ESTONIAN UNIVERSITY OF LIFE SCIENCES
Institute of Economics and Social Sciences

Abu Mohammad Talha

BIOMAJANDUSTOODETE VÕIMALUSED BANGLADESHIS

Master's Thesis
Curriculum in Agri-Food Business Management

Supervisor: Prof. Ants-Hannes Viira

TARTU 2021

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SCOPE OF BIOECONOMY PRODUCTS IN BANGLADESH

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Estonian University of Life Sciences
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Bangladesh is a large and densely populated developing country. Bioeconomy could be a major factor for ensuring Bangladesh's food and environmental security. Bioeconomy is a new term in Bangladesh, and people's knowledge of it is limited. Given the large population, food security and environmental sustainability bioeconomy should be very common and widely discussed topics. Despite having all of the prerequisites for bioeconomy in Bangladesh, bioeconomy is not as popular in Bangladesh like western world. This research was conducted to determine why bioeconomy is not popular in Bangladesh, this study was conducted to determine the scope of bioeconomy products in Bangladesh. What is customers desired bioeconomy products that can be create market scope and can be developed was determine in this research.

Keywords: Organic product, Jute Products, Forestry, bioeconomy, bioeconomy products scope.

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Bangladesh on suur ja tihedalt asustatud arengumaa. Biomajandus võib olla peamine tegur Bangladeshi toidu- ja keskkonnajulgeoleku tagamisel. Biomajandus on Bangladeshis uus termin ja inimeste teadmised sellest on piiratud. Arvestades suurt rahvaarvu, peaks toiduga kindlustatus ja keskkonnasäästlikkus olema biomajandus väga levinud ja laialdaselt arutatud teemadel. Hoolimata sellest, et Bangladeshis on kõik biomajanduse eeldused, pole biomajandus Bangladeshis nii populaarne kui läänemaailm. See uuring viidi läbi selleks, et teha kindlaks, miks biomajandus pole Bangladeshis populaarne, see uuring viidi läbi biomajandustoodete ulatuse kindlakstegemiseks Bangladeshis. Selles uuringus arutati, mida kliendid soovivad saada biomajandustoodetest, mis võivad luua turu ja mida saab arendada.			
Märksõnad: Märksõnad: Mahetoode, džuuditooted, metsandus, biomajandus, biomajanduse toodete ulatus.			

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TABLE OF CONTENTS

LIST OF ABBREVIATIONS

OECD-The Organisation for Economic Co-operation and Development

EU-European Union

IFOAM- The International Federation of Organic Agriculture Movements

ARS- Agricultural Research Service

USDA-United Sates of Department of Agriculture.

KSF- Kazi Shahid Foundation

IPM-Integrated Pest Management

NGOs-Non-Governmental Organizations

DAE- Department of Agricultural Extension

MT- Matric Tones

FY- Fiscal Year

TK- Taka

BDT- Bangladeshi Taka

GDP-Gross Domestic Product

FAO- Food and Agriculture Organization of the United Nations

IAEA- International Autonic Energy Agency.

MTCP- The Medium Term Corporation Program

UBINIG- Unnayan Bikalper Nitinirdharoni Gobeshona, the Policy Research for Development Alternatives

JDPC- Jute Diversificaton Promotion Center

NWFP-Non Wood Forest Products

LIST OF FIGURES

LIST OF TABLES

CHAPTER 1
INTRODUCTION

The word bioeconomy is used in several forms and different contexts worldwide. According to the European Commission, the bioeconomy involves producing renewable resources of biological origin on land and in the sea and using these resources and waste streams to produce value-added products such as food, feed, bioproducts, and bioenergy (Biernat, 2019). In 2006, the OECD established the definition of bioeconomy and decided its implementation in development policy. OECD states that the Bioeconomy is the aggregated collection of economic activities in a community that uses the unseen principles found in goods and biological processes to accelerate the increase and create stability for people and nations. The US definition of bioeconomy shares much closeness than the definitions developed by the OECD and the European Union. According to a concept of white house documents in 2012, the Bioeconomy is an economy focused on using research and invention in biological sciences to fuel industrial development and produce public profits (Adamowicz, 2017). The primary need of the bioeconomy is to adapt to climate change and its related adverse impacts on a sustainable path. Some of the bio-economy challenges are the rising world population, the increasingly wealthy middle class, rapid urbanization, related pollution problems, and inequality in income distribution. Sustainable development aims to harmonize economic growth, environmental protection, and social inclusion. The growth of the bioeconomy can help solve environmental, social, and economic problems that exist in post-industrial societies and emerging markets.

On a national, EU, and global level, the idea of sustainable consumption and development is gaining momentum, and the bioeconomy is an essential component of that concept. The sustainability of the bioeconomy has three major dimensions: Economy, Society, and Environment. The implementation of new core technology has had a significant influence on society. In developing nations, the tremendous impact of innovations such as diesel engines, internal combustion engines, and mains electricity is well known. However, above all other technologies, biotechnology provides complete or qualified solutions to most healthcare, food safety, environmental degradation, and energy supply. It can allow long-term growth as well as lead to value creation in all sectors of society.

Bangladesh is in the new era of the Bioeconomy. The term bioeconomy is unique from Bangladesh's perspective. Agriculture is one of the primary income sources of Bangladesh, this sector represents 23% of Bangladesh's domestic gross product, and in the agricultural industry, more than 65% workforce is connected. Nevertheless, Bangladesh's agriculture is highly dependent on fertilizer and the traditional structure of cultivation. Traditional cultivation is a historical cultivation procedure of Bangladesh agriculture. In traditional cultivation, Bangladesh maintains its food security. In traditional cultivation, using fertilizer and parasitize in the soil makes soil cultivation and productivity higher at some primary point, but it will negatively impact productivity and soil and nature in the long term. In this concern for increasing soil structure and to get good agricultural product outcomes for a sustainable agriculture sector and food-producing sector, Bioeconomy in agriculture can play an important role by increasing food-producing in a systematic way. The usage of proper organic farming methods can increase agricultural production. Bioeconomy organic farming is essential for sustainable production of high-quality food, reducing high inputs on display, improving environmental and nature conservation, and adapting to climate changes and developed rural livelihood. Bangladesh has lots of potential scope in organic farming/food. Creating awareness may increase the scope of organic farming in Bangladesh.

Forestry is one of the small industries in Bangladesh; few forests in Bangladesh are mainly natural. In the content of wood and biological development, forestry can play a role in evolution by producing a good wood supply, maintaining natural balance, and protecting land from a natural disaster. If it is coming to nature-friendly fiber, then Jute is made of natural fiber. The jute industry is one of the biggest industries in Bangladesh, and It has cultural and economic importance for Bangladesh's industrialization. Before 1970 jute was the major export item from Bangladesh. As far as 2018, Bangladesh produces 33 percent of world jute production. If scientific development is put to practice, there is ample opportunity, and scope to develop jute industries and use Jute in textile and alternative plastic. This thesis will highlight the prospects and potential of Bangladesh's bioeconomy in the fields of organic farming, jute, and forestry.

Aim of the Research

To analyze the scope of the bioeconomy products in Bangladesh. How much potential Bangladesh has in the bioeconomy products and how the bioeconomy and the bioeconomy products scope can be developed in Bangladesh. The research tasks seek to achieve the aim:

1. To present a theoretical discourse and overview of bioeconomy-based business development in Bangladesh.
2. To find out the scope of the bioeconomy products in Bangladesh.
3. To find out the scope of bioeconomy product which have the customers demand in Bangladesh market.
4. To find out those bioeconomy products and business which have the scope to extend in Bangladesh Market.

The dissertation will try to understand how Bieconomy can characterize the Bangladesh economy in the current period. The analysis will be guided by the survey approach, with resources of the theoretical approaches of some of the most preponderant authors in the subject. Before summarising the Bangladesh Bioeconomy system innovation, it was thought necessary to define the term "bioeconomy." The opening chapters of this thesis give a literature study on the issue, combining a study of institutional organization and theoretical research to establish an all-encompassing definition of Bio-economy, which will serve as the basis for the rest of the report.

Research Methods

This study will concentrate on the analysis and synthesis process for building a theoretical foundation for discussing the market realities in Bangladesh. Descriptive analysis aims to show an overview of the bioeconomy and its current state. The survey approach will learn about the current state of bioeconomy products and the variety and market realities in Bangladesh.

In terms of empirical data, because Bangladesh Bioeconomy is still a very recent field in an early stage of development – Bioeconomy is not even institutionally considered an economic sector. It was decided by a collaborative discussion with the supervisor that the most feasible approach would be to interview some of the stakeholders of the Bangladesh Bioeconomy. Consumers will be asked a series of multiple-choice questions as part of a survey. They asked multiple-choice questions about bioeconomy products dependent on agricultural, jute, and forestry-based products to the customer, who is the real asset for the industry. The actual demand for bioeconomy products based on organic farming, Jute, and forestry products can be tabulated by analyzing the data collection results based on the survey questions. The survey data will be analyzed using MS Excel, percentages, graphs, and tables.

CHAPTER 2
LITERATURE REVIEW

2.1 Bioeconomy of Bangladesh

India borders Bangladesh's geographical position on its north, west, and northeast, and Myanmar and the Bay of Bengal on its south. There are eight divisions of Bangladesh. Most food plains account for about 80% of land in the three significant ecosystems, while hills account for about 12% and terraces for about 8%. Most of the country's productive land is used for farming and settlement. Lots of rivers flow from Bangladesh land, which comes from India, Nepal, and ended in the Bay of Bengal; here is Figure-1 the Bangladesh Map where Bangladesh is situated and the rivers of Bangladesh, making Bangladesh land fertile and cultivable land. Figure-1 shows that India surrounds Bangladesh from three sides, and in the south of Bangladesh, the Bay of Bengal and Myanmar are situated. In Bangladesh, almost everywhere jute is produced, in yellow color is described the jute production area of Bangladesh, Jute is related to low land and river area, so almost all river and low land area have jute in Bangladesh. The green color in the map showing the forest area of Bangladesh; the forest is in some specific area, among them Chittagong, Khulna, Mymensingh, and Sylhet division is the main forest area in Bangladesh. Bangladesh is in very beginning positions in organic farming, where shrimp, some tea state, and some farmland are the organic land in Bangladesh. In red color indicates the organic farming area of Bangladesh, among them Khulna, Maheshlkhali inland of Chittagong division and Northern part of Rangpur are the organic farming area.

The most common source of income in Bangladesh is agriculture, and it employs more than 60% of the population. The country's manufacturing sector is thriving due to its abundant natural resources, labor, low price, and an atmosphere conducive to business (Halder, 2015). The whole of the bioeconomy is a very straightforward task, here adding only a few areas that contribute to nature and the environment and are needed for environmental sustainability. Bangladesh developed bioeconomy sectors more in energy, biomass. The country has the lowest energy consumption per capita. According to IAEA (Country Nuclear Power Profiles, 2016), the energy consumption in 2013 is about 216 kgoe/a, which is lower than the global average of 1894 kgoe/a. Rural areas in the country meet their majority of energy needs with conventional biomass fuels. Bangladesh's total primary energy consumption is dominated by

biomass, accounting for about 60% of the country's total primary energy consumption. Discussions on the scope of bioeconomy products are discussed in detail from the previously available literature.

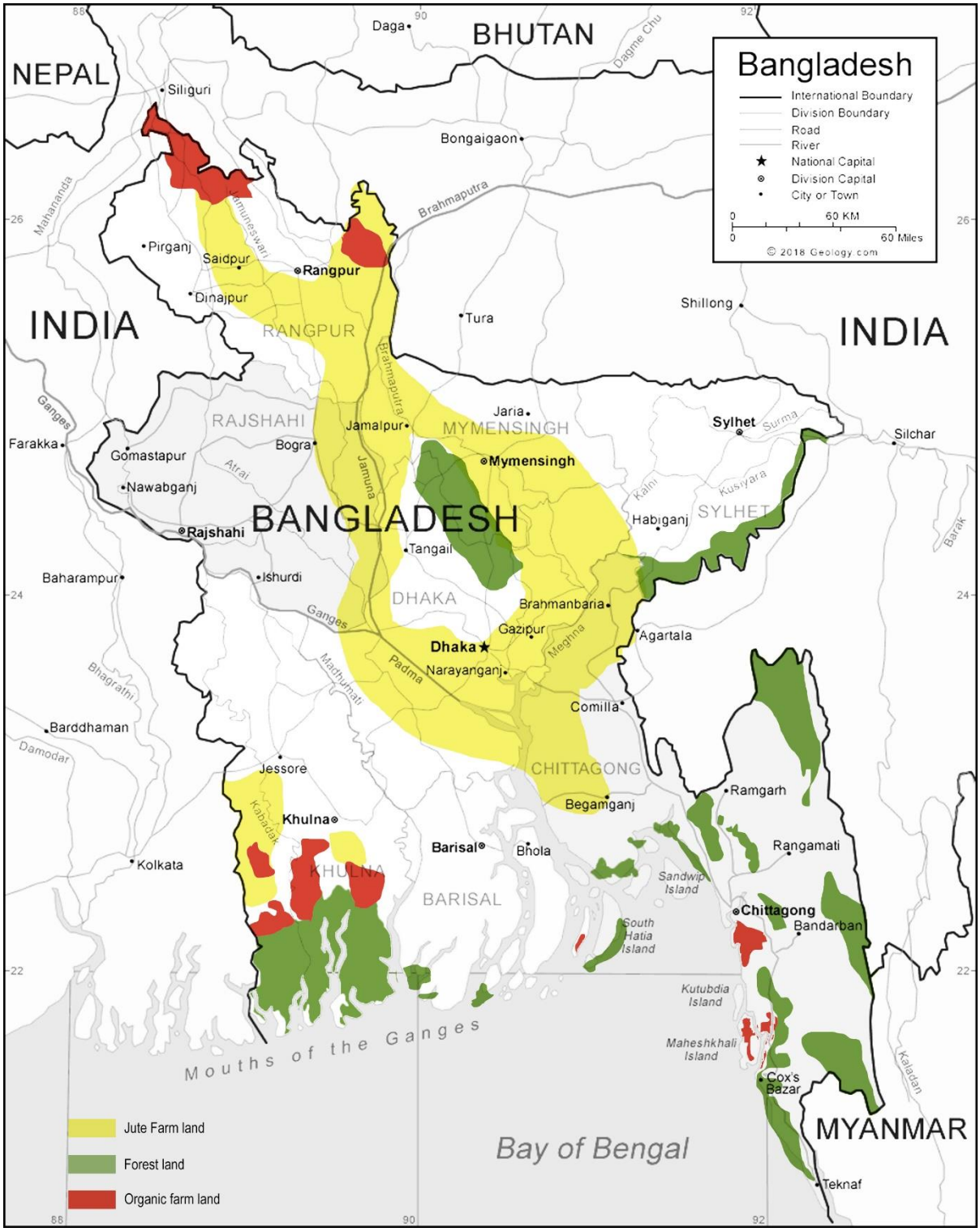

Figure 1. Agriculture land use map for bioeconomy products.

