Life Science Studies

Journal homepage: www.journal.inrrd.com/lss

Original article

Agribusiness Comparison of Cultivated Products and Foods Export-Import Quantity of Sub-Continental and Western Countries: Analysis Climate and Demography

Md. Amirul Islam[1,2]*, Tangila Akter[3], Kuntala Ghosh[4], Kazi Iffat Tamanna[5], Khondoker Faried[6], Md. Al Amin[2], Md. Shaim Hossain[7], Md. Mahmudul Hasan[1] and Sreti Rani Sarkar[5]

[1]*Institute of Natural Resources Research and Development, Rajshahi 6206, Bangladesh*
[2]*Department of Sanskrit, University of Rajshahi, Rajshahi 6205, Bangladesh*
[3]*Department of Statistics, Eden Mohila College, Dhaka 1205, Bangladesh*
[4]*Department of Agriculture Extension, Durgapur, Rajshahi 6240, Bangladesh*
[5]*Department of Agriculture Extension, Puthia, Rajshahi 6260, Bangladesh*
[6]*Department of Agriculture Extension, Singra, Natore 6450, Bangladesh*
[7]*Department of Economics, University of Rajshahi, Rajshahi 6205, Bangladesh*

ARTICLE INFO

Article history
Received 13February 2024
Revised 28 May 2024
Accepted 04 June 2024
Available online 10 June 2024

Keywords
Agribusiness
Quantity
Western and Sub-continental
Climate
Demography

ABSTRACT

With an emphasis on climate and demographic factors, this study investigates the agribusiness dynamics of cultivated crops and food export-import quantity comparison of sub-continental countries (India, Bangladesh) and Western countries (USA, Canada). Quantitative data from agriculture reports and databases on international trade from 1961 to 2023 are used in the investigation. Important factors are the amounts of goods imported and exported information on the climate, and demographic figures from 1900 to 2022. Techniques for comparative analysis draw attention to regional differences and trends. Fertilizer-related products are most exported in Canada, Bangladesh, India, and the United States of America, including ammonia anhydrous, ammonia, NPK fertilizers, and di-ammonium phosphate. According to import result in sequences, monoammonium phosphate, di-ammonium phosphate, ammonia and fertilizers in tons and others products result in details text. Climate data in sequences country maximum and minimum temperature Canada 49.6, -63; Bangladesh 45.1, 2.6; India 52.9, -45; United States 56.7, -78. Demographic data show that the population of those countries is increasing with each census year. As the different temperatures and dense populations of sub-continental countries drive their import demands, Western countries' sophisticated agricultural practices and attractive weather contribute to their dominant export status. Global agricultural commerce is significantly shaped by demographic pressures and technological improvements.

Introduction

The integrated economic operations involved in the production, processing, marketing, and distribution of agricultural products as well as related goods and services are collectively referred to as agribusiness (Barnard et al. 2020; Borsellino 2020). It includes a broad range of activities, such as ranching and farming as well as food processing, packing, shipping, and retailing (Bairwa et al. 2014). Throughout the agricultural supply chain, agribusiness optimizes efficiency, profitability, and sustainability by combining aspects of economics, business management, and agriculture (Kamble et al. 2020; Keshelashvili 2018). Crops cultivated specifically for human or animal consumption are known as farmed agricultural products. They consist of fruits, vegetables, legumes, oilseeds, and staple grains like rice, wheat, and corn (Bvenura and Kambizi 2022; Isakson 2014). These goods serve as the

*Corresponding author
Email address: amirulislam6430@gmail.com (Md. Amirul Islam)

foundation of the world's food systems, giving billions of people access to vital nutrition and nourishment (Devaux et al. 2021; Shrimpton 2017). Food export-import quantity is the amount of food that is traded internationally between nations (Chung and Liu 2022). The balance between supply and demand is reflected in the export-import quantity, which is impacted by a number of variables including consumer preferences, trade policy, market pricing, and agricultural production (Syed 2015; Vollrath et al. 2006). The nations of the Indian subcontinent India, Pakistan, Bangladesh, Sri Lanka, and Nepal have significant biodiversity and a variety of agricultural landscapes (Ismail et al. 2023; Atapattu and Kodituwakku 2009). For many people, agriculture is their main source of income, and major economic drivers include products like fruits, grains, pulses, rice, and spices (Kumar et al. 2006). The agricultural industries of Western nations, such as the US, Canada, Australia, and those in Western Europe, are highly mechanized and technologically sophisticated (Say et al. 2018). Agribusiness has a strong emphasis on sustainability, efficiency, and innovation. It offers an extensive variety of goods, including as cereals, dairy products, meats, and high-value specialty crops, to both domestic and foreign markets. Climates in the USA and Canada vary widely, with temperate regions in the north and subtropical and dry regions in the south (Motha and Baier 2005). Both nations have sizable populations that are diverse in terms of race and culture, which supports thriving labor markets and consumer markets. India's climate, which is primarily tropical, is ideal for growing rice, wheat, sugarcane, and spices (Pradheep et al. 2021). Due to its large and diverse population, which includes a growing middle class, sizable rural communities, and a variety of cultural traditions, it has a substantial impact on patterns of food consumption. Bangladesh is mostly dependent on agriculture, especially rice farming, due to its subtropical monsoon environment (Ghose et al. 2021; Rahman and Anik 2020; Wassmann et al. 2009). Due in large part to small-scale farming, the country's highly populated demographic environment offers both potential and problems for agricultural production and food security. The United States of America has a strong GDP and high income levels in the agro sector, which encourages the use of sophisticated technologies. Canada prioritizes sustainable practices and has a steady GDP and an affluent citizenry. India is a country with a rising GDP and a wide range of income levels, fueled by contributions from smallholders and large-scale agriculture. Bangladesh's GDP is growing moderately, but the country still faces issues with lower incomes, thus infrastructure and technology expenditures are needed to improve productivity and income equality. Drones and the Internet of things are two precision agriculture technologies that are improving farming methods in the USA and Canada (Shaikh et al. 2022; Mohamed et al. 2021; Fastellni and Schillaci 2020). Crop insurance and large-scale commercial farming subsidies are given top priority in the USA (Kramer et al. 2022). Support for small farms and an environmental practice is emphasized in Canada (Laforge and McLachlan 2018). India prioritizes subsidies for seeds, fertilizers, and irrigation, with a recent focus on expanding market access (Fan et al. 2008). Bangladesh places a strong emphasis on helping smallholders by providing loan access and input subsidies (Misra 2021). The United States of America participates in a number of bilateral and multilateral trade agreements, giving exports of beef, soybeans, and cereals priority (Johnson and Schwarzenberg 2020; Mercier 2020; Zahniser et al. 2015). With the help of trade agreements like The United States-Mexico-Canada Agreement (USMCA), Canada exports cattle, grains, and oilseeds while maintaining a balanced agricultural sector (Anderson 2020; McDaniel 2019; Van 2018). With accords like The South Asian Free Trade Area (SAFTA), India hopes to increase agricultural exports, concentrating on rice, fruits, and spices (Pal and Mukherjee 2022). Bangladesh imports pulses, cereals, and edible oils as part of regional trade agreements, with the goal of increasing its exports of seafood and jute (Ratna 2024). Agri-environmental sustainability encourages farming methods that protect the environment, cut pollution, and increase biodiversity. Crop rotation, organic farming, agroforestry, and precision agriculture are some of the techniques used to assure long-term viability while reducing environmental effect and protecting ecosystems. Several studies have been done (Table 1) with somewhat similarities on this issue.

