 1980s there was a lot of cotton cultivation in this region. Despite the vastly sown cotton cultivation, the cultivators dropped cotton cultivation. If the government determines the correct price than the international market, people in this region will be tilted in cotton. Modern agricultural scientists are inventing agricultural produce in the era of modern technology. But there is no better variety of cotton today, Not to touch any modernity. In the 1980s, no other species were invented except CB-9 varieties. If cultivate the same varieties repeatedly on the same soil, there is no good yield. 23].

Rangpur and Dinajpur:

Cebi-14 and high yielding varieties of cotton cultivation are increasing in Dinajpur and Rangpur regions. Cotton cultivation is becoming increasingly popular as a companion crop. The possibility of cotton cultivation in the northern region of the country is inaccessible. Cotton cultivation along with basic crops in the land and weather in the country has increased. And if this cotton cultivation is increased, the import cost will be reduced every year. White Gold of Bangladesh could become an agricultural product. Currently cotton is being cultivated in the flat, mountainous and saline lands in the southern part of the country. However, newer crops are grown in the northern region of the country. It can be possible to produce Bari Mug-6, Lalmaras, Mardazak, Data, coriander leaves, almonds, sesame seeds, moongs, jute seeds, ghee, paddy, rice, banana and other crops as a cotton crop. It is possible to produce two crops in the same crop and earn more profit. Recently, the yield of cotton has increased manifold due to the introduction of hybrid and high yielding varieties of cotton. With that, cotton cultivation has now become a profitable crop because cotton market has increased. Presently, the second largest cash crop of cotton and the main raw material of textile industry. Plant cultivation of plain land is being done in 34 districts of the plain area and most recently, there are hill species in the three hill districts as well as cultivation of plain land cotton cultivation. The Cotton Development Board is continuously working with cotton farmers and is going to expose the possibility of day by day. Cotton is one of the most profitable crops in Bangladesh today. village of Biralupazila of Dinajpur. He said, he has cultivated cotton in 2 bighas of land. As the country's climate and soil are suitable for cotton cultivation, initiatives have been taken to promote cotton cultivation throughout the country. Our country is engaged in cotton cultivation[24]

Climate Change and Mitigation Strategy

Cotton covers about 2.5% of the world's arable lands, and related to 0.1% to 0.3% of global GHG emissions. It is therefore not a principal source of GHG emissions. Yet cotton can contribute to mitigating climate change, in particular by increasing efficiency and reducing emissions from the more efficient use of carbon based fuels and inputs made therewith (irrigation water, fertilizers, pesticides, etc and adoption of low input and organic practices. On a field level, the following mitigation measures can be identified in order to increase cotton crop efficiency in terms of yield per unit of GHG emitted:

- Minimize soil tillage on cotton cropland in order to prevent soil to air emissions;
- Minimize carbon-based fuel mechanization and transport;
- Minimize the use of synthetic fertilizers in general and nitrogen fertilizers in particular, because these are an important source of N_2O emissions;
- Minimize the use of irrigation water, because of its carbon-based fuel footprint, and reduce competition for freshwater for man and nature;
- Minimize the use of industrial preparations such as pesticides, herbicides and defoliants because of their carbon fuel footprint;
- Minimize the burning of cotton crop residues where still applied, and recycle these for soil fertility management when not used as a fuel for cooking and heating;
- Adopt where feasible organic farming practices [11]

Cotton in the Income Generation of Tribal People

Hill Cotton/Comilla Cotton is a short staple length, course fiber grown in three hill districts as Jhum crop, which has very good export value. Jhum is a mixed crop cultivated mainly in hill slopes where more than two crops are seeded in a pit and harvested sequentially. In general, 4-5 years interval is needed for further cultivation in the same land. The main crops cultivated in Jhum are Aus rice,

Sesame, cotton, maize, marpha, chili and pumpkin. In three hill districts, huge area of land is under Jhum cultivation. If we can improve the variety and efficient management practice of cotton grown in hill area, economic development and improved livelihood of tribal farmers is possible. Cotton is only cash crop for tribal farmers. In this area, we need to address on a urgent basis so tribal farmers can go for better income generation [25].

Role of Cotton in Employment Generation Employment Generation in Spinning and RMG Sector

Our textile sector through spinning and RMG has been creating employment for 5 million people of which 80% are women. So cotton as well as Textile sector can also contribute in generating employment. In addition, through marketing and ginning of cotton can also create employment opportunity in the rural and urban area.

Employment generation at farmer's level through cotton production: Presently, cotton is growing in 33 districts of Bangladesh and 35 thousand farmers are involved in production process from sowing to yield which is developed as the best employment opportunity in Bangladesh. As cotton is now a profitable crop so more farmers are increasingly interested to grow cotton. If we can increase cotton production and area for cotton production, the number of farmers will be increased and more people will get involved eventually [25].

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Employment in Private Ginning Industry

Ginning is the process of separation of fiber and seed from seed cotton. Farmers harvest seed cotton from the cotton field. The private ginning industry is involved to purchase seed cotton from the farmers through local traders and separate seed and fiber through ginning process and send the fiber to spinning mill by making bale and seed is used for different value addition product like edible oil, cotton oil cake for animal and fish feed, used in soap industry etc. For the processing of seed cotton many workers mostly women are employed. Expeller also is used for oil extraction from seed as crude oil after refine is being used as edible oil. Many men and women are used as workers in these industries. So if the cotton production is increased the number of ginning industry will be increased and scope of employment generation will be increased [25]

Profitability of Cotton

Cotton is a highly competitive and long duration crop, it requires 6 months from sawing seeds to yield cotton. Within this time our farmers can grow two crops from the same land through which he can generate more income from same land. High and medium high land is suitable for cotton production where many high value crops can grow. During early and mid-ninety's, the area and

production was increasing but from late ninety's the acreage and production was drastically dropped. During that time cotton price was also low in international market. So, cotton was not profitable for most of the farmers. That's why the farmers were migrating to grow other short duration high value crops like vegetables, wheat, maize, potato, banana, flower etc.

CONCLUSION

Bangladesh have to increase cotton production to keep sustainable Ready-Made Garments sector but of course it has to be accomplished by keeping food security intact. Cultivation can be further boosted if government encourages cotton cultivation despite tobacco cultivation. As a cash crop cotton can be good alternative to tobacco production for the farmers. According to Md. Abu Taleb Chowdury, Fiber Technologist, Cotton Development Board, "cotton development board is more capable than before to face challenges of cotton cultivation. Our scientists are trying to invent water tolerable cotton species; they are also working to develop cotton species convenient for hill track area to boost up our cotton cultivation. Actually, land scarcity is main problem for us. Our government's priority is to maintain food securities as well as we need to increase cotton cultivation. But there is no proper coordination between Agricultural ministry & Textile ministry. Proper coordination and adequate training facilities among cotton farmers can change the whole scenario of cotton cultivation."

Cotton provides food, feed, fiber and fuel. It contributes in food security by increasing by purchasable power of the farmers. It creates income and employment, which has significant impact on economic and social aspect. Cotton plays a key role in the national economy of different countries that is why it is called White Gold for many countries of the world. Government and other policy makers should develop positive support to boost up the cotton production.

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