2.2 Organic Farming for Sustainable Growth

Organic agriculture is a form of agriculture that promotes genetically, socially, and economically sustainable food, textile, and timber production. Conservation of soil productivity is seen as critical for product production in this perspective. Agriculture lands are not fertilized with chemo-synthetic fertilizers, treated with contaminants, or treated with pharmaceuticals. Additionally, socio-economic considerations are considered. Organic farming is a development approach that removes or considerably limits the usage of synthetic chemical fertilizers, pesticides, growth inhibitors and animal feed additives, as the US Department of Agriculture states. (Chakraborty, 2018). Organic farming has gained popularity worldwide over the last few decades. It has been developing its primary importance in modern society in a dramatic manner. Using ecologically friendly pesticides and biological fertilizers produced mostly from animal and plant wastes and nitrogen-fixing cover crops, organic farming is a kind of agriculture that encourages the cultivation of healthful soil. Traditional agricultural practices used toxic chemicals and industrial fertilizers, and the use of these practices created a significant amount of environmental damage. As a result, the modern organic movement was founded to fix the problems caused by the use of these traditional agricultural practices. Organic farming employs environmentally friendly pesticides and biological fertilizers extracted primarily from animal and plant wastes, as well as nitrogen-fixing cover crops (Adamchak, 2008). It is essential to comprehend the guiding concepts of organic agriculture to comprehend the inspiration for organic farming. These principles include the most relevant objectives and constraints for manufacturing high-quality food, fiber, and other products in an environmentally friendly manner. Organic agriculture is dependent on the complex relationship of land, herb, animal, person, ecosystem, and climate.(Meena, Meena, Naik, Meena, & Meena, 2020)

Moreover, this and its presence and significance in human and natural life are growing. At the beginning of the twentieth century, the idea of organic agriculture was born. Increased demand from customers in most developed countries worldwide has fueled the growth of organic farming (Ostapenko and Herasymenko 2020). To grow and cultivate organic agriculture's roots, one must adhere to the principles of organic agriculture outlined below (Table:1). These principles express the contribution that organic farming can offer to the environment and a vision to improve organic farming globally to benefit nature and humans. These concepts, according to IFOAM, refer to organic farming in a broad sense, encompassing how people look

at plants, water, soils, and animals to grow, prepare, and distribute food and other products (Kandel, 2018).

Principles of Organic Agriculture	Details
Principle of Health	Organic agriculture should strive to maintain and improve the soil, wildlife, plants, people, and planets as a whole.
Principle of Ecology	Organic agriculture is based on replicating and preserving living biological systems and cycles.
Principle of Fairness	Organic cultivation should be built on a foundation of mutual respect for the natural world and life opportunities.
Principle of Care	Organic farming can be conducted responsibly, with an emphasis on the health and well-being of current and future generations, as well as the environment.

Table 1. Principle of Organic Farming.(IFOAM Organics International, 2020)

Soil and the environment are both considered public goods. Traditional farming activities have a detrimental effect on soil fertility, which is cause for concern. Drought is exacerbated by a deficiency of organic matter in the soil. Traditional cultivation lacks the long-term impacts on land fertility, causing potential generations to face challenges. Organic cultivation is a long-term method of land restoration. According to Akinnifesi (2018), a portion of the world's land has been polluted(Akinnifesi, 2018). There is also a connection between certain chemicals and an increased risk of cancer in humans. Long-term exposure to chemicals like 'Roundup weedkiller' has been linked to an increased risk of cancer. According to the World Health Organization, the long-term risk of prolonged exposure to these chemicals is reduced when you consume organic vegetables (Glyphosate is possibly carcinogenic to people, according to the World Health Organization). Countries such as the United Kingdom and the United States must import organic food from other countries (commonly in developed countries). Some organic methods are more expensive (labor-intensive weeding), but others save money (cost of chemicals). As explained by Tejvan (2019), "When compared to traditional farms, organic farms tend to have improved soil quality and minimize soil erosion. Organic agriculture is more

energy-efficient and produces less soil and water contamination, and lowers greenhouse gas emissions. Organic farming is also linked to increased plant, animal, insect, and microbe biodiversity, as well as genetic diversity." (Tejvan, 2019)

2.2.1 Benefits of Organic Farming

Organic farming can be lucrative, and customers like organic food because it is both nutritious and ethical nature friendly. On the other hand, organic agricultural practices provide many environmental benefits and financial and ethical concerns. According to the Organic Trade Association, 500 million pounds of chronic and poisonous pesticides will be eliminated from the environment per year if any farmer in the United States turned to organic cultivation. The use of pesticides and chemicals has several harmful consequences for the environment. Using pesticides cause disease tolerance in weeds, plants, plant-eating insects, bacteria, and fungi. Using pesticides on plants polluted the regular air sources, soil fertility, and climate. These poisonous pesticides can remain in soil and nature for a long time (Gill & Garg, 2014). Cover crops and seed rotation are two examples of innovative farming methods discouraged by synthetic chemicals, leading to deforestation and other adverse environmental issues (Chait, 2019). To grow healthy food, you need healthy soil, to begin with. If farmers use toxic pesticides and chemicals on the soil, it can become incapable of thriving on its own. Chemical soil management is much inferior to natural cultivation methods. According to a significant nine-year analysis by the USDA Agricultural Research Service (ARS), organic cultivation builds up organic soil quicker than traditional and conventional farming. Dr. Elaine Ingham states and believes that - from one teaspoon of rich organic or compost soil, there can be found 1 billion necessary bacteria from over 15,000 distinct species (Martens, 2000). On the other side of Ingham, one teaspoon of chemically or processed soil may contain00 beneficial bacteria (Begum, 2021).

Organic farming not only benefits the climate but also addresses significant soil and land problems, including deforestation. Researchers found that the organic field had eight inches more topsoil and just one-third of the erosion loss of the chemically treated field in a large study comparing adjacent organic and chemically treated wheat fields. People should be worried about erosion if they are not already. Erosion is a significant issue that harms the land, food supplies, and humanity. Organic agricultural methods, on the other hand, help to prevent erosion (Chait, 2019). Organic farming also aids in water conservation. Organic growers, on the whole, spend more time amending soil and mulching, all of which help save water. When

grown conventionally, cotton, a popular crop, necessitates a lot of irrigation and water. Organic cotton cultivation, on the other hand, needs less irrigation and therefore saves water. The word "sustainable" comes from the Latin word "suspendere," which means "to hold alive," indicating permanence or long-term protection. According to Ikerd, sustainable agriculture is "capable of sustaining its efficiency and usefulness to the community throughout the long term. It must be environmentally sound, resource-conserving, economically feasible and socially supportive, commercially efficient, and environmentally sound" in the sense of agricultural development. Profitability, social and economic justice, and environmental sustainability are the three core targets of sustainable agriculture. Organic cultivation avoids all forms of inorganic agricultural methods and eliminates all environmental and social problems associated with chemical-based farming. Agriculture will only be profitable if it is economically viable in the long run. Organically produced goods command a higher selling price, making organic production more lucrative. Agriculture, without a doubt, needs a complete overhaul in order to become more competitive. However, this is essential in order to protect the climate and increase the efficiency of the agro-ecosystem. Policy initiatives are essential to promote agricultural practices that are socially and environmentally sustainable in the long run (Meena et al., 2020).

Furthermore, livestock raised on organic farms is fed safe, without chemicals, which keeps livestock disease-resistant and naturally healthy. Getting productive organic animals should be happy and healthy, which is a bonus for organic farmers. In general, if the farm has higher biodiversity, then it will be a more stable farm. Organic farming always promotes healthy biodiversity, essential for a farm's resilience to disease, bad weather, and pests. Reduced biodiversity can also be linked to increased infectious diseases, which are not suitable for people or the environment (Chait, 2019). In Bangladesh, the organic farming concept is crucial because the term 'certification' always rises next whenever organic farming comes up. Ecological farming differs from one location to the next, and it encompasses the environment, crops, livestock, and biosphere, among other things. Eco is a simple word with a simple meaning. If farmers use less fertilizer, pesticide, and compost, and these are natural and eco-friendly farming methods, the ecosystem is assisted by the farmer, and it is eco-friendly. As a result, eco-farming continuously varies from person to person. Proper organic cultivation, on the other hand, follows strict guidelines. However, organic farming can help with local food security in a variety of ways. Organic farmers may not have significant upfront costs, so they borrow less capital. Synthetic inputs are not utilized because they are unaffordable to an increased amount of resource-poor farmers owing to reduced incentives and the need for

foreign currency. For resource-poor, small-scale farmers, organic soil enhancement could be the only financially viable option. This feature of organic farming's development method ensures that organic farmers and customers are less reliant on a factor about which they might have no influence, thus improving food security. Low cash costs were listed as a significant explanation for beginning organic agriculture in some of the ventures surveyed by Annual Research of Resouce Economy (Meemken & Qaim, 2018)

2.2.2 Organic Farming in Bangladesh

It has been the apparent fact that all Bangladeshi cultivation was organic before the 1960s. Consider a period when there were genuine food shortages, sometimes famines, and people perished from malnutrition. The conundrum was resolved precisely as a result of the use of synthetic inputs and modern agriculture. However, as all organic farming research would point out, the organic farming needs more labor and land for the exact yield than industrial farming practices. Farmes get less amount of food from the given amount of labor, and they get less food from any soil what they use for cultivation, whether they do not use chemical fertilizers, herbicides, fungicides, or genetically engineered crops. Carbon farming, also known as modern or chemical farming, replaces pesticides for the land and labor that organic farming necessitates. In truth, that is the whole argument. In a wealthy world, a passion for the natural and the absence of chemicals is unimportant. Simply because an increase in food prices is not all that significant in a wealthy nation — and that is pretty much what wealth entails. It is when the concept collides with suffering where things get dangerous (Worstall, 2018). The most obvious fact is that organic food is comparatively more expensive. It is a known fact that many Bangladeshis face real and severe financial constraints regarding food spending; hence, raising prices is a wrong idea (Worstall, 2018).

Bangladesh has recently begun making modest efforts to resurrect its glorious history in medicinal plant manufacturing. Villagers are receiving the best possible assistance from local governments in cultivating medicinal plants. They have enabled interested farmers to grow these plants on government-owned fallow lands and roadside spaces. A farmer would not need to use chemicals or artificial fertilizers when planting field-based herbal crops. For a few years, farmers in Gaibandha villages have been cultivating 'Tulsi,' a cure for various eliments, and 'Basok,' another herbal vine. The plants are grown alongside the key crops. The majority of farmers are pleased with their 'Tulsi' planting since the product pays well. In other regions of Bangladesh, farmers grow 'Shefali,' 'Parijat,' 'Rongon,' and 'Madhabi Lata' for medicinal herbs,

with the flower and vine for starting materials, plus many other plants for medicine,in addition to ‘Tulsi’ and ‘Basok Any portion of a plant or tree is used to make a drug, which is a fascinating feature of these medicines. These include leaves, flowers, tree outer and inner bark, stems, vegetables, and pastes and powders produced from these ingredients. In the Subcontinent, about two thousand medicinal plants have been discovered (Sarkar, 2019). Similarly, bananas, papaya, pineapple, jackfruit, litchi, and other fruits and vegetables are accessible from the local organic farms. Cucumber, cauliflower, onion, cabbage, radish, and carrot are among the crops. Bdfoods, Square household goods ltd, Pran Foods ltd, and Ahmed food products are only a few examples. Aftab food ltd is a private limited company that promotes agricultural goods. They also please customers in the same way. In this manner, they often purport to deliver healthier food options.(Rafij & Ratan, 2018)

Nearly 80% of the population in Panchagarh, Bangladesh’s northwestern tip, is considered financially weak. Kazi Shahid Foundation (KSF) was founded as an autonomous socio-economic scheme to promote a dairy cow rearing model linked to commercial organic tea farming and improved the livelihoods of poor women and their families. Instead of synthetic fertilizers and pesticides, the farmers from Pairabandha in Mithapukur Upazila in Rangpur use manure, water hyacinths, crop residue, and other perishable six products in their fields. Some Kaunia farmers cultivate earthworms at their homes to produce vermicompost (high in nitrogen, phosphorous, and potassium)(Kazi Shahid Foundation, 2015) According to a recent report by Chakraborty(2018), rice farming using Integrated Pest Management (IPM) is more commercial than traditional mechanized rice farming. Bangladeshi farmers use many chemicals to increase their production. As a result, the government and 14 non-governmental organizations have encouraged and educated farmers to adopt organic farming. During that time, approximately 440,000 farmers received season-long IPM preparation. Bangladesh became the second country in Asia to implement organic farming (177,700 hectares, or 2% of total land area) thanks to the combined efforts of the government and non-governmental organizations (NGOs) (IFOAM, 2006). In Bangladesh, NGOs are assisting more than the government in the adoption of organic farming. Farmers under Nayakrishi and Proshika have been converting their land to organic farming since 12 to 15 years ago, other side BARI touch farmers are doing organic farming for seven years, and Kazi tea farmers have been doing so for five years. From 4 to 7 years, DAE farmers have used fewer chemicals (Chakraborty, 2018)

Further examination reveals that the land and the sea in Bangladesh are equally polluted. Hazardous chemicals are widely used to preserve sea fish in Bangladesh. These chemical-coated fish are eaten by people worldwide, and their byproducts are used to feed poultry. Along with land, a similar proportion of organic techniques is visible at sea level. Four dry fish producer groups have been established via MTCP2 to grow dried fish without pesticides. Following training on several eco-friendly ways of dry fish farming, these groups have started producing dried fish organically. Additionally, their hazards to their well-being have been decreased, which translates to an overall better quality of life (Asia-Pacific Farmers' Forum, 2020).