The previously available studies (Haque et al. 2022; Samad et al. 2022; Maniruzzaman et al. 2024) have been done on agribusiness and its economic factor, but there is no available on agricultural production quantity. Therefore, the objective of this research was to comprehensively analyze several aspects of Indian

Table 1. Available studies of Agricultural product and food export-import

Aspect	References
The US's decreased ability to compete internationally in the Chinese meat import business	Hejazi et al. (2019)
The diversification of the world's commerce in agribusiness between 2000 and 2019	da Costa et al. (2021)
Impact of Agricultural Imports and Exports on Bangladesh's Economic Development of an Analysis of the Agribusiness Supply Chain	Hasan et al. (2020)
Exporters and importers of agricultural products internationally	Erokhin et al. (2021)
Perspectives from Bangladesh and Cambodia on rules of origin and non-tariff barriers in agricultural trade	Deb (2006)
Analyzing Indian agribusiness's worldwide competitiveness in the Asian environment of the twenty-first century Possibilities and difficulties	Singh (2019)
Concerns about food safety and exports of fresh food products from LDCs	Unnevehr (2000)
shifts in the global labor market, agri-food complexes, and export farming	Friedmann (2021)
agriculture products exported from India Results and future possibilities	Suresh and Mathur (2016)

Sub-continent (Bangladesh and India) and Western countries (United States of America and Canada). How much quantity (ton) of products have been exported and imported by those countries? There are various climate conditions and demography shapes that impact exports and imports in terms of climate and demography.

Methodology

Data collection

Gather information on the export and import of agricultural products and foods from dependable sources, such as government trade offices, foreign organization (such as the FAO and WTO), and databases like UN Comtrade. Accumulate climatic information from national agencies and meteorological databases, such as temperature, precipitation, and length of the growth season. Obtain demographic data from national statistics offices and demographic databases.

Country selection

Based on your geographic location and economic classification, pick Western countries (the USA and Canada) and subcontinental countries (like Bangladesh, India).Make sure that each region is represented with a range of climatic zones and demographics.

Data analysis

Provide a quantitative framework for analyzing the amounts of foods and agricultural goods that are imported and exported. Use statistical techniques to investigate the links between export-import volumes, climate variables, and demographic factors, such as descriptive statistics. To see patterns and trends in the data, use graphical displays such as bar charts.

Comparative analysis

Compare the amounts of agricultural products and foods that are imported and exported from subcontinental and Western nations. Consider the effects of the two regions' respective climates and demographics on the dynamics of agribusiness. Determine the key distinctions and parallels which similarities or commonalities between trade patterns and the factors that influence them.

Results

Canada

The descriptive statistics data set (Table 2) provided Canada agribusiness with nine products of fertilizer data starting from 2002 to 2021, providing information on their export and import quantity (ton), enabling a comprehensive examination of these variables linked with the associated 95% confidence limit (CL). According to the export-import study, Monoammonium phosphate (MAP) in the export minimum measured 1382.71 (T) and the maximum measured 115788.7 (T), while the import quantity was 522203.67 (T) and the maximum was 1760524.71 (T). According to data set following fertilizers products, di-ammonium phosphate (DAP), the minimum export measured 10 (T), and the maximum measured 15354 (T), While the import minimum measured 29915.14 (T) and the maximum measured 241370.46 (T). Other fertilizer’s, such as ammonium

Table 2. Descriptive statistics of Canada agri-products (Fertilizer) export-import

Items	Min	Max	Mean ± SD	Cl (95.0%)
MAP	1382.71	115788.70	37406.64 ± 35863.66	16784.71
	522203.67	1760524.71	889261.88 ± 328329.47	153662.92
DAP (T)	10.00	15354.00	4270.05 ± 4935.80	2310.02
	29915.14	241370.46	106117.39 ± 50220.13	23503.74
Ammonium Sulphate	149811.31	509566.01	310586.75 ± 96226.96	46379.91
	46798.85	235455.26	105656.93 ± 53348.87	24968.04
Ammonium Nitrate	166226.44	726912.93	388263.22 ± 131639.47	61609.17
	44039.56	361107.99	209970.27 ± 96253.51	45048.02
Ammonia Anhydrous	822134.02	2807969.57	1171917.79 ± 408365.75	191121.05
	531.69	50825.70	13076.22 ± 11413.47	5341.67
Fertilizers	10857.15	41886.86	30027.02 ± 7787.27	3644.55
	36712.23	90147.25	64361.44 ± 14798.14	6925.74
NPK Fertilizers	24277.31	109323.07	55552.93 ± 24108.21	11282.98
	14539.77	307080.94	67980.35 ± 80630.95	37736.44
Nitrogenous Fertilizers	6757.57	174838.67	93798.90 ± 45705.15	21390.67
	20149.59	158520.67	69682.19 ± 47037.77	22014.35
Calcium Ammonium	28.00	19414.00	5426.64 ± 6200.56	2988.57
	25791.11	123761.66	79816.92 ± 25043.17	11720.56

sulphate, ammonium nitrate, ammonia anhydrous, fertilizers, NPK fertilizers, nitrogenous fertilizers, and calcium ammonia, have the maximum and minimum export and import quantities (T) shown in (Table 2).

The data set of Canada cattle and meat descriptive statistics (Table 3) provides 7 items, providing data only for exports starting from 1961 to 2023 through the quantity in head and metric tons (MT). In row sequences, the products are such as milk, nonfat dry, cattle, swine, beef, swine meat, and chicken meat. According to Table 3, the export of swine (head) has a minimum number of 4 (head), while the maximum number is 10032 (head). On the other hand, in weight exports of beef, the minimum measured 12 (MT) and the maximum measured 657 (MT).

The data set of normal food (Table 4) for human beings provides 15 product data points starting from 2001 to 2022, including food export and import goods such as apples, barley, cassava, cocoa beans, coffee, grapefruit, rice, alcohol, aquatic plants, groundnuts, aquatic animals, grapes, bananas, beans, and grape wine. The export barley minimum measured 1867 (T) and the maximum measured 4240 (T), while the import minimum measured 80 (T) and the maximum measured 348 (T).

In this study, the data is organized by month of a year, starting from January to December, and the year is 1901 to 2022, and the curve is according to the maximum, mean, and minimum Canadian temperature (Fig. 1).