Organic shrimp is now the most common and rapidly growing food industry in Bangladesh, with WAB Trading Int. (Asia) that are exporting organic shrimp to markets around the world, especially in Europe. About 55,000 marine shrimp farms, averaging 3 ha. in scale, exist in Bangladesh. The coastal districts of Satkhira, Bagerhat, Khulna Cox's Bazaar, Barguna, Chittagong, and Bhola currently have around 170,000 ha of marine shrimp farms. The majority of brackish-water shrimp culture occurs inside the Bangladesh Water Development Board, which was established to conserve land suitable for agriculture and protect human life and facilities from catastrophic tidal activity. Private farmers have built shallow levees along the riverbank in many places for drainage and aquaculture (Karim Mahmudul, 2006). Many nature and eco-friendly initiatives and steps are implemented by the Department of Agricultural Extension (DAE), funding from various aid agencies since the 1980s, despite government policy still encouraging people to "Develop more food." However, the nation still lacks a standard evaluation and qualification scheme. Organic farmers, organizers, and sellers are dispersed throughout the country. Organic goods are unable to compete or reach the global market due to a lack of standards, and they have also struggled to gain the confidence of domestic consumers.

Farida Akhter, the executive director of UBINIG, is a supporter of organic food and feels that the practice of unique regenerative farming and having variety in production may help us accomplish the 2021 goal. They think that agricultural practices must be able to replenish the components of the whole ecological system, and they manage the Nayakrishi Andolon, a biodiversity-based ecological agriculture movement. Nayakrishi is organic food production, as described by conscientious consumers concerned with food safety, in contrast to industrial food production using pesticides and chemicals. Although organic food may be provided as

Nayakrishi, it is not simply a raw material for eating. Nayakrishi serves the purpose of regenerating live and rich soil, including plants and animals, and regenerating and restoring biodiversity and eco-systemic diversity while also building the indigenous knowledge system's potential (Siddiqua, 2017). This organic renaissance will not be simple, but Farida feels it is well within reach. “Most importantly, our customers must be informed about the many health advantages that organic food may provide. People may certainly aspire to rely on ‘organic’ food production if people have the demand for biodiversity-based, eco-friendly crops.”While choosing organic food is undoubtedly a better option, Shahidul Rashid Bhuiya, Professor of Genetics and Plant Breeding at Sher-e-Bangla Krishi University, argues that it is never simple in Bangladesh, given the limited quantity of arable land available to feed the country’s ever-growing population. However, this safety comes at a higher cost, frequently twice as much as conventionally produced food, which may cause some families to rethink (Siddiqua, 2017).

Organic food is beneficial to one’s health. On the other hand, customers have no means of knowing which things are genuine since practically all organic food manufacturers are unaccredited. Consumers cannot evaluate the purity of items on their own, and there is no thorough research on the subject, “Dr. M Abu Sayeed, head of Bangladesh’s Doctors for Health and Environment, claimed as much(HelpGuide, 2020). No law in Bangladesh specifies organic food. On the other hand, some natural agriculture advocates have been striving to promote centuries-old farming systems that do not need the use of pesticides. They think that increasing the popularity of natural agriculture among rural communities would raise soil fertility, improve yearly crop yield, and reduce organic food costs for all classes of consumers (Rahman, 2019).

Shashya Prabartana which first opened its doors in Mohammadpur's Sir Syed Road in 2002, now sells over a hundred different goods, including local rice varieties, flour, wheat, lentils, edible oil, beans, peas, dairy products, pickles, honey, almonds, sugar, molasses, spices, meat, fowl, and fish.. For the last year, Shashya Prabartana has been conducting an e-commerce operation for Dhaka residents. Shashya Prabartana’s daily sales run between Tk50,000 and Tk80,000, according to Adhir Chandra Das, the outlet’s online sales operator. Under the name “Naya Krishi Andolon,” inaugurated in 1988, Shashya Prabartana is the sales outlet of UBINIG (Policy Research for Development Alternative), a leader in the organic food movement. However, Farhad Mazhar, who is the founder of Naya Krishi Andolon, highlighted a crucial difficulty. “We cannot always fulfill demand,” he said. Delowar, the organizer of Prakritik

Krishi, has had a similar experience (Rahman, 2019). Demand for organic food has been progressively rising as worries about the widespread use of chemical fertilizers in high-yield agriculture, followed by food adulteration, have grown. Despite the desire, organic agricultural techniques have failed to gain traction in the nation, as predicted three decades ago. Organic food is grown on approximately 7,800 hectares of land in Bangladesh, accounting for approximately 0.1 percent of the country's total acreage," said Dr. Nazim Uddin, senior scientist at the Bangladesh Agricultural Research Institute's Horticulture Research Centre (Rahman, 2019).

Though Bangladesh has some organic farming initiatives from private and personal farming and some government initiative, they are not enough compared to Europe or The USA. To boost organic farming for the well-being of nature and bio-economical part, proper awareness and more government initiative need to change the traditional farming method. The market for organic farming in Bangladesh is increasing day by day, but organic product availability is very poor. According to Chakraborty, 2018, organic farming is both a philosophy and a practice in agriculture that incorporates all agricultural processes that promote environmentally, socially, and economically sustainable food and fiber production. Organic food manufacturing adheres to the highest standards in sustainability, natural resource conservation, and animal welfare, ensuring that no genetic engineering, pesticides, additives, or fertilizers are used; each stage in organic food development is controlled and certified (Chakraborty, 2018). Before the chemical farming period, agriculture in Bangladesh was fully organic on the organic sources of fertilizers (crop residues, animal manure, and domestic wastes) for fertilizing the land. Because of climatic adversities and the change from importance and commercialization pressure, farmers are presently heavily relying on input-generated agriculture (Chakraborty, 2018). As a result, several researchers asserted that organic cultivation is more successful in developing countries and can contribute to socioeconomic and ecological sustainability. Organic cultivation can mitigate the negative consequences of the ecological movement (IFOAM Organics International, 2020). Thailand and the Philippines produce the most organic rice for export. Bangladesh could earn foreign currency by processing and exporting organic rice, which is in high demand domestically and internationally. Cereals such as (wheat, maize, or corn), pulses (gram, black gram, and lentil), fruits (banana, mango, orange, and pineapple), oilseeds & oils (soybean, sunflower, mustard, groundnut, castor, vegetables, herbs and spices (chili, turmeric, tamarind, ginger, and others), and others (sugar, tea, Jute, cotton, and others) are among the other potential organic products found in Bangladesh which can be valuable

assets in the context of bioeconomy. Farmers have stated that fine rice is a lucrative farming venture and a good source of income. As a result, Bangladesh can grow traditional fine and aromatic rice in addition to modern varieties. Bangladesh's land and environment are also ideal for year-round production. Since the country never used high chemical compounds or inputs before the 1960s but is now experiencing a decline in soil quality and other issues, it would be much easier to persuade farmers to switch to organic farming (Pagiola, 1995). Organic agriculture is not only a solution for developed countries; it can also benefit developing countries by contributing to purposeful and long-term socio-economic and ecologically sustainable growth. Organic farming needs much labor, but Bangladesh has a competitive advantage because there is enough labor available at fair wages (Shennan et al., 2017).

2.3 Jute and Bioeconomy in Bangladesh

Jute was first cultivated in the West Bengal districts of Khulna and 24 Pargana. After much discussion, white jute was invented in the India-Burma area, while Tossa is an African variety(Jahan, 2019). Tossa jute and white jute have been discovered to have developed in southern China, where some researchers consider secondary centers of origin. Jute has played an essential role in the community and economy of West Bengal and Bangladesh's south-western region for centuries (then India) (Jahan, 2019). Jute has a long history of trading. The British East India Company traded Jute for the first time when the British colonized India. The company sent its first shipment in 1793, and they continued to change until the twentieth century. Raw Jute was traded with the Scottish jute industry in Dundee (Jahan, 2019) As a result, jute mills and factories sprung up to meet the demand. In 1855, the first jute mill was founded in Kolkata, India, and more jute mills were established in West Bengal during the 1900s. Since the partition is 1947, the highest-quality jute stocks persisted in the southwest of Bangladesh (then East Pakistan), though jute mills producing raw jute were in West Bengal, India. Then there was the drive to construct new mills in Bangladesh (then Pakistan) (WorldJute, 2002)

Reports on the current condition of jute retting, as well as its advantages and disadvantages. They also discovered that the farmers are involved in jute farming, with most of them retting their jute in ponds/canals, which is time-consuming. Since biomass is decomposed, the activity damages jute fiber processing, fish farming, and the ecosystem. To avoid the difficulties of jute retting, farmers are becoming more interested in the ribbon retting operation. Farmers will require a low-cost ribbon retting technique to produce high-quality jute fiber without forgetting

the value of high-quality jute fiber (Rostom Ali, Kozan, Rahman, Islam, & Iqbal Hossain, 2015). Another research in Bangladesh looked at the impact of storage climate on jute seed quality. They discovered in this analysis that jute seed loses viability in storage, resulting in a scarcity of quality seed compared to the demand for sowing, impeding the expansion of jute cultivation in Bangladesh. Furthermore, this research found that extending the storage time causes seed quality to deteriorate (Tareq, Khan, & Mollah, 2015). Islam, 2020, researched the marketing of raw Jute in Bangladesh (2017, 2019). Jute marketing employs many employees, and the new marketing framework cannot be assumed to be ineffective. According to the findings, taking proper and sufficient measures to grow this sector is critical for rendering the market more viable for entrepreneurs. There is a chance that jute marketing could spread throughout the world. For a better result in the jute industry, irregular marketing activities should be noticed, and enhanced marketing facilities should be given (Akter, Md, & Islam, 2020).

2.3.1 Jute and Jute Products

For more than 100 years, jute is used in Bangladesh for making various nature-friendly products. Jute is called the golden fiber of Bangladesh. Despite Bangladesh's reputation for jute and related fibers, the garment industry rushed in and grew due to the country's relative advantage and low labor costs. Jute has a promising future for use in numerous textile industries because of the multifibre idea of combining jute with other natural and synthetic fibers. Considering the opportunities, Bangladesh's government has been diversifying the applications of jute with its limited resources. It will need much help to produce and promote such a diverse range of items. As a result, Bangladesh's government launched a policy initiative to encourage the private sector to produce various jute items. Jute Diversification Promotion Centre (JDPC) was founded in 2002 to carry out this initiative. JDPC's mission is to offer extension services to the private sector to build industries to manufacture various jute products with a high added value (Golam, Rahman, & Sobhan, 2009). Demand for eco-friendly goods and services is rising right now. Global warming is a worry for political, economic, and environmental officials everywhere. Now the world is hoping to lessen the struggle between the global population and the diminishing natural resources and the pollution of the environment and industrialization. The promotion of fiber other than natural cotton and synthetic cellulose has emerged as an essential factor. For textiles, it is predicted that demand would climb from 60 million tons in 2011 to 130 million tons in 2050, without including the numerous other fibers used (Alexandratos & Bruinsma, 2012). Like many environmental issues synthetic fibers cause, they have provided humankind with innumerable advantages in our everyday lives. Jute and jute

products have brought the ecological balance from the environmental pollution caused by synthetics. Bangladesh has been producing traditional and essential jute products and, today, jute is used to make a wide range of Hi-Tech and diversified jute products worldwide, including Bangladesh. Jute goods can be used for a variety of purposes, including(Allen, 2011):

1. Bags and sacks for packing various agricultural products, minerals, cement, and other materials.
2. Wool and cotton packing bags.
3. Fabrics and materials for wrapping.
4. Carpet and linoleum carrier and backing fabric; cordage and twines; webbing to cover inner springs in auto seats and upholster furniture & ship cargo separator.
5. Cloth for ventilation and partitioning in mines.
6. Roofing and floor covering apparel.
7. Footwear Lining.
8. Wallcovering and furnishing fabric; m. Fashion accessories.
9. Geotextile for industrial and construction use.

Jute fibers are being used in various consumer products, including decorative fabrics, chic-saris, salwar kameez, soft luggage, footwear, greeting cards, and molded door panels. Due to technological advancements today, jute can be used to replace costly fibers and scare timber(WorldJute, 2002). Fine jute threads can be extracted and made into imitation silk. As the increasing concern is being shown for forest destruction for the pulpwood used in most papermaking, the use of jute for this purpose may increase. Webs of various sectors utilize jute fibers as a natural fiber bettering alternative. Other industries include paper, celluloid film, non-woven textiles, composites (pseudo-wood), and geotextiles. Today's consumers value diversified jute products more and more. These include espadrilles, carpeting, textile goods, Geotextiles, composites, and more. Jute-derived byproducts have many cosmetics, medicine, paints, and other industries (SOUTH ASIA ENTERPRISE DEVELOPMENT FACILITY & IFC, 2005).

Bangladesh yarn supplies account for roughly 75% of global yarn imports. India provides the majority of the remaining 25% (Allen, 2011). According to the report, the world import market for jute yarn is expected to reach 400,000 tons, which strongly supports the continuation of India's mandatory packaging order and its possible extension to other jute yarn imports. In table 2, the output of jute products in Bangladesh is seen by year from 2008-09 to 2018-19. The fiscal year 2017-18 saw the highest output of jute products, with 10.29 lakh MT generated. The lowest volume of jute goods is manufactured in 2008-09, with just 5.89 lakh MT.

FY	Production (in lakh MT)
2008-09	5.89
2009-10	6.95
2010-11	6.88
2011-12	7.14
2012-13	9.77
2013-14	9.83
2014-15	8.65
2015-16	9.63
2016-17	9.83
2017-18	10.29
2018-19	9.38

Table 2. Production of jute goods in Bangladesh from 2008-09 to 2018-19 (Akter et al., 2020)

Bangladesh exports jute products to several countries per year and earns a large amount of money. Table 3 shows the results, the amount of export in lakh MT, and export value in crore Tk. are shown from FY 2014-15 to 2018-2019 (Akter et al., 2020).

Year	Export (in lakh MT)	Export value (in crore TK BDT)
2014-15	8.18	5602.16
2015-16	8.25	6240.00
2016-17	8.04	6430.60
2017-18	8.27	6801.57
2018-2019	7.30	5220.85

Table 3. Export of Jute products from Bangladesh (2020) (Akter et al., 2020)

Jute has a high level of biological productivity. Jute is a fast-growing plant that takes just four to five months to mature. Jute is biologically effective compared to other crops in terms of the time it takes to grow from seed to harvest (Jahan, 2019). Jute has higher productivity than wood. While trees produce eight to ten tones of wood per hectare per year, Jute can produce twenty to forty tones of dry stem annually. As a result, it is a vital renewable energy source that also serves as a source of firewood in rural areas. After cotton, Jute is the most important natural and vegetable fiber in terms of use, availability, output, use, and price. Jute has various

biological properties, including high tensile strength, low extensibility, and improved fabric breathability (Jahan, 2019). Plants such as Jute provide food for both animals and humans. Jute leaf is a common vegetable in rural areas (Islam, 2013)hen other solid materials are retted, methane emission is estimated to be 1- 2 m^3 per kg, while one kg of jute fibers will emit 1.428 m3 methane. This biogas is widely used in domestic settings, especially in rural areas. Jute can produce 98 kg biomass per day/per hector, while other plants can only make 28 kg per day/per hector, according to an estimate (Jahan, 2019)

Jute produces natural fiber, which is a beneficial fiber of plastic alternative. Previously jute product was the primary source of having a bag, and valuable rope, shoes, and many more bioeconomic products were made from Jute. Still, they exist but in a minimal amount (Ohm, 2020). Now Jute in the textile industry is mainly used to make jute bags for caring rice, seeds, or crops, but there is very high scope to use this nature-friendly fiber in the textile industry to make garment clothing. Today, attention has shifted to Geotextiles, Nurseries, Garden Centres, Composites, Non-Wovens, Pulp, Home Furnishings, Textiles. There has been a lot of fine-tuning, however. Commercially significant volumes and values must be investigated. Jute needs to identify new or under-utilized applications that can take in large amounts to offset losses from the traditional market. It is critical to establish parameters by which the proposed ways of jute diversification can be evaluated. A clear qualification is the scope of the development application. Niche markets, especially of high value, should not be ignored. Only a proper plan should be executed. The second criterion appears to have significant merit: The marketability of resulting products. Competitive arguments require consideration, but product development can also affect the latter. Specific fiberboards, softening, composites, cutting costs, bleaching, and dyeing have attracted everyone concerned with hard fibers and jute. Jute has thus been endowed with characteristics similar to other materials and fibers. The approach promises excellent development potential for household furniture, clothing, and decorative items, but profitability will play a significant role since these attributes will not be competitive. Jute is used for making handcraft and some entry labels of garments products mainly in the invention stage, and there is very high scope to increase jute product for local and international markets. From the bio-economical perspective, jute and jute products are sustainable and reusable; in this content for sustainable growth and natural sustainability, jute products have a good scope in Bangladesh if the price and production of jute products can be within the budget. As a vegetable, jute leaves can be more green vegetables for human needs if it is adequately informed all over the country that jute leaves can be eaten as food. There are lots of jute

products available in Bangladesh which are nature friendly. However, still, there is much scope for using Jute as an alternative to plastic bags. Even Bangladesh Jute Research Institute recently invented Somali bags from jute fibers that are much thinner than plastic bags and look the same as plastic bags.

2.4 Forestry in Bangladesh

In terms of tropical rain forests and biodiversity, Asia has a long history of being a wealthy country. However, many tropical forest habitats have been polluted and impoverished. Sustainable forest management systems in Bangladesh have been focused on sustainable wood production, and multiple forestry techniques have been used for forestry management(Biswas & Choudhury, 2007a)Bangladesh, located on the northeastern tip of the Indian subcontinent, covers a region of 147,570 km^2. Mainland Bangladesh comprises various branches and tributaries of the Padma, Jamuna, Meghna rivers, and several other rivers. These rivers' sediments and nutrients aid in the forest, wetland, habitat, and marine habitats in the region. Bangladesh is among the most climate-prone countries in the world. On the whole, the nation has regular and violent rains, hurricanes, and cyclones. In addition to supporting, provisioning, and governing functions, forests often help minimize flood risks, help with climate change adaptation, and contribute to residents' livelihoods. The primary advantage of sustainable forest conservation in heavily settled Bangladesh is for the people in the surrounding area, most of whom are land-based agricultural laborers. As the world's environment has become a significant concern, particularly in fragile states like Bangladesh, sustainable and climate-resilient forestry has gained more significance (Ministry of Environment and Forests, 2012).

According to the Ministry of Environment and Forests, Bangladesh (Ministry of Environment and Forest, 2012), forests are characterized as "land with trees higher than 5 meters and a canopy cover of more than 10 meters spanning more than 0.5 hectares land." It removes property that is mainly used for agriculture or economic development. A forest is a forest, regardless of whether or not there are trees there. Reforestation sites estimated to cover a land by 10% and a tree height of 5 metres, as non-stored lands for which human activities or natural causes are likely to become forest, are included. This includes: bamboo and palm regions, provided the requirements for height and canopy have been satisfied, woods in the national parks, reserves and other protected places such forests of particular scientific, historical, cultural or spiritual worth. Crop stands in agricultural processing processes, such as

fruit crops and agroforestry systems, and plants in urban parks and gardens are excluded. Ecologically the forests of Bangladesh can be classified into five types:

1. **Tropical Wet Evergreen Forests:** Sylhet's hill forests, as well as a few tiny forest pockets in Chittagong and the Chittagong Hill Tracts
2. **Tropical Semi-Evergreen Forests:** The majority of Chittagong, Cox's Bazar, and Chittagong Hill Tracts' hill forests
3. **Tropical Moist Deciduous Forest:** The sal forests of Dhaka, Mymensingh, Dinajpur, Rangpur, and Comilla are located in the more excellent districts of Dhaka, Mymensingh, Dinajpur, Rangpur, and Comilla.
4. **Fresh Water Wetland Forests:** During the monsoon, these areas get submerged and inundated. The Sylhet haor area's reed land and hijal-koroj forests
5. **Mangrove Forests:** All the marine, estuarine tidal forests, including the Sundarbans

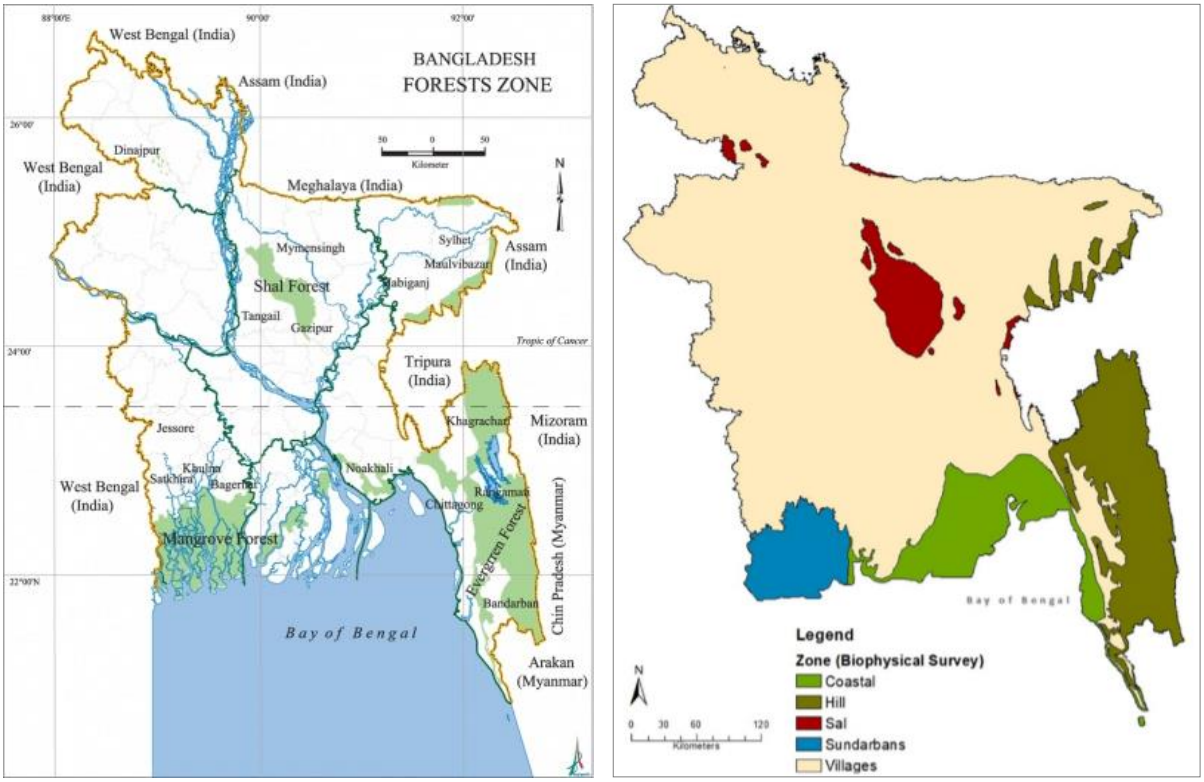

Figure 2: Bangladesh Forests Zones (2018), (Banglapedia, 2018)

The state-owned forests are found all across the nation (Figure 2). Out of the 64 districts, 32 districts have no state-owned forest property. Approximately 84% of the total forest area is natural forest, and almost 16% is planted. Hill and mangrove forests occupy around 68% of the total forest area (Figure 2) (Muqsudur Rahman, 2018). With a total size of 0.27 million hectares, homestead forests may be found all across the country. Forest cover covers just a tiny

percentage of the village area (2.86 million hectares). Homestead forests provide 70% of all timber, 90% of fuel, 48% of sawn and veneer logs, and over 90% bamboo requirements. Bangladesh has roughly half of its land covered with trees. Around three-quarters of the agricultural land is covered with trees. (Muqsudur Rahman, 2018).

However, forest contribution to the Bangladesh economy is negligible, and forests play an essential role in preserving the local and national climate. In 2019/2020, the forestry and agriculture sector contributed 12.7 percent of the total GDP of Bangladesh and 10.2% of agricultural production ("GDP: Agriculture and Forestry ," 2020). This industry employs approximately 2% of the workforce. According to FAO (2011), timber and poles, fuelwood, bamboo, thatch grasses, cane, and other forest products are the most commonly traded in Bangladesh. Three tiers of people are involved in forest products: primary collectors/growers, intermediaries, and mohajans. Over 0.1 million people work as primary forest product collectors in the Sundarbans alone(FAO, 2011). In the hill forest areas of Chittagong Hill Tracts, Chittagong, and Sylhet, it is estimated that over 0.2 million people work as primary workers. In the plain land Sal forest (Central and North-Western) areas of the country, about 0.075 million people work as primary workers, either as participants or as intruders. As a result, at least 0.4 million people are involved in the forest products trade somehow. The number of large investors is limited. Shorupkathi is the most important timber market in the coastal zone. Although some mohajans are stationed in Khulna, most of the coastal zone's mohajans are stationed at Shorupkhati. The forest produces trade in Bangladesh is centered in Chittagong. The timber traders of Chittagong handle the majority of Bangladesh's forest produce trade, including imports.

Although high-quality woods like teak, garjan, and sundry come from government forests, most of the wood comes from rural areas. In 2007, the government claimed about 15% of the country's land as "forestland," which has since increased slightly. Timber, fuelwood, poles, bamboo, cane, thatch leaves, fish, honey, wax, and other products come from these forest lands. Timber, fuelwood, and poles are all considered wood for this report. Bamboo, also known as "poor man's timber," is the second most crucial forest product traded after wood. It is primarily transported by river, and thus, with a few exceptions, the flow of its trade follows the flow of the river from upstream to downstream(FAO, 2011). Bamboo is an important raw material for pulp production. Bamboo production will increase, reducing the need for pulp imports (Choudhury, Abdullah, & Hossain, 2011).

Forest Type	Location	Area (million hectares)	Remarks
Hill Forest	Eastern part extending over Sylhet, Habiganj, CHT, Chittagong and Cox'sbazar	0.67	Under the control of FD. Major produce: large saw log, poles, firewood, thatching material and bamboo.
Natural Mangrove (Sundarban)	South-West in Khulan, Bagerhat and Satkhira	0.60	Includes 0.17 million ha water area; Major produce: timber, poles, firewood, pulpwood, thatching material
Mangrove afforestation	Along the Coastal zone	0.19	Major produce: firewood, pulpwood.
Sal Forest	Chiefly in the Central region in Gazipur, Tangail, Comilla, Sherpur and Mymensingh. Small patches also found to occur in Dinajpur, Rangpur, Thakurgaon, Naogaon and Panchagarh in the north-western region	0.12	Indigenous Sal and plantation of short rotation exotics for poles, posts and firewood.
Un-classed State Forests (USF)	Hill Tract districts	0.73	Under the control of district councils subject to shifting cultivation. Major produce: bamboo, thatching material and firewood.
Swamp Forest	Mainly in Sylhet and Sunamganj district in the north-eastern part	0.02	Hijal (*Barringtoniaacutangula)* an d Koroch*(Pongamiapinnata)* are the main species of the forest. The swamp forests support freshwater fisheries and are vital spawning grounds.
Village Forests	Scattered throughout the country mostly on the homestead land	0.27	Almost all the village area (2.86 million ha) is covered by trees of varying density.Major produce: timber, bamboo, poles, posts and firewood.