Table 3. Descriptive statistics of Canada cattle and meat related products exports

Items	Min	Max	Mean ± SD	Cl (95.0%)
Milk (MT)	0	25	3.98 ± 5.62	1.41
Nonfat Dry	0	166	46.38 ± 36.48	9.18
Cattle (head)	0	1688	697.22 ± 407.79	102.70
Swine (head)	4	10032	2884.46 ± 3059.09	770.42
Beef (MT)	12	657	253.88 ± 214.78	54.09
Swine meat	21	1546	540.90 ± 502.44	126.53
Chicken Meat	0	152	46.79 ± 60.87	15.33

Table 4. Descriptive statistics of Canada fruits and normal food exports and imports

Items	Min	Max	Mean ± SD	Cl (95.0%)
Apples	53	122	87.83 ± 20.94	13.30
	492	583	536.58 ± 26.29	16.70
Barley	1867	4240	2615 ± 714.88	454.21
	80	348	184.33 ± 88.39	56.16
Cassava	0	5	1.08 ± 1.56	0.99
	9	31	17.58 ± 7.01	4.45
Cocoa Beans	142	214	178.66 ± 21.97	13.96
	214	312	260.41 ± 27.82	17.68
Coffee	50	94	76 ± 12.90	8.19
	315	397	353.33 ± 26.93	17.11
Grapefruit	0	2	0.25 ± 0.62	0.39
	54	72	63 ± 6.29	4.00
Rice	6	36	17.83 ± 12.23	7.77
	534	835	663.66 ± 91.44	58.09
Alcohol	54	178	95.83 ± 41.79	26.55
	554	1556	1132.08 ± 259.81	165.07
Aquatic Plants	4.15	6.44	5.74 ± 0.83	0.52
	1.41	6.78	2.69 ± 1.51	0.96
Groundnuts	19	45	33 ± 9.17	5.82
	169	265	220.5 ± 32.70	20.77
Aquatic animals	2.4	13.08	8.82 ± 3.20	2.03
	0.01	4.01	2.88 ± 1.38	0.87
Grapes	8	19	12.66 ± 3.33	2.12
Banana	496	592	554.66 ± 33.02	20.98
Beans	55	100	75.66 ± 13.45	8.55
Grapes-wine	314	365	329 ± 13.92	8.84

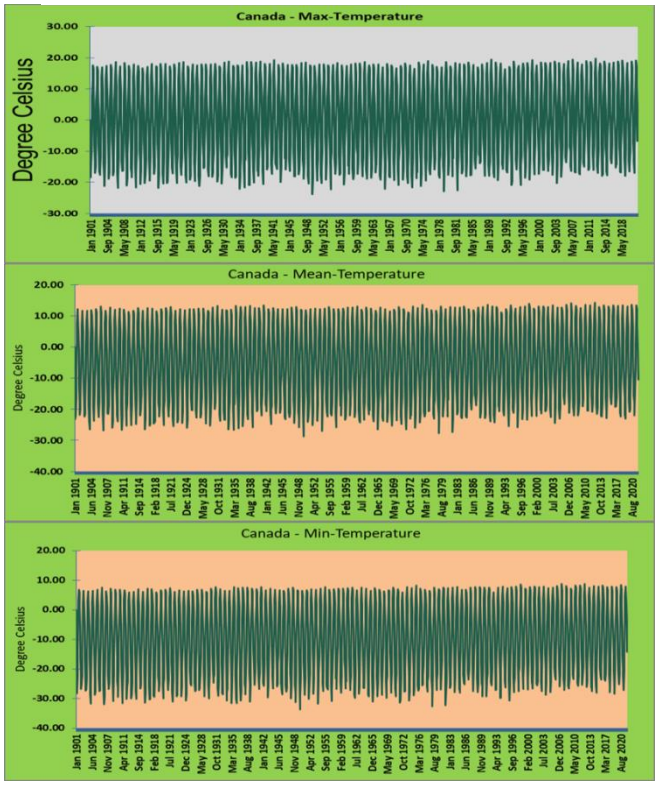

Fig. 1. Canada 121 years of climate max, mean, and min data

Canada's maximum temperature is recorded 49.6 and its minimum temperature is -63. The demography data has been taken from the 1981–2021 survey and indicates, through a curve, the maximum of Canada's population in the 2021 survey, which measured 36,991,981 (Fig. 2), and the minimum population measured in the 1981 Canadian population survey, which measured 24,343,181 (Fig. 2).

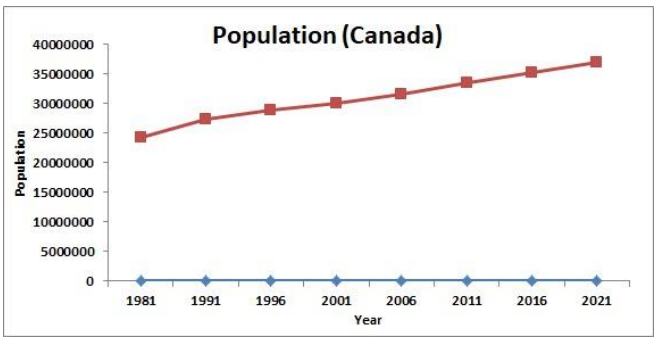

Fig. 2. 43 years of demography data for Canada

Bangladesh

The line graph (Fig. 3) data set provides Bangladesh agribusiness with all kinds of products for export and import starting from 1990 to 2023. For the export of ammonia, the maximum quantity was 186250.00 (T) in 2005, while the minimum measured was 10995.05 (T) in 2002. On the other hand, for the import of chemical wood pulp, the maximum measured was 509240 (T) in 2016 and the minimum measured 3200 (T) in 1994. According to the descriptive statistics (Fig. 4) for the temperature of Bangladesh, the maximum temperature is recorded 45.1 and the minimum temperature is 2.6. Bangladesh population survey data (Fig. 5) has been taken from 1901 to 2021, which indicated a line graph curve; the maximum population is 169.829 million in the 2021 survey, and the minimum population is 28.928 million in the 1901 survey year.

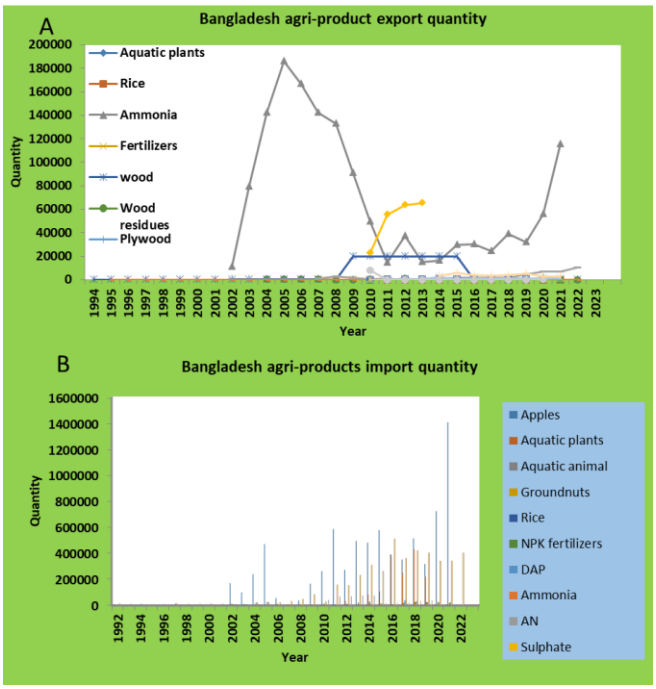

Fig. 3. Bangladesh agricultural products and food exports and imports quantity

India

According to (Fig. 6), for Indian beef exports, the maximum measured is 2022 (MT), while the minimum is 0. On the other hand, for the import of dissolving wood, the maximum measured is 798886 (T) and the minimum measured are 7900 (T). Following the Indian 121-year temperature curve (Fig. 6), the maximum temperature is recorded 52.9, while the minimum temperature is (-) 45. On the other hand, according to Indian census data (Fig. 7), the maximum population was 13093.04 lakhs in the 2021 census, and the lowest population was 2383.64 lakhs in the 1901 census.

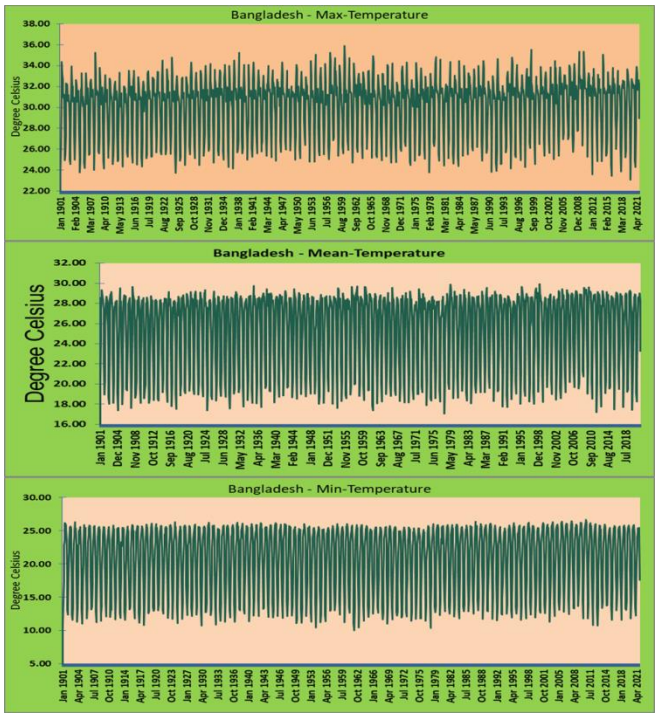

Fig. 4. Bangladesh 121 years of climate max, mean, and min data

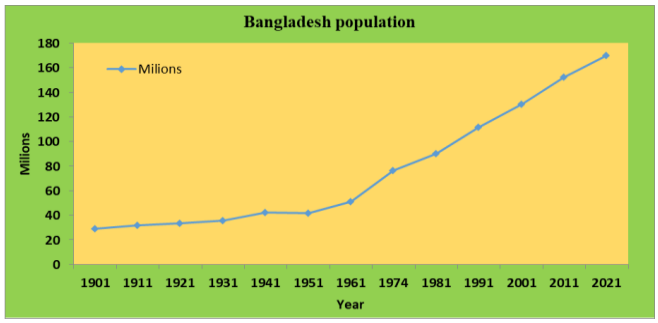

Fig. 5. 121 years of demography data for Bangladesh

United States of America

The descriptive statistics dataset provides the United States of America's agribusiness for export and import quantities like as Fertilizers (Table 5), Cattle and meet (Table 6), Corn (Table 7), and Woods (Table 8). For NPK fertilizers, the maximum measured export by the United States of America is 570984.7 (T), while the minimum measured is 60977.04 (T). On the other side, the maximum import measured is 4346665.16 (T), and the minimum measured is 83036 (T). According to the temperature curve (Fig. 9), the United States' maximum temperature is recorded 56.7 degree Celsius and the minimum temperature is -78. According to the

census (Fig. 10), the maximum household population is 331449281 in the 2020 survey, and the minimum population is 9222853 in the 1910 survey.

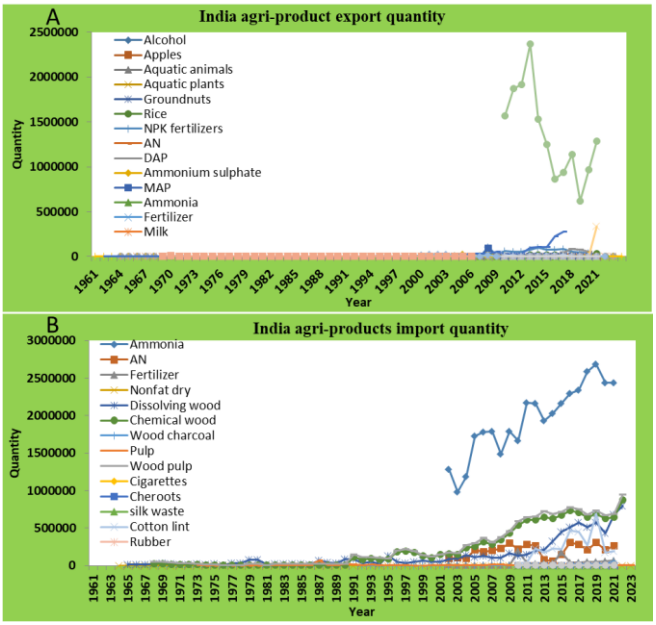

Fig. 6. India agricultural products and food export and import quantity

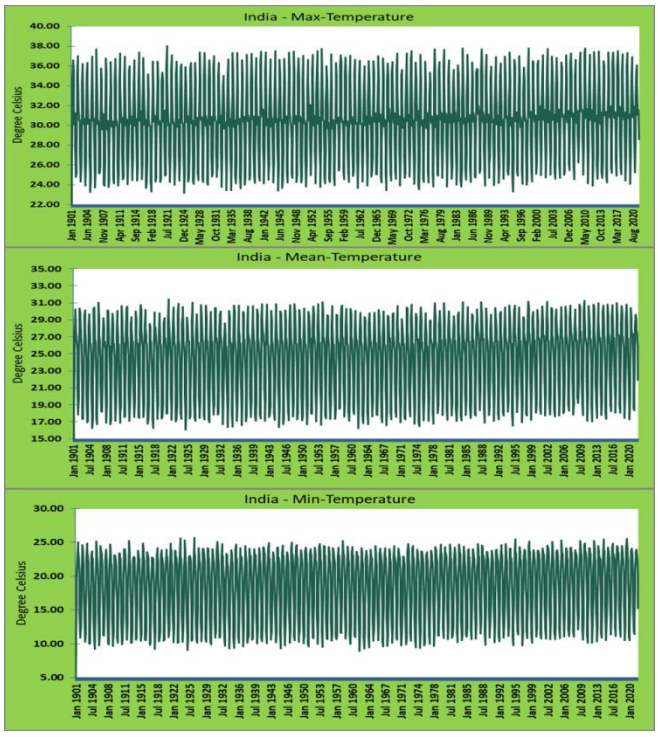

Fig. 7. India 121 years of climate max, mean, and min data

Discussion

There are no direct available studies on Canada, Bangladesh, India and United of States of America agri- products export and import quantity in relation with climate and demography. The goal of the study is to compare the amounts of food and agricultural goods that are imported and exported comparison between Western (United States of America, and Canada) and sub-continental nations (Bangladesh and India) while taking climate and demographic variables into account. Agribusiness is essential to employment, economic growth, and global food security. It creates connections between farming, processing, distribution, and retail to guarantee effective food supply chains. Agribusiness also promotes innovation in sustainable agricultural methods that adjust to climate change and population growth, supporting rural livelihoods. Canada uses its large amount of fertile land and cutting-edge farming technologies to its advantage as a significant exporter of agricultural products, such as wheat, canola, and pulses. A significant contributor to both the GDP and trade balance, agribusiness is a vital economic sector in Canada. Bangladesh prioritizes agribusiness to maintain food security and sustain its sizable agrarian labor. Bangladesh is largely an importer of agricultural commodities such as wheat, edible oils, and pulses. It exports goods including seafood, tea, and jute, which are essential to its economy despite obstacles. India is a major player in the agricultural industry, exporting a wide variety of goods like cotton, rice, and spices. India's rural jobs and economic stability rely heavily on agribusiness.