Table 4: Distribution of major forest goods in Bangladesh (2011) (Choudhury et al., 2011)

Apart from wood and bamboo for thousands of years, the tribal people have developed from a forest-based subsistence system in the hill and sal forest (Campos Arce, 2019). Several specialized livelihood groups have developed around the Sundarbans ecosystem, including Bawali (wood collectors), Mawali (honey collectors), crab collectors, and fishermen (Campos Arce, 2019). In Bangladesh's village landscape, homestead forests are the most prominent feature. Rural dwellers grow trees and other crops in an effective agroforestry method, mixing

multipurpose trees, food and forage plants, palms, medicinal plants, spices, and other plants in mixture with livestock, poultry, and fish in their homesteads, backed by solid tradition and traditional wisdom (Bangladesh Forest Ministry Plan 2017-2036, 2016). Aside from providing income, homestead forests are a valuable habitat for various common birds and animals(Iftekhar, 2006). Bamboo, Fish, Golpatta, Sun-grasses, Honey, Wax, and Cane are essential non-wood forest products (NWFPs) or "Minor Forest Products." Other plants include Phooljharoo (broom inflorescences), limestones, Saccharum spp. (nal), Murta, Hogla, Crab, fodder, leaves, stone, sand, kurujpata, climbers (lota), medicinal (barks, fruits, leaves, etc.) plant parts(FAO, 2011). While the essential NWFPs contribute only 6 to 8% of total revenue but are very important in employment generation, the number of NWFPs collected and traded by more minor well-off groups is relatively high. Despite the lack of reliable statistics, 60% of the total employment generated by the FDs in the NWFPs could be attributed to lower-income groups. This translates to NWFPs support the livelihoods of at least 0.6 million people (Henry et al., 2021)

The lush green countryside, the world's longest sea beach, colorful cultural diversity, ruins of ancient civilization, and the world's largest single-patch mangrove forest are just a few of Bangladesh's many attractions. The Sundarbans are the Royal Bengal Tiger's only unspoiled home. They run a small business selling traditional handicrafts and novelty items in some areas, popular with visiting tourists. Most peoples have no legal rights or access, but some areas have small businesses catering to tourists (Furukawa, Akter, & Salma, 2010). Bangladesh's tourism industry is still developing rather than fully developed. Bangladesh is quickly emerging as a desirable tourist destination, thanks to the gradual development of infrastructure facilities and increased exposition. Since native people depend heavily on natural resources and typical assets for their survival, forestry works as an essential rule against poverty. Social forestry, also known as participatory forestry, has a long history in Bangladesh. Over the last 20 years, the Forest Department's social forestry programs have offered significant revenue and job opportunities, as well as other benefits and services to participants. They also led to the beneficiaries' social status and acknowledgment growing. There have also been improvements in working standards and livelihoods (Biswas & Choudhury, 2007b).

CHAPTER 3
METHODOLOGY

The literature review from previous authors and article clarifies that Bangladesh's bioeconomy is not a wider part than other parts of the world. Sector-wise, some bioeconomy products are developed and available in Bangladesh, which is not sufficient for the vast number of populations. The author finds the common product category where the scope is to develop bioeconomy products from the literature review so that the author surveyed the customers to find the data on what kind of products are essential for client needs and can be possible to produce in Bangladesh. The author tries to find the products already developed from the previous literature or have the scope to develop in the Bangladesh market. After finding and determining customers' needs and availability of bioeconomy products, the author finds the survey question and started the survey. The research is conducted based on a customer survey and literature review. To determine the result of the scope of bioeconomy products in Bangladesh, the author mentioned various literature and based and compared the survey to the customers with multiple choice-based survey questions with writing options; here, every question has options. Customers can also write if something out of choice they want to answer. All the survey was done in google form where automatically result was updated whenever customers fill the survey form.

For reaching the customers, the author uses social media platforms to connect with the customers, with the help of social messaging site messenger, WhatsApp, email, Imo and open survey post in University of Liberal Arts Bangladesh Facebook group called 'ULABians News' group post. Because the previous article said that bioeconomy is a relatively new phrase and concept in Bangladesh, surveying common people may assist in locating the scope of the field. For surveying common people, the author decided common people in various social platforms to conduct the survey. Considering the communication medium and the distance survey because of this covid19 pandemic situation digital online survey is the best option to conduct the survey. This group of respondents was selected to fill the survey because they can use a digital platform. The total number of the respondent was 80 for this survey. Survey questions were primarily designed in easy choice-based option mainly, where this group of respondents has the minimum digital capabilities to do the survey. Survey questions were developed from the idea of literature review, wherein literature most of the standard product category was

discussed, and previously published articles also discussed even future scope. Depending on the literature and the data of various articles, the questionaries part was developed. Based on these questions, the scope of everyday and bioeconomy products in Bangladesh can be found.

After obtaining the results of all survey queries, the products are categorized and written down in the following chapter in the commodity group-specific outcome portion. At the same time, tables and graphs would be used to illustrate the survey results. For all the products classified in the outcome and finding section, the author also administers a summary section in which the survey results and findings will be presented in conjunction with the previous researchers' results also discussed in the discussion sector, and findings result was classified and describe details with survey questions. Also, The conclusion is written after the outcome results and discussion section. A questionnaire with fifteen questions was created and divided into several parts.

The first part of the survey, questions one to four, focused on organic food products. Those questions were designed to elicit consumers' interest, and demands in organic goods and their awareness, and using these questions, consumers' desired product availability and their everyday purchasing product category were questioned. The second part of the questionaries from five to seven focused on jute products based. In this part of the survey questions, the author tried to find the customers' data about what products they used most, whether their preference over jute products and their knowledge over jute product pricing also to survey their desired jute products they searched in the market. The third part questionaries are from eight to twelve are developed based on forestry-based bioeconomy product. These parts questions were developed to know the awareness about forestry-based bioeconomy awareness through common peoples and discover their preference for forest-based bioeconomy products and the awareness of product capabilities based on forest. How much scope or their using tendency on forest-based bioeconomy products was surveyed. The last questionaries are from thirteen to fifteen is to find the result of the overall bioeconomy products scope in Bangladesh. How the bioeconomy products prices are in the market, that customers can afford or not, also this parts aim was to find the reasons behind bioeconomy product was not developed in Bangladesh. Table:4 provides an outline of the issues. Many of the questions were open-ended or more space for further explanations and details.

Questions	Details	Type
1	Are you aware of bioeconomy?	Yes/No+Other
2	What kind of food do you buy regularly?	Choice+Other
3	What kind of organic product do you search for in the market?	Choice
4	Do you find your organic desire products in the market?	Yes/Nos
5	Do you prefer natural jute products or synthetic products?	Choice
6	What kind of jute product do you search for in the market?	Multiple Choice+Other
7	Do you think jute products are costly than synthetic products?	Multiple Choice+Other
8	Are you aware of the forestry-based bioeconomy?	Yes/No
9	Are you interested in wood houses?	Yes/No+Other
10	Do you like natural fruits, honey, meat, wood products that come from the forest?	Yes/No+Other
11	Do you take herbal medicine which comes from the forest?	Yes/No+Others
12	Do you use wood furniture?	Yes/No+Others
13	Are bioeconomy products prices convenient to your expenditure	Yes/No+Others
14	What is the reason you think that bio-economy product is not popular in Bangladesh?	Open Ended
15	If given better options to procure bioproducts, would you buy?	Yes/No+Others

Table 5: Survey Questionnaire (2021)

The result and finding part are divided into two parts wherein; the first part the work from the survey result will be discussed in detail with essential graph, table, or with the figure. Also, the result of which products are essential and which products are searched by customers, and their survey result. The second section is the findings section, including the findings and scope of bioeconomy products based on the survey results and the literature review. The survey's key findings will be discussed in the research's findings section. The final section of the results and findings is the discussion, in which the detailed results and findings will be discussed, and previous literature will be compared with the findings of this research. The scope of bioeconomy products and the reasons, benefits, and drawbacks of bioeconomy products not developed in Bangladesh will be discussed in the discussion section.

3.1 Limitation of the Study

The limitation of the study plays some negative impact on this research. The first limitation of this study was the relevant literature based on bioeconomy products in Bangladesh. Proper literature was added to very few in the discussion section. Another weakness of this research is the design of survey questions and the survey itself. Instead of a survey, an interview may be the best alternative for gathering meaningful data for this study. There also had a marketing research scope in this survey which is missing in this survey. Because all survey participants are from digital platforms, another constraint of the respondent group is that all respondents are digitally literate.

This survey may not be the 100% accurate customer viewpoint because there was a limitation to reach the root level and the rural aged customers who are not aware of the digitally aware and educated. Another restriction of this survey is that it is focused on a few specific bioeconomy items, which is why it is not a 100% bioeconomy product-based survey. This is a limited survey and research based on organic food, jute, and forestry-based bioeconomy items.

Chapter 4

RESULT

4.1 Results

The survey is based on three category bioeconomy products where organic food, Jute and forestry-based bioeconomy product is the surveyed throw customers. Firstly, in organic products, the authors' idea is to find the data on how many customers are interested in organic products and the categories they are searching for in the market. What is the most relevant commodity that is lacking from the market, and how do consumers respond to the product? The author tried to find out the market data and the desired products missing in the market.

The first attempt to survey the customers is how many of them have an idea and know about the bioeconomy. The results (Figure 3) shows that 81.3% of participants know about the bioeconomy, and 13.7 % do not even know about the bioeconomy. Another 15% of participants have different perceptions about the bioeconomy.

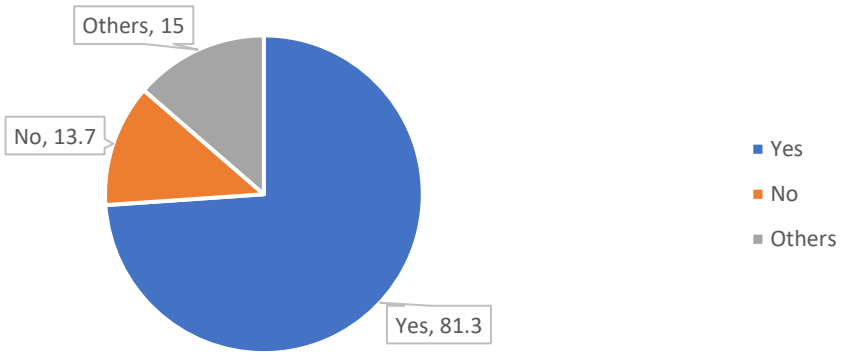

Figure 3: The result of bioeconomy aware people percentage (2021)

4.1.1 Organic Products

Determining the scope of the organic product in Bangladesh, the first determination is to find the participants what kind of product they are using for their daily purchase. After getting their purchase habit, we can determine the bioeconomy product customers in Bangladesh. There was a survey to find what kind of product they regularly buy from the market. In this specific result, customers respond that only 28.7% of customers buy organic products in their daily life, in figure:5 it is showing that in Bangladesh, customers tendency to buy the product is non-organic

products, they considered the price of the product also, even customers determine the availability of the products. The result of participants purchasing organic items is higher than the result of participants purchasing non-organic goods; here, considering the consumer survey results, the Bangladesh market has a vast scope to grow organic goods scope.

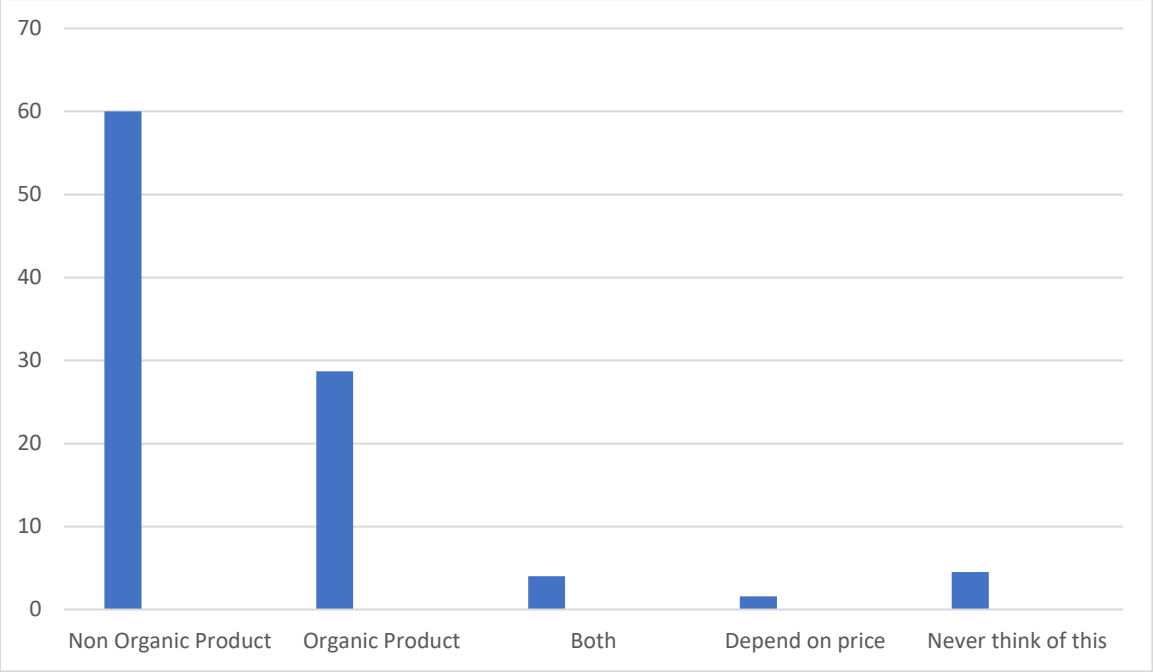

Figure 4: Customers buying products category (2021)

After finding the data on how many peoples are using bioeconomy based organic products, the author tries to find the result that customers most search for organic products in their daily lives. To findings the most searched organic product, the survey question pattern is to divide the organic products into two categories: whether they search for organic food or organic cosmetics. In this specific options survey, all the participants answer in this specified and survey results are showing in figure 5, where the result is showing that organic food is searched by 71.3% of participants in their daily life. Another product category is organic cosmetics, which is searched by 28.7% of customers in the market.