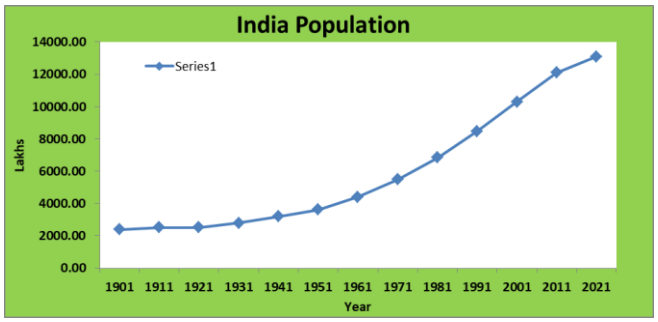

Fig. 8. 121 year's demography data for India

In order to balance its trade in agricultural products, the nation also imports pulses and edible oils to meet domestic demand. As one of the biggest exporters of meat, soybeans, and corn worldwide, the United States of America boasts a thriving agriculture industry. Its trade surplus depends mostly on agricultural exports. Importing seafood, tropical goods, and specialized foods helps the USA's agriculture commerce network remain vibrant.

Table 5. Descriptive statistics of USA agro-products (Fertilizer) export-import

Items	Min	Max	Mean ± SD	Cl (95.0%)
Amm. sulphate	449007.93	981384.79	801113.05 ± 163106.80	76336.33
	249133.00	83705500	416769.43 ± 160073.09	74916.51
MAP	1853467.43	3414494.38	2297989.53 ± 408565.12	191214.36
	62419.39	1889403.00	764278.87 ± 604977.87	283138.35
DAP	566583.32	6880237.85	3230203.33 ± 1964841.99	919574.35
	4914.73	1443723.00	394621.56 ± 461879.37	216166.20
AN	117441.56	450076.13	250645.16 ± 94377.78	44170.16
	259751.00	1110275.02	632230.40 ± 264190.19	123644.81
NPK fertilizers	60977.04	570984.70	143702.80 ± 106176.20	49692.00
	83036.00	4346665.16	368741.76 ± 937059.24	438557.22
Ammonia	23494.97	645484.40	252408.00 ± 213489.60	99916.23
	2415762.00	7939605.00	5374226.00 ± 1729257.00	809317.00
CAN	661.35	17044.91	4066.67 ± 3892.32	1821.66
	3503.00	103139.00	48874.14 ± 30062.24	14069.56
Fertilizers	96770.89	219740.90	144694.80 ± 39959.50	18701.62
	30777.72	11309765.00	695000.90 ± 2499206.00	1169665.00

Table 6. Descriptive statistics of USA cattle and meat related products export and import

Items	Min	Max	Mean ± SD	Cl (95.0%)
Milk	0	152	32.45 ± 41.35	10.68
	0	50	5.18 ± 10.90	2.81
Nonfat Dry	1	893	274.15 ± 235.84	60.92
	0	121	6.01 ± 21.60	5.58
Cattle	16	511	161.60 ± 123.43	30.83
	389	2786	1581.42 ± 614.95	153.61
Swine	3	268	58.15 ± 61.46	15.35
Beef	15	1608	582.85 ± 525.06	131.15
	352	1669	1070.17 ± 324.61	81.08
Swine meat	25	3302	886.78 ± 1086.62	271.43
	102	610	350.89 ± 130.00	32.47
Chicken meat	2241	3380	2950.53 ± 434.62	175.54
	6	83	44.30 ± 22.55	9.10

Table 7. Descriptive statistics of USA others product export

Items	Min	Max	Mean ± SD	Cl (95.0%)
Coarse Grain	50.45	77.48	60.71 ± 9.03	7.55
Corn	45.13	69.92	54.48 ± 8.95	7.48
Soyabean	44.57	61.52	52.31 ± 6.32	5.28
Wheat	21.17	32	25.59 ± 3.15	2.63
Cotton	9.15	16.35	14.17 ± 2.82	2.61
Cigarettes	3705	92427	32810.08 ± 27962.66	17766.63
Cheroots	1360	4553	2301.66 ± 980.09	622.72

Table 8. Descriptive statistics of USA wood related products import

Items	Min	Max	Mean ± SD	Cl (95.0%)
Wood charcoal	6800	183010	41223.74 ± 39313.97	9983.88
Dissolving wood	18737	329000	172192.51 ± 72849.61	18500.33
Chemical Wood	2509100	6457320	4445773 ± 1103026	298189.7
Pulp	5000	120500	28757.94 ± 20888.76	5492.42
Bleached	1891000	5714701	3933354 ± 1169946	316280.8
Poultry	0	59	10.76 ± 19.28	5.16
Cigarettes	6853	50420	19481.42 ± 13353.32	8484.29
Cheroots	10146	44774	26587.67 ± 12157.39	7724.435
Silk waste	12.94	121.27	39.47 ± 31.47	19.99
Cotton	428	7324	2115.16 ± 1956.92	1243.37
Rubber	36756.38	54720.91	48614.58 ± 4890.11	3107.02
Raw silk	1	16	4.91 ± 4.56	2.89
silk worm	0	14.88	1.99 ± 4.73	3.00

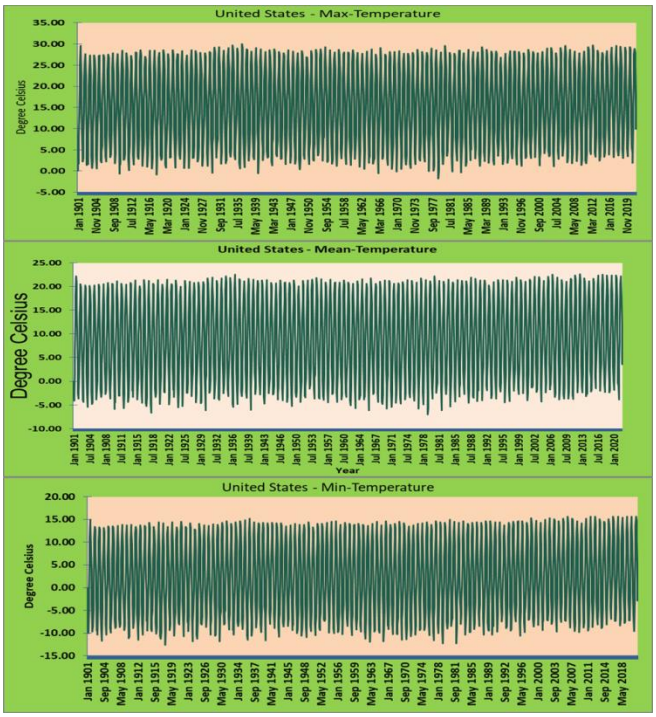

Fig. 9. The United States of America 121 years of climate max, mean, and min data