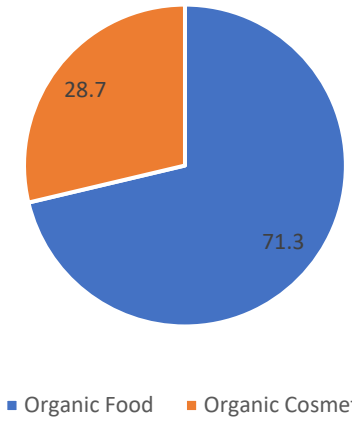

Figure 5: Customer's choice of organic products (2021)

The good part of this survey is that all participants searched for organic food(meat, fish, rice, dairy product and food) from the market where 71.3% people want to buy organic food from the market and the rest 28.7% want to buy organic cosmetic (soup, cosmetic, medicine, and shampoo) from the market. Where 100% of the customers searched organic product but the main downfall in this is the availability of the organic product in the market, So Customers desired organic products availability is to find in the market. Figure 5 shows their interest in organic products b can they fulfill their interest from the available product in the market? Are they even finding their desired product in the market? So that finding customers desired organic products in the market is also part of the survey. According to figure 6, the survey result shows that the availability of the desired organic product in the market is 47.5 %. From is survey findings is that 52.5% of participants think that their desired organic products are absent in the market. In this context, the result shows the downfall of avaiability of organic products in the market, where customers are interested and search for their desired product in the market, but they cannot find those products.

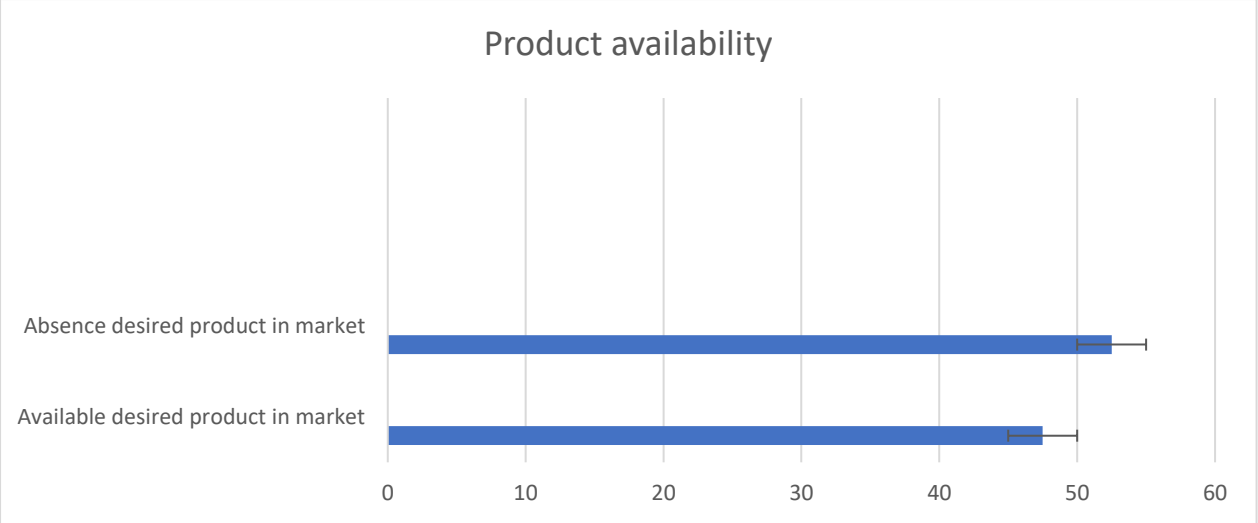

Figure 6: Available organic products in the market (2021)

All the above survey questions show that the demand and the supply gap of organic products in the Bangladesh market result from the above survey results showing a high possible scope of organic bioeconomy products in the Bangladesh market. The survey result shows that 81.3% of participants aware of the bioeconomy. Customers in Bangladesh want to buy organic products from the market; all participants combined want to buy organic products from the market, whether organic food or organic cosmetic or medicine. According to the survey result, the down part of the Bangladesh market is that 52.5% of participants said that they do not get their desired organic products in the market what they search for. Depending on the survey questions result in the survey represent that in Bangladesh perspective bioeconomy products have high potentials scope, considering the result that people awareness about bioeconomy products and the result of their desired to get their chosen products from the markets indicates that they are highly potential scope for the organic product in Bangladesh.

4.1.2 Jute Products Survey Results

Jute is the source of another essential bioeconomy product in Bangladesh; customers in Bangladesh are all known about jute products. Jute products preference among the Bangladeshi customers is very high; among the survey, 75.9% of Bangladeshi customers prefer jute products rather than synthetic products, survey result is positive across the jute products. Here in figure, 7, customers' preference for jute product over synthetic product is very high.

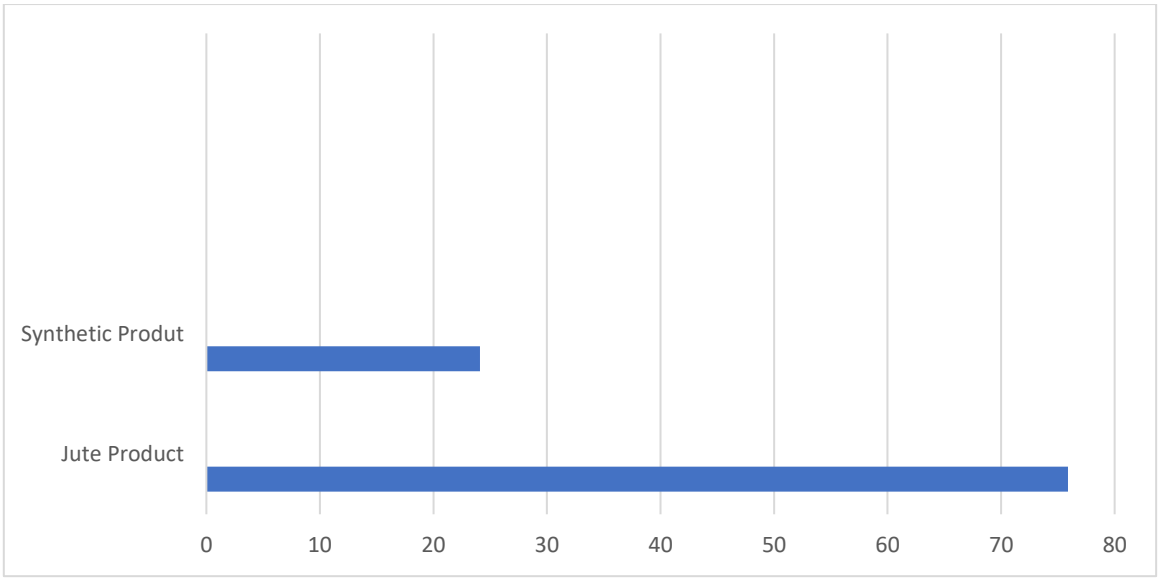

Figure 7: Jute Products Preference by Customers (2021)

The survey result shows that jute products are the best choice for the customers; almost 80% of customers choose reusable jute products over synthetic ones. Another issue from the literature is that the bioeconomy product is costly than the normal products, so that the author survey this important cost issue of jute products price compared to the synthetic products where survey result shows that the cost of jute products is higher than synthetic products. Figure:8 is the result of the cost comparing survey of jute products among the customers, wherein figure 8 represents that 62.5% of customers said that jute products are costly products than cheap available synthetic products.

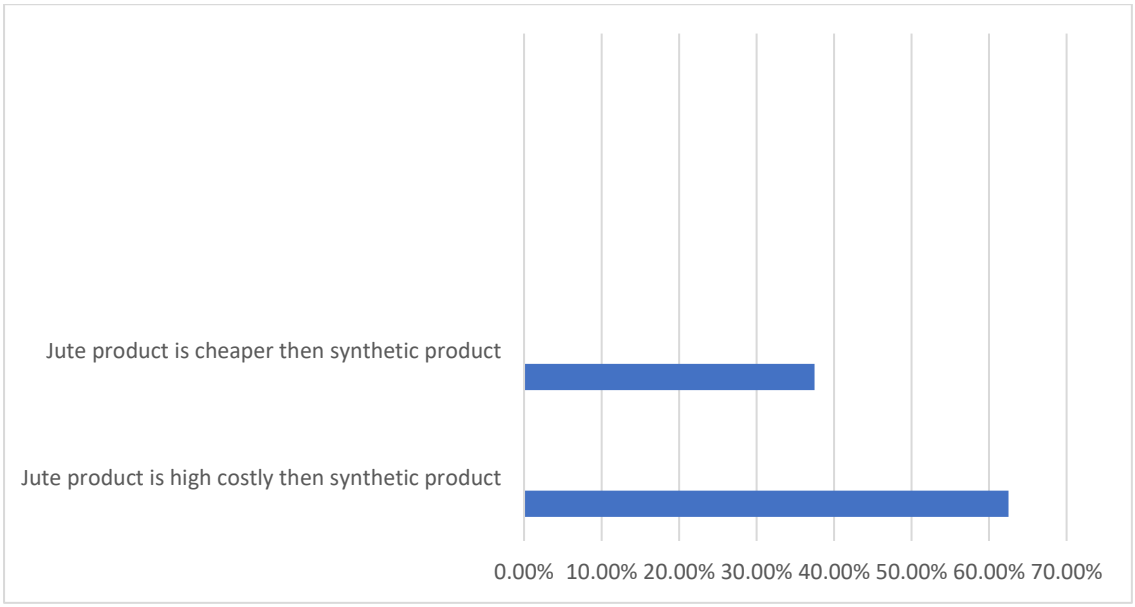

Figure 8: Jute products price compare over the synthetic product (2021)

Many participants think that the jute products are more costly than synthetic product; still the survey need to find the products category or the specific products that have the scope in the Bangladesh market. So, the survey wat what is the products that customers searched in the market, depending on this resulting figure 9 shows that the searched jute products among Bangladeshi customers. All the surveyed customers know about jute products and searched their desired jute products from the market. However, most customers search for Jute bags, Jute textile, Jute apparel, and jute craft. Another finding of this study is that every consumer agreed that they had looked for jute goods in the market at some stage. From this survey result, it is indicated that in Bangladesh, jute-based bioeconomy products have scope in jute bags, apparel, crafts, and exciting scope in jute textile. People are interested and searching jute textile in the market, few customers also think about jute shoes. So, comparing all the products category that are searched by Bangladeshi customers, jute products scope shows satisfying positive results.

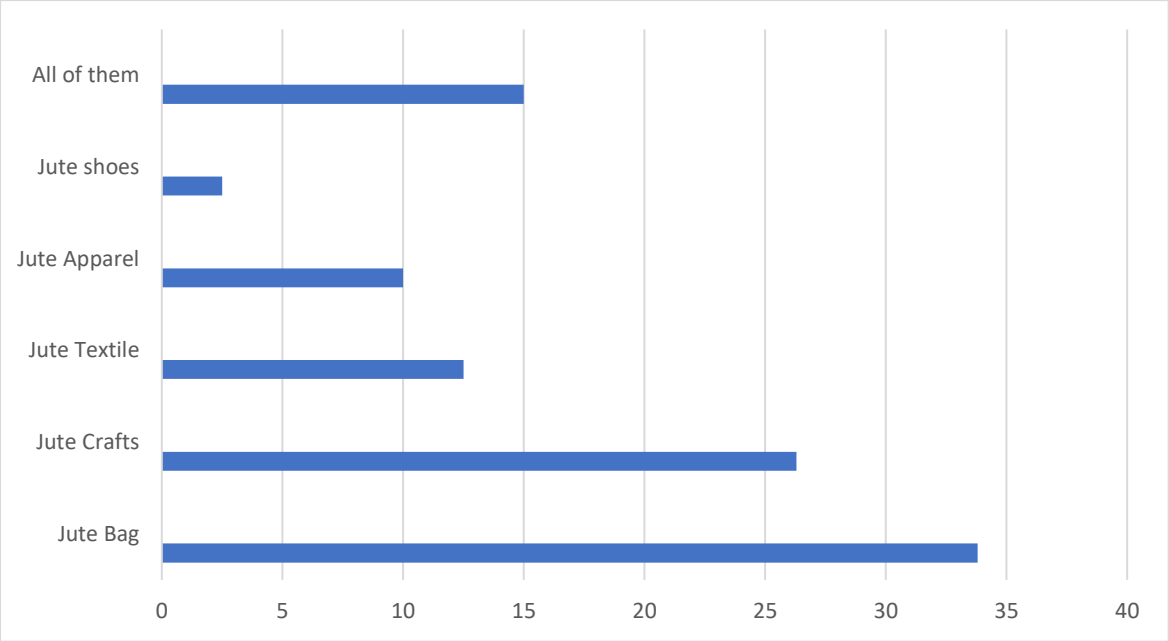

Figure 9: Jute product searched by customers (2021)

This whole complete survey based on jute-based bioeconomy products shows a positive result on jute-based products scope determining. The result shows that customers are interested in jute products; they like jute products over synthetic products. Synthetic products are cheap and available in lots of design and category; based on this customer's choice in jute products, this is the positive sign for jute product growth in Bangladesh. However, the result shows that many customers think and answered that jute product is the costly product

compared to other synthetic products. Still knowing the jute product are expensive products, respondents want to use jute products in their daily lives, so they searched various jute products in the market—their expectation to get jute products in various categories. According to the survey answer, there is the scope of jute products to extend in Bangladesh market, because bioeconomy-based jute product has customers demand in Bangladesh.

4.1.3 Forestry Products Results

Forestry-based bioeconomy is the new concept in Bangladesh. In Bangladesh, people know significantly less about the forest; according to the previous survey, many forest-based products fulfill bioeconomy requirements. Based on the previous result, the first target was to find the participants' awareness about forestry-based bioeconomy products, so that the first survey was to find forest-based bioeconomy product-aware people in Bangladesh. Surveys across forestry-based bioeconomy results showed that people might not know forestry-based bioeconomy but used forestry-based bioeconomy products in their regular life. Forest is fulfilling their daily product requirements from the past to the present. Figure 10 shows that 66.3% of participants know about forestry-based bioeconomy terms, indicating that they are aware of forestry-based products.

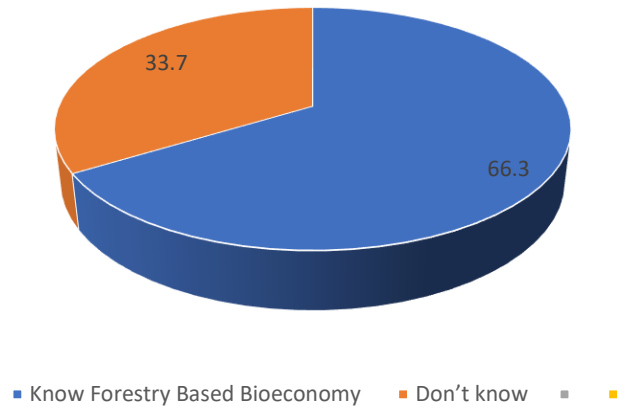

Figure 10. Percentage of participants know about forestry-based bioeconomy (2021)

In general forestry-based products list first comes wood, so the survey was about wooden house preferences by the customers. Whether they prefer wooden houses or desire to build their own. Figure 11 depicts the product category and customer choice, with 57.5% of consumers interested in using or purchasing wooden dwellings. The results also reveal a substantial reaction from clients on the extent of the wooden home. Another 37.5% of consumers were

uninterested in buying a wooden home. As a bioeconomy product, wooden houses still have room to grow in Bangladesh.

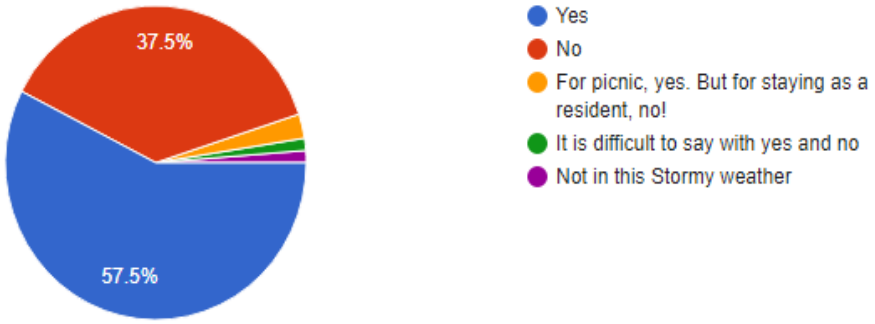

Figure 11: Wooden house preferences across customers.

The second category of products from the forest is honey, meat, fruits, or wood, and the result for Natural fruits, honey, meat, and wood directly comes from the forest. These products fulfill bioeconomy products' needs in market, so surveying this product, there were questions to find how many peoples like forestry-based products. This survey shows that 82.3% of participants are interested in forestry-based honey, meat, fruits, and wood products. Herbal medicine is a vital bioeconomy product from the forest and forestry-related resources; few more details were surveyed in this survey. Bellow table:5 is showing the percentages of participants who like forestry-based natural fruits, honey, meat, and wooden products. Among all the participants that how many of them are taking herbal medicine from natural forest. In this response, 52.5% of people take herbal medicine, which source is forest and nature. The most extensive forestry-based product is wooden furniture, and in this field, 83.8% of participants use wooden furniture. Wooden furniture is historically a forest-based product in Bangladesh, people using wood for furniture for many years.

Number	Product	Result
1	People like natural fruits, honey, meat, wood products	82.3% from 100
2	Taking Herbal Medicine	52.5% from 100
2	Wooden Furniture user	83.8% from 100

Table 5: Forestry-based bioeconomy products user (2021)

After conducting a study on forestry-based bioeconomy products, the results show that forestry products have much potential scope in the Bangladesh market compared to the survey results. Because participants are interested in a wide range of forestry-based items, the results imply that wooden houses, wood goods, and wooden furniture have a future in Bangladesh. In Bangladesh, people are also interested in and use forest-based herbal items. Why bioeconomy product is not popular in Bangladesh, there was a survey on price to determine whether the price is inconvenient for bioeconomy products in Bangladesh. According to the literature study, bioeconomy product prices are higher in Bangladesh; hence a survey was undertaken to determine if the price is the primary driver of bioeconomy development in the countries examined. The survey results demonstrate that the items are expensive and out of their budget; in figure 12, the difference between their spending and the price of bioeconomy items is shown. Overall, 52.5 percent of respondents said the price of bioeconomy items is out of line with their budget. According to the poll, 38.8 percent of respondents believe they can link their spending to bioeconomy goods. Some consumers have a different point of view. However, according to the findings of this poll, individuals believe that bioeconomy goods are expensive in Bangladesh.

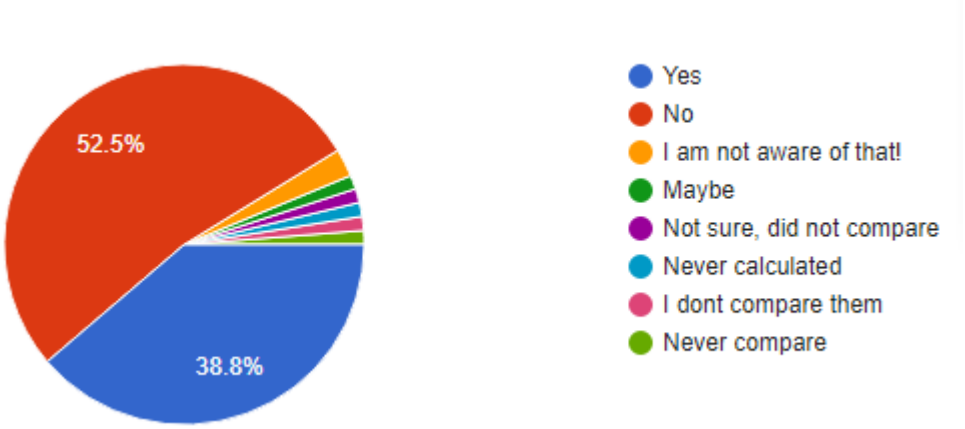

Figure 12: Bioeconomy product price and customer expenditure mismatch (2021)

To find why the bioeconomy is not popular in Bangladesh, the author survey all the possible customers; the result bioeconomy is not popular in Bangladesh for several reasons. Most classified reasons findings from the survey why bioeconomy is not popular in Bangladesh and the reason behind is shown in table 6:

Sl.No	Keywords	Generalize	Result
1	Related to high cost, costly, high price in general reason is the price.	Cost and price	37.5(30)
2	Lack of awareness, government initiative, funding's, proper information, Scientific innovation	Awareness and Innovation	27.5(22)
3	Alternative cheap product, Chinese product, minor variation, limited option	Competition	15% (12)
4	Various other reasons		20% (16)

Table 6: Reason that affects the bioeconomy products popularity.

According to the result from all the individual participants, the author classifies the data into 4 categories. The 37.5% of participants think that the cost and the price of bioeconomy products is the biggest reason that bioeconomy products are not popular in Bangladesh. People cannot buy bioeconomy products from the market because they are more costly available products. Another reason that awareness and innovation there are customers, government, innovation plan, funding is all together 27.5% customers think that is why bioeconomy products are not popular in Bangladesh. The survey said that awareness is needed to throw the customers and government, create awareness about the necessity of bioeconomy products, and help for extended time nature and human sustainability. Rest 15% of customers think that the other product competition and the cheaply available lots of variation are the negative parts for not being popular bioeconomy products. According to them, there are not many variations available in the market in bioeconomy products, while cheap products from China and production in local markets have lots of variation; that is why people choose other products rather than bioeconomy products.

4.2. Discussion

Bangladesh's bioeconomy is a novel idea; nonetheless, Bangladesh is building a bioeconomy in every industry. Bangladesh's bioenergy and biomass sectors have grown significantly. The majority of the villagers are aware of biogas, biomass, and solar energy. Bangladesh has made significant progress in bioenergy and biogas. The research result indicated that 81.3% of peoples are aware of the bioeconomy, which is the core findings to measure bioeconomy products scope in Bangladesh. While many participants are aware of the bioeconomy, there is a high scope of improvement in the bioeconomy products market. After discussing all the

results in the first part, it is shown that there is a lot of potential scope for bioeconomy products in Bangladesh. However, in total bioeconomy items derived from natural bioeconomy-based items like food, jute, or forestry, Bangladesh is still in the early stages of producing these items. Bangladeshi people are interested in organic goods, whether they are directly or indirectly accessible, in the particular product category of organic farming. They want to find their desired product in organic food form or organic medicine/cosmetic form. The result showed that customers do not get their desired products in the market, indicating the scope of developing bioeconomy products according to their needs. Many scopes develop customers' desired organic products in the food sector where organic rice, fish, meat, and dairy products can be supplied and maintained. Other organic products scope is in the market is medicine, and cosmetics like soap, shampoo, or daily used the product. There are customers for this category's product; this has high scope to develop and supply this category's product for customers' needs. The research result also indicates that all the participants are interested in organic products, whether they search for organic food, organic medicine, or cosmetics. The problem from the survey result shows that the availability of organic products in the market. The findings reflect that 52.5% of customer's desired products are not available in the market.

According to Ashim Chakraborty, the definition of organic farming is essential in Bangladesh because, once we bring it up, the word "certification" still follows. From one place to the next, ecological farming takes on different forms. Ecology includes, among other aspects, the atmosphere, crops, animals, and the biosphere. According to his article, organic farming can ensure environmental sustainability, but can it also ensure economic sustainability? (Chakraborty, 2018) Organic farming is crucial in Bangladesh; it cannot be neglected, but this survey result indicates that customers who got their desired organic product in the market are expensive products; according to the survey results, customers also think that organic products are costly. In this state, it can also be said that bioeconomy and organic products can also secure economic sustainability because they have high market value and profit.

From the literature review, several authors specify that organic farming is an essential element for environmental and natural sustainability; organic farming also improves soil quality and makes healthy food. Akinnifesi Festus states that Traditional cultivation lacks the long-term impacts on land fertility, causing potential generations to face challenges. Organic cultivation is a long-term method of land restoration. According to reports, a portion of the world's land has been polluted by using fertilizer. For maintaining soil fertility and ensuring long-run food

security, avoiding pesticides and fertilizer is a must need. The best alternative to maintaining the soil's natural fertility is organic farming. According to the study, if Bangladesh can raise awareness about organic farming instead of regular fertilizer-based farming, people would become more aware of it and utilize it. However, this study also said that the Bangladesh government should take initiatives to expand the scope of bioeconomy-based organic farming. Government initiatives and assistance to farmers and market monitoring may broaden the reach of organic farming in Bangladesh. Worst all, Tim states that the most obvious fact is that organic food is more expensive. We understand that many Bangladeshis face real and severe financial constraints regarding food spending; hence, raising prices is a flawed idea (Worstall, 2018). Bangladesh is not prosperous as a first-world country where people can spend much money on food. Bangladesh organic food has a limited market, few providers, and a tiny client base. Whereas organic food costs are pretty high in Bangladesh, low-income individuals cannot purchase such pricey items. According to research, consumers believe that organic and bioeconomy items are more expensive than non-organic food, which is a disadvantage for organic items. The hefty cost is unaffordable for most people. Market monitoring is critical for expanding the reach of organic products. In addition, government intervals may guarantee that the product's price remains steady. As we can see in Bangladesh, prices fluctuate and skyrocket anytime there is a special event or religious celebration; the government attempted but failed to monitor and regulate pricing. Government intervals and market monitoring are vital steps to take in order to expand the breadth of organic goods and make them a common commodity for low-income people.

Government measures are critical for expanding the breadth of organic goods in Bangladesh. Market control and farmer inspiration might bring about a shift in organic agricultural methods. The government may also grant loans to small-scale organic producers and grant tax breaks to them. The importance of social awareness in developing consumers' attitudes toward purchasing organic goods cannot be overstated. Customers are eager to purchase organic and natural items, and they have explored the market for organic items to purchase, but they are unable to do so due to the high price. Bangladesh can fully use the range of organic goods if the prompt government and private sectors' prompt efforts guarantee food security and sustainable food supply. The lack of this study is that the outcome is based on one-sided consumer research and is dependent on past study results and conclusions. If market research, product research, and interview data research were conducted appropriately, the overall data would be more precise and more specific. However, this study demonstrated the extent of these

defined items depending on client needs. Some further study and implementation are required for organic farming, organic product marketing, and organic product supply chain difficulties to expand the breadth of organic goods and satisfy the scope.

Jute is the most prevalent natural commodity, and all Bangladeshi buyers are familiar with it. Jutes production and cultivation are prevalent in all areas of Bangladesh. Previously, jute was the primary source of income for the Bangladeshi economy. The jute products scope based on results revealed that 100 percent of participants seek jute goods in the market, but according to their survey results, they cannot locate their chosen product in the market. The potential bioeconomy-based jute product scope in the Bangladeshi market is very high. Alternative jute plastic bags, jute textiles, and jute apparels are the most searched products and had the scope to develop. So, depending on the research result garments industry have a high scope to produce high numbers of jute textile rather than synthetic or other fabric. Jute craft, jute blanket, jute dress, or jute shoes can be the potential jute-based bioeconomy product in Bangladesh. Jute based bioeconomy products are the most common bioeconomy products, survey result indicates that jute-based bioeconomy product is used by 75.9% of customers. Jute products are generally costly than the available synthetic products. Depending on the survey result, the survey was limited to specific jute products listed, and the customers' desire for that product was counted in the result.