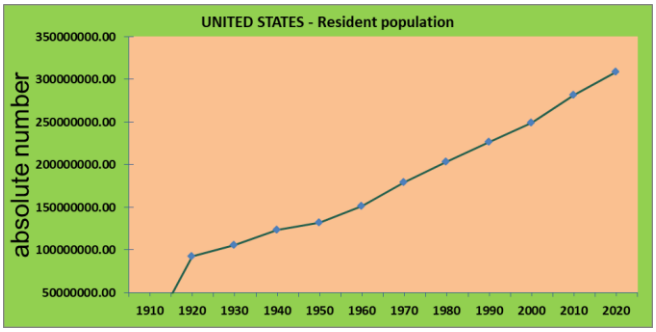

Fig. 10. 110 years demography data for the United States of America

In our study, Canadian fertilizer products have been exported most ammonia anhydrous, with a maximum quantity of 2807969.57 (T), and di-ammonium phosphate (DAP) has been minimum exported at a quantity of 10 (T). Monoammonium phosphate (MAP) has been the most imported in terms of quantity 1760524.71 (T), and the minimum number of imported products is ammonia anhydrous, which is measured at 531.69 (T). In Bangladeshi fertilizers, the ammonia has been most exported at the maximum quantity of 186250 (T), and the general (Common) fertilizer has been the lowest exported at 0.1 (T). In terms of the import of fertilizers, di-ammonium phosphate (DAP) has been most commonly imported at a quantity of 1404316.71 (T), while ammonium nitrate has been the least imported at a quantity of 0.4 (T). For the fertilizer exports of India, NPK fertilizer has been the most exported, with a quantity of 107013.03 (T), and monoammonium phosphate (MAP) has been the lowest exported, at a quantity of 0.38 (T). Ammonia has been the most imported at a quantity of 2691012.56 (T), and general fertilizer has been the least imported at a quantity of 2381.95 (T). In the perspective of the United States of America's fertilizer product, di-ammonium phosphate has been the most exported at a quantity of 6880237.85 (T), and calcium ammonium nitrate has been the least exported at a quantity of 661.35 (T). The United States of America has imported the most general fertilizers at a quantity of 11309765 (T), and calcium ammonium nitrate has been the lowest imported at a quantity of 3503 (T). Canada is a major exporter of anhydrous ammonia because of its large deposits of natural gas,

which is a necessary component in the manufacturing of ammonia. On the other hand, because monoammonium phosphate (MAP) is a favored fertilizer for its agricultural operations, Canada imports a significant amount of this substance. Lower exports of di-ammonium phosphate (DAP) are the result of decreased demand. The fact that Canada can produce enough anhydrous ammonia domestically is reflected in the low level of imports of this fertilizer. Also, Bangladesh is a major exporter of ammonia because of its natural gas-driven domestic production capacity. Exports of general fertilizers decline as local production concentrates on particular varieties. Di-ammonium phosphate (DAP) is heavily imported since local agriculture depends on it. The least amount of ammonium nitrate is imported, presumably as a result of legal constraints and worries about handling and usage safety (Khanal and Regmi 2022). India meets the demands of the global agricultural market by exporting significant amounts of NPK fertilizer, which has a balanced nutrient content (Randive et al. 2021). Because of its restricted production, monoammonium phosphate (MAP) exports are minimal. General fertilizers are the least imported because they may be produced locally, but ammonia is imported in large quantities because it is needed for the production of fertilizers in the country (Skorupka and Nosalewicz 2021). The United States' strong production capabilities enable it to export a substantial amount of di-ammonium phosphate (DAP). Exports of calcium ammonium nitrate are low, most likely as a result of constrained supply and demand. While the United States imports limited amounts of calcium ammonium nitrate because domestic supplies are sufficient, it imports huge amounts of general fertilizers to suit a variety of agricultural demands (Timsina 2018).

To augment domestic output, Canada imports cattle and meat-related goods, especially processed foods and specialty meats (Maynard and Wang 2010). Due to low local production, Bangladesh imports a sizable amount of meat, mostly beef and mutton to satisfy rising demand (Begum et al. 2011). India, which has historically been a major supplier of buffalo meat, imports very little meat because of cultural customs and home production being self-sufficient (Gadekar 2021). The USA, a significant producer and exporter of meat, imports particular cuts and processed meats to meet the varied tastes of its consumers and to supplement its domestic supply. Notable imports come from Canada and Mexico. Various imports guarantee diversity and satisfy particular market demands in various nations.

Canada only exports cattle and meat-related products; they do not import these products (Galloway et al. 2007). They have the most exported swine; the maximum measured is 10032 (head), while the minimum exported milk is 0 (MT). Bangladesh is usually not able to export cattle and meat, but the farmers try to always make a good production of meat and supply over the market in Bangladesh. We don't have enough meat and cattle export and import data. In Bangladesh, the milk requirement is 15.20 million tons based on 250 ml/head, while production is 10.68 million tons, and the meat requirement is 7.29 million tons based on 120 gm/day/head, while production is 7.67 million tons (Khaleduzzaman et al. 2022). In India, the maximum beef exported measured is 2022 (T) in 2016, while milk and nonfat dry products have a minimum measured of 0 (T). India usually does not import meat. In the perspective of the United States of America, chicken meat has the most exports at a quantity of 3380 (T), while milk has a minimum quantity of 0 (T). On the other hand, cattle have imported the maximum measure of 2786 (head), while the not-fat dry minimum measure is 0 (T). Those countries have exported and imported agricultural products according to their country's population demand, and when production is high but other countries need these products, the country has exported and other countries have imported them.

Different roles are played by fruits, grains, and everyday foods in Bangladesh, India, the USA, and Canada. Because of a shorter growing season, Canada needs to import a variety of fruits and some rice in order to ensure year-round availability. Since rice is a staple crop that is widely consumed in Bangladesh, its production and importation are essential for ensuring food security. Fruit imports are also necessary to meet nutritional requirements. India's economy and cuisine rely heavily on rice, a staple grain whose large-scale domestic production also sustains a significant amount of fruit consumption. The USA has a varied diet with high fruit production and consumption; imports of rice complement local production, making it less essential but still crucial for some demographic groups and culinary practices. These everyday foods are essential for economic, cultural, and nutritional well-being.

In our study, for Canadian fruits and regular foods exported, barley had the maximum measured at 4240 (T), while casava had the minimum measured at 0 (T). For the imported products, an apple has been imported; the maximum measured value is 583 (T), while aquatic animals have been imported; the minimum measured value is 0.01 (T). For Bangladesh, areca nuts have been the most exported, measured at 65000 (T), while the rice export minimum is 2 (T). Again, areca nuts have been imported; the maximum measured is 67388 (T), while the groundnuts minimum measured is 0 (T). For India, rice has been exported; the maximum measured value is 31552 (T) while aquatic plants have been the lowest exported, at a quantity of 0.27 (T). Actually, India is very sufficient for food for its large land. For the perspective of the United States of America, cigarettes have been most exported; the maximum measured is 92427 (T), while the minimum measured is 9.15 (T). For imported agricultural products, the chemical wood has been the most imported, and the maximum measured is 6457320 (T), and the silkworm has been the minimum imported, measured at 0 (T).

Canada, Bangladesh, India, and the USA all see substantial reductions in agricultural output as a result of climate change. The variety of crops that may be grown in Canada is limited by the country's cold temperature, thus greenhouses and cutting-edge technologies are essential for optimizing agricultural productivity. On the other hand, Bangladesh's tropical environment makes year-round farming possible, but production can be affected by cyclones and floods. Many different types of crops can be grown in India's distinct temperature zones, although agriculture is susceptible to climatic fluctuations due to its reliance on the monsoon. Because of its enormous geographic expanse and variety of climates, the USA is able to produce a wide range of agricultural products, from fruits in California to grains in the Midwest. The dynamics of agricultural import and export are influenced by population size. High local demand frequently restricts export possibilities in densely populated Bangladesh and India, necessitating imports to meet needs for food security. Bangladesh imports basic goods like rice when its output is low. India's enormous population generates a lot of demand within the country, but the country also produces a lot of goods for export, particularly rice and spices. On the other hand, because of its smaller population, Canada produces more than it needs, which makes it possible for large exports of cattle and wheat. With a huge population and a developed agricultural sector, the USA exports excess produce while importing particular types to fulfill market demands. This allows the country to accommodate a wide range of dietary needs and preferences.

In our study, out of a total of 121 years of temperature data, the maximum temperature in Canada was 49.6, and the minimum temperature was -63° Celsius. The maximum temperature in Bangladesh is 45.1° Celsius, and the minimum temperature is 2.6° Celsius. For India climate data, the maximum temperature is 52.9° Celsius, and the minimum temperature is -45° Celsius. On the other hand, for the climate of the United States of America, the maximum temperature is 56.7° Celsius and the minimum temperature is -78° Celsius. In perspective demography, Canada's current population is the maximum, which is 36,991,981, and the minimum, which are 24,343,181. Bangladesh's current population is the maximum, which is 169.829 million, and the minimum, which is 28.928 million. India's current population is the maximum, which is 13093.04 lakhs, and the minimum, which is 2383.64 lakhs. The United States of America's current population is the maximum, which is 331449281, and the minimum, which are 9222853. Climate and agricultural production are connected in the same row. Tropical food and products grow normally at a hot or medium temperature, and those kinds of agricultural products do not grow at the minimum (negative) temperature. In a similar system, cold weather or minimum temperature products did not result in production in hot climate countries. We know India, Canada, and the United States of America have large land areas, but Bangladesh is a small country. When their climate is in a bad situation, they stop their production, and when their climate is good, they can grow more and more products from their large land areas. However, the different scenario in Bangladesh is for the small land areas for production. From the perspective of demography, the United States of America and Canada have a small population according to their huge land area. But Bangladesh and India have the largest populations in the world. As a result, Canada and the United States of America have large land and a small population, so they are able to export agricultural products, and for their climate, sometimes they need to import agricultural products. In India and Bangladesh,

they cannot export agricultural products for their domestic demands, and sometimes they need to import for larger sizes. So, agricultural products and food exports and imports depend on climate and demography.

Conclusion

The export-import amounts of agriculture between Western nations (Canada and the USA) and subcontinental nations (India and Bangladesh) indicates unique patterns influenced by demographic and climatic variables. The primary focus of sub-continental nations, which are distinguished by tropical and subtropical temperatures, is on labor-intensive crops like rice, tea, and spices. With sizable agrarian populations, Bangladesh and India mainly rely on agriculture for jobs and financial stability. They are significant exporters of climate-appropriate products like rice and tea, but they also rely on imports of necessities like pulses and edible oils to meet domestic demand. These countries struggle with issues like reliance on the monsoon, small-scale farming, and restricted access to cutting-edge agricultural technologies. Conversely, the temperate weather and sophisticated agricultural infrastructure of Western nations like Canada and the USA allow for the large-scale production of a wide variety of crops. While the USA is a major exporter of corn, soybeans, and beef, Canada is a leader in the export of wheat, canola, and pulses. Additionally, both nations import specialty foods and tropical goods, highlighting their complimentary trading relationships. Compared to their counterparts in sub-continents, their agriculture industries are less dependent on human labor, highly mechanized, and backed by technological developments.

Conflict of Interest

The authors state that there isn't any conflict of interest to the current paper's publication.

Author Contributions

Md Amirul Islam and Sreti Rani Sarkar perform Conceptualization, Literature Review, Data analysis, Writing-Original draft, Review and Finalization. Tangila Akter, Kuntala Ghosh, Kazi Iffat Tamanna, Khondoker Faried and Md. Al Amin performed Data analysis, Data curation, Figures analysis and adjusting. Md. Shaim Hossain and Md. Mahmudul Hasan performed Review and Editing.

References

Anderson MS (2020). Canadian Agriculture in the 21st Century: Change and Challenge. FriesenPress.

Atapattu SS, & Kodituwakku DC (2009). Agriculture in South Asia and its implications on downstream health and sustainability: a review. Agricultural Water Management, 96(3), 361-373.

Bairwa SL, Kalia A, Meena LK, Lakra K & Kushwaha S (2014). Agribusiness management education: a review on employment opportunities. International Journal of Scientific and Research Publications, 4(2), 1-4.

Barnard FL, Foltz J, Yeager EA & Brewer B (2020). *Agribusiness management*. Routledge.

Begum IA, Rahman S, Alam MJ, Buysse J & Van Huylenbroeck G (2011). Bangladesh poultry sector: growth, competitiveness and future potential. Livestock: Rearing, Farming Practices and Diseases Animal Science, Issues and Professions, 81-104.

Borsellino V (2020). Agribusiness. In Zero Hunger. Springer International Publishing, 29-41 pp.

Bvenura C & Kambizi L (2022). Future grain crops. In Future Foods. Academic Press, 81-105 pp.

Chung MG & Liu J (2022). International food trade benefits biodiversity and food security in low-income countries. Nature Food, 3(5), 349-355.

da Costa CC, Sondergaard N & Jank MS (2021). The diversification of global agribusiness trade from 2000-2019.

Deb UK (2006). Rules of origin and non-tariff barriers in agricultural trade: Perspectives from Bangladesh and Cambodia.

Devaux A, Goffart JP, Kromann P, Andrade-Piedra J, Polar V & Hareau G (2021). The potato of the future: opportunities and challenges in sustainable agri-food systems. Potato Research, 64(4), 681-720.

Erokhin V, Tianming G & Ivolga A (2021). International Agricultural Trade: Exporters and Importers. Shifting Patterns of Agricultural Trade: The Protectionism Outbreak and Food Security, 21-51.

Fan S, Gulati A & Thorat S (2008). Investment, subsidies, and pro-poor growth in rural India. Agricultural Economics, 39(2), 163-170.

Fastellini G & Schillaci C (2020). Precision farming and IoT case studies across the world. Agricultural internet of things and decision support for precision smart farming. Academic Press, 331-415 pp.

Friedmann H (2021). Changes in the international division of labor: agri-food complexes and export agriculture. In Towards a new political economy of agriculture. Routledge, 65-93 pp.

Gadekar BB (2021). Livestock And Agricultural Development. Lulu Publication.

Galloway JN, Burke M, Bradford GE, Naylor R, Falcon W, Chapagain AK & Smil V (2007). International trade in meat: the tip of the pork chop. Ambio, 36(8), 622-629.

Ghose B, Islam ARMT, Islam HT, Hasanuzzaman M, Huang J, Hu Z & Ibrahim SM (2021). Rain-fed rice yield fluctuation to climatic anomalies in Bangladesh. International Journal of Plant Production, 15, 183-201.

Haque MK, Zaman MRU, Rahman MA, ... & Rabbany MG (2022). A review on impacts of COVID-19 on global agricultural system and Scope for Bangladesh after pandemic. Environmental Science and Pollution Research, 29(36), 54060-54071.

Hasan MM, Hossain BS, Sayem MA & Afsar M (2020). effect of agricultural exports and imports on economic growth in Bangladesh: A study on agribusiness supply chain. Journal of Distribution Science, 20(11) 79-88.

Hejazi M, Marchant MA, Zhu J & Ning X (2019). The decline of US export competitiveness in the Chinese meat import market. Agribusiness, 35(1), 114-126.

Isakson SR (2014). Maize diversity and the political economy of agrarian restructuring in Guatemala. Journal of Agrarian Change, 14(3), 347-379.

Ismail T, Qamar M, Khan M, Rafique S & Arooj A (2023). Agricultural Biodiversity and Food Security: Opportunities and Challenges. Neglected Plant Foods of South Asia.

Johnson R & Schwarzenberg AB (2020). US-EU Trade Agreement Negotiations: Trade in Food and Agricultural Products. US Congressional Research Service, 20.

Kamble SS, Gunasekaran A & Gawankar SA (2020). Achieving sustainable performance in a data-driven agriculture supply chain: A review for research and applications. International Journal of Production Economics, 219, 179-194.

Keshelashvili G (2018). Value chain management in agribusiness. International journal of business & management, 6(2), 59-77.

Khaleduzzaman ABM, Hossain AS & Ahasan SA (2022). Prospects on Trade of Livestock & its Products in Bangladesh. Prospects on trade of livestock and its products in South Asia, *11*.

Khanal LN & Regmi J (2022). Physical and chemical analysis of Beirut ammonium nitrate blast: A concern of particulate matter in atmosphere. Nepal Journal of Environmental Science, 10(2), 59-66.

Kramer B, Hazell P, Alderman H, Ceballos F, Kumar N & Timu AG (2022). Is agricultural insurance fulfilling its promise for the developing world? A review of recent evidence. *A*nnual Review of Resource Economics, 14(1), 291-311.

Kumar P, Singh NP & Mathur VC (2006). Sustainable agriculture and rural livelihoods: A synthesis. Agricultural Economics Research Review, 19, 1-22.

Laforge JM & McLachlan SM (2018). Environmentality on the Canadian prairies: Settler-farmer subjectivities and agri-environmental objects. Antipode, 50(2), 359-383.

Maniruzzaman M, Haque MK, ... & Hossain MY (2024). Agribusiness prospects and challenges in developing countries: Contribution to overcoming world food crisis in the post-pandemic period. Sarhad Journal of Agriculture, 40(2), 578-587.

Maynard L & Wang X (2010). Context-dependent BSE impacts on Canadian fresh beef purchases. Journal of International Food & Agribusiness Marketing, 23(1), 32-55.

McDaniel CA (2019). Economic Implications for the United States of a North America without NAFTA or USMCA: A Brief Summary of Key Areas. George Mason University, Mercatus Center Working Papers, 10102.

Mercier S (2020). Adding a new perspective to US agricultural trade policy. Renewable agriculture and food systems, 35(4), 445-448.

Misra M (2021). Commercial micro-credit, neo-liberal agriculture and smallholder indebtedness: Three Bangladesh villages. Journal of Contemporary Asia, 51(2), 330-350.

Mohamed ES, Belal AA, Abd-Elmabod SK, El-Shirbeny MA, Gad A & Zahran MB (2021). Smart farming for improving agricultural management. The Egyptian Journal of Remote Sensing and Space Science, 24(3), 971-981.

Motha RP & Baier W (2005). Impacts of present and future climate change and climate variability on agriculture in the temperate regions: North America. Climatic Change, 70(1), 137-164.

Pal P & Mukherjee S (2022). Agriculture trade of India and implications for current and future trade agreements. India's Agriculture and Food Exports, 58.

Pradheep K, Joseph John K, Latha M & Suma A (2021). Status of crop plants of agricultural importance in Kerala state, India: an update. Genetic Resources and Crop Evolution, 68(5), 1849-1873.

Rahman S & Anik AR (2020). Productivity and efficiency impact of climate change and agroecology on Bangladesh agriculture. Land Use Policy, 94, 104507.

Randive K, Raut T & Jawadand S (2021). An overview of the global fertilizer trends and India's position in 2020. Mineral Economics, 34, 371–384.

Ratna RS & Rana U (2024). Potential of trade opportunities between Bangladesh and North-Eastern Region (NER) of India, and Benefits for Bhutan and Nepal.

Samad MA, Rahman MA, ... & Hossain MY (2022). Implications of COVID-19 on oxbow lake (*Baors*) fisher's community, Bangladesh: resilience to food security against probable natural calamities. *Heliyon*, *8*(11), e11326.

Say SM, Keskin M, Sehri M & Sekerli YE (2018). Adoption of precision agriculture technologies in developed and developing countries. The Online Journal of Science and Technology-January, 8(1), 7-15.

Shaikh TA, Rasool T & Lone FR (2022). Towards leveraging the role of machine learning and artificial intelligence in precision agriculture and smart farming. Computers and Electronics in Agriculture, 198, 107119.

Shrimpton R (2017). Fixing our food system. World Nutrition, 8(2), 207-231.

Singh S (2019). Examining global competitiveness of Indian agribusiness in the twenty-first-century Asian context: Opportunities and challenges. Millennial Asia, 10(3), 299-321.

Skorupka M & Nosalewicz A (2021). Ammonia volatilization from fertilizer urea—a new challenge for agriculture and industry in view of growing global demand for food and energy crops. Agriculture, 11(9), 822.

Suresh A & Mathur VC (2016). Export of agricultural commodities from India: Performance and prospects. Indian Journal of Agricultural Sciences, 86(7), 876-83.

Syed MA (2015). Regional analysis, import-export and related issues on food security. Food Security and Risk Reduction