According to Amreen Jahan, Jute has some environmental, economic, social, and new application producing factors (Jahan, 2019). Amreen Jahan state in her research that jute can produce new technological applicants; juteborg (A Swedish Institution for Jute design and solutions) is developing modern jute-based fabrics, composites, and mixing techniques. They concentrate on the various applications of Jutes and function to exploit the synergetic impact in the manufacturing, interior, automobile, clothing, design, and packaging industries. In the future, these new technological products may have scope in Bangladesh, which is not included in this research. Day by day, jute products are getting popular with the customers because of their long-time sustainability. Compare to plastic bags; jute bags are more sustainable and reusable. Jute crafts and jute ornaments, jute textile, jute bags, jute blanket, jute shoes, many more things are expected for Jutes, and customers are interested in new jute products for the search jute products every day in the market. According to Golam, Rahman & Sobhan (Golam et al., 2009) Jute has a promising future for use in numerous textile industries because of the multifiber idea of combining jute with other natural and synthetic fibers. Considering the

opportunities, Bangladesh's government has been diversifying the applications of jute with its limited resources. Jute textile and garments products can be the multiple income sources of Bangladesh. Bangladesh is at the top of readymade garments producers in the world. If proper initiatives can be taken and synthetic fiber can be used more broadly in the Bangladesh garments industry, then jute textile will be the golden fiber again. Compared to the survey result, customers will indicate that they will accept jute textile in a welcome manner. Jute textile has a high scope in the Bangladesh market as well as the world market.

According to the South Asia Enterprise Development Facility and IFC (SOUTH ASIA ENTERPRISE DEVELOPMENT FACILITY & IFC, 2005) Jute fibers are used in various consumer products, including decorative fabrics, chic-saris, salwar kameez, soft luggage, footwear, greeting cards, and molded door panels. Due to technological advancements today, jute can be used to replace costly fibers and scare timber. Fine jute threads can be extracted and made into imitation silk. Jute may be an alternative to silk and is widely used as such; given the availability of jute in Bangladesh, jute can be used in different innovations and maybe the best for an available plastic bag; recently, it has been proved that for jute, there may be items that are alternative plastic but made of jute. Bangladeshi scientists invented Sonali Bag, which is a look-alike plastic bag but from jute. If proper steps and initiative and government budget can be a pass for jute development, Bangladesh can compete with world-renowned jute research institution like juteborg. Depending on this research, the decision about jute products scope is higher in Bangladesh perspective, if properly jute can replace the synthetic garments industry and come with a new idea and new product with affordable price jute can break all previous income records of Bangladesh. This research is based only on customers' choice and their desired jute product based where the result specifies that jute has a high future and high potential scope of jute products in Bangladesh. This research is not conducted with any scientist elaboration scope of jute products or the jute product inventions-based research. However, a regular consumer study revealed that accessible jute items accessible on the market but not in regular supply are daily looked for by consumers, who purchase and utilize them. If a clever marketing strategy, supply, and production management can be handled, jute is the best standard bioeconomy product with a large market in Bangladesh.

Forestry is the natural element used for natural sustainability, and forest provides daily life goods for humans. The research results showed that in Bangladesh, people use forest-based bioeconomy products every day and their everyday life desired product from the forest is

higher. Peoples depend on the forest for herbal medicine, wood for furniture, wooden house, natural fruits, honey, and meat. They rely on forest-based natural products and want to use standard forestry-based bioeconomy products. Aside from providing income, homestead forests are a valuable habitat for various common birds and animals (Sayed Iftekhar, 2006). Forest is a significant source of bioeconomy products that can improve financial conditions and preserve the nature of lots of animals, birds, and insects. Forest is also an essential element for bioeconomy products, organic food, and economic growth. Forestry is the part that is very closely related to the Bangladeshi peoples. The survey result shows that people are aware of forestry-based bioeconomy and are interested in forestry-based bioeconomy products. Many people are interested in wooden houses, which means wooden houses have the potential scope in Bangladesh. Fruit, honey, meat, wood products are the most searched and liked product by the customers.

In forestry-based bioeconomy products, fruit cultivation, honey, honey products, wooden furniture, wooden cooking utensils, and many potential scopes are available in Bangladesh. Another possible scope is herbal medicine, where Bangladeshi people are historically interested in taking herbal medicine; there is a high potential scope of development in this sector. According to Choudhury, Abdulla, and Hossain (Choudhury et al., 2011), timber and poles, fuelwood, bamboo, thatch grasses, cane, and other forest products are the most traded in Bangladesh. Three tiers of people are involved in forest products: primary collectors/growers, intermediaries, and mohajans. Over 0.1 million people work as primary forest product collectors in the Sundarbans alone. Forest is the primary income source of some categories of people; they live and depend on the forest. Initially, Khagrachori and Bandarban forests were the sole source of revenue and livelihood materials for a small number of tribal and hill forest region inhabitants in various parts of the Sundarbans. The forest influences their lifestyle; their essential nourishment and living ingredients are derived from it. They live on the forest's most good economy, which is built entirely on bioeconomy products. Forests gradually became a common source of revenue for them as well as the government. For certain items, the forest is currently the sole source. Wooden furniture is the most often used furniture in Bangladesh, where wood forests are the sole supply of furniture globally. Among all forest-based products, wood has the highest market share value. Another widely used medical and treatment approach in Bangladesh and throughout the globe is primarily rooted in the forest. Bangladeshi people have traditionally relied on herbal treatments, particularly in rural areas, and herbal treatments continue to be necessary. The forest provides a plentiful source of natural honey and meat.

According to Sayed Ifthekher, homestead forests are a valuable habitat for various common birds and animals besides providing income. In Bangladesh, most of the natural species and animals are living in the forest. For natural balancing and crops, birding animals and birds are much more critical elements. From the beginning of the world, the forest is the place here always animals living. This study solely looks at forest-based goods from the standpoint of buyers. However, for forest and forestry-based research and its economic contribution to the Bangladesh economy, a short study defining the complete economic, ecological, and biological scope might be conducted. Fur kawa, Akter,& Salam, in their research (Furukawa et al., 2010) claimed that forestry-based tourism has a scope in Bangladesh. Forestry tourism may be a key source of revenue if sufficient knowledge and infrastructure are created. Forest tourism is now available in the Sundarbans (the world's largest mangrove), Rangamati, Bandarban, and Khagrachori. Systematic and scientific waw can boost forest-based tourism. At the same time, forest tourism might be another natural revenue stream based on the bioeconomy. This study lacks surveys on tourism, forest-based fisheries, and indigenous peoples who live in the forest. This thesis might benefit from interviews with indigenous people and honey and wood collectors from the forest. However, due to the covid19 condition and the distant digital survey, this was not practicable. There was plenty of room to survey forestry from intimate interviews with closely tied people to the forestry-based economy; they may be the most acceptable participants for this study. This research's findings from the consumers' viewpoint state that Bangladeshi consumers wish to acquire forest-based natural bioeconomy items, that Bangladesh has a range of forestry-based bioeconomy items, and that efforts and applicable guidelines may boost the forest bioeconomy.

CHAPTER 5
CONCLUSION

Bioeconomy is a new concept in Bangladesh, but as a hugely populated country, Bangladesh has an advantage over the population in the concern of the bioeconomy market and customers. If proper guidelines and awareness can be created through the mass population about the benefit and necessity of bioeconomy products, bioeconomy products can gain a considerable market share. The problem findings from the survey are the facts that are why bioeconomy product growth is negligible. From the government perspective, awareness through the producers and customers should increase naturally, and funding throws the bioeconomy products producers and farmers should be increased and giving them funds and intensely monitoring market can increase potential bioeconomy products scope.

This research highlighted some of the essential product scopes in the Bangladesh market and their scope depending on consumer needs. Bioeconomy and bioeconomy-based goods are becoming increasingly significant as part of the growing global bioeconomy. The government should provide sufficient space and efforts for emerging bioeconomy technologies to thrive in the Bangladesh market. The following are critical: developing countries' potential to participate in the burgeoning bioeconomy; the study focuses on market share, market supply, and consumer preference for bioeconomy goods. To expand the breadth of the bioeconomy, Bangladesh should form partnerships with industrialized countries where it may get current bioeconomy technology assistance and apply it in Bangladesh. Aliens from contemporary technologically advanced and stable bioeconomy-improved countries will aid in the development of Bangladesh's bioeconomy product categories and correct marketing guidelines for existing items. Bangladesh's growth and policies are entirely dependent on government policies, and when the government changes policies, the majority of the time, the country also changes. The bulk of the time, management power is guided by the government's political interests rather than the objective of the master plan. Medicinal plants, for example, were formerly prioritized, and as a consequence, they were included in the majority of forestry initiatives. However, as government management priorities have altered, the emphasis has switched away from medicinal plants, resulting in a large amount of money and effort being lost. A similar situation happened earlier in the country with different sorts of participatory

forestry. Because forestry operations need long-term interventions, political commitment is necessary to maintain forest management activities' long-term sustainability. To grow the bioeconomy in Bangladesh, the government must first grasp the market requirement and environmental elements of bioeconomy goods. Only then can long-term goals and adequate guidelines be developed, ranging from root label farmers to industrial producers.

Organic farming can be a lucrative business, with a rising worldwide market currently supplied by 90 developing nations, excluding Bangladesh. Local Bangladeshi customers have a reasonably developed view of organic produce, are interested in purchasing certified organic items, and are even prepared to pay a higher price for them. Certification, on the other hand, is required to enter this industry. To achieve this scope for organic goods, developing nations such as Bangladesh must solve the following issues: boosting farmers' technical understanding of organic farming and organic inputs; effective and efficient post-harvest processing; and effective and efficient infrastructure and export logistics to guarantee that fresh food arrives in excellent condition. This will enable this industry to meet the necessary criteria for producing and selling organic items in domestic and international markets while also providing an extra premium to Bangladesh's disadvantaged farmers. According to this analysis, organic farming has proved to be a pricey commercial commodity in Bangladesh. The research and findings cited above support organic farming in Bangladesh, as well as all growing infrastructure. The three targeted locations, as well as their cultivated holdings, meet agricultural expectations. Farmers in Panchagrar, Coxbazar, Rangpur, and Khulna embrace organic tea, shrimp, and farming, which bodes well for the Bangladesh organic goods industry. However, to broaden the scope of organic farming in Bangladesh, the government should adopt rules and preserve environmental sustainability while meeting market demand for bioeconomy items. The forestry business in Bangladesh suffers from a lack of appropriate research.

The Bangladesh Forest Research Institute is the only government agency involved in forest studies, yet the quality and scope are unknown. There has not yet been any fundamental research. There are no reliable data, for example, on the country's forest acreage or increasing stock. Despite being Bangladesh's least studied forest, the Sundarbans mangrove forest is the world's largest single tract of mangrove forest. The tropical Dipterocarp forest in Bangladesh's hilly areas is the country's second-largest natural forest; however, it suffers from regeneration problems. The need for in-depth scientific research on these forests should be stressed in the forestry master plan. Correct research and data can enhance the entire forest-based bioeconomy

structure; if proper research and masterplan can be implemented, then this customers' research data will be helpful to expand the forestry-based bioeconomy products and the products' scope, can be increased and current scope can be fulfilled.

Bangladesh may claim that jute and jute-related fibers may be cultivated everywhere in the nation. Bangladesh has a comparative edge in terms of producing high-quality jute fiber. Although conventional jute products see a decline in usage, jute possesses a wide range of intrinsic and extrinsic qualities. Exploring these qualities may lead to the creation of a diverse variety of jute goods. Biodegradable, nontoxic, nonelastic, acidic, hydrophilic, and high absorption products are developing worldwide from jute. Bangladesh is still far behind in jute development. According to the findings of this study, the Bangladesh market has consumers who want to utilize jute goods; however, the market or manufacturers are unable to provide the full range of jute product needs. Government efforts and jute research should continue to be carried out to meet the spectrum of jute goods and consumers' desires. However, the bioeconomy and bioeconomy goods sectors are beset by several difficulties that are hindering their expansion. For long-term economic solutions, Bangladesh's people need a more local resource-based economy.

Consequently, significant efforts must be taken to secure the long-term stability of the bioeconomy business while simultaneously improving the country. The study's conclusions give market data and clients for Bioeconomy goods to resolve and expand the scope of jute goods. The study's findings are expected to be helpful to farmers, industrialists, Bioeconomy product producers, strategy planners, and researchers address the difficulties confronting the bioeconomy and bioeconomy-based product businesses and effectively overcome these problems, which may lead to a high market potential for bioeconomy goods. For creative best potential bioeconomy products scope and use of natural wealth properly without hampering natural rights can be long-lasting good sustainability for nature and the Bangladesh environment. If gradually bioeconomy products become prevalent, it will be more efficient to earn revenue for the producer and Bangladesh. Bangladesh has the potential scope to systematically increase organic farming because in Bangladesh, agriculture is the primary earning source, so if Bangladesh farming gradually can move to organic farming, that will be more helpful for the Bangladesh economy. Jute products scope should be reuse like the past ’70s where Bangladesh was the top of the world, need proper initiatives and the help can grab the jute-based world bioeconomy products market. Forestry and forest-based bioeconomy

goods may be a significant bioeconomy commodity sector in successful farming. This can be stated in comparison to Bangladesh's human and natural assets: Bangladesh is not correctly using its bioeconomy product development capabilities; if Bangladesh overcame many of these traditional major roadblocks, Bangladesh would have a vast bioeconomy product spectrum.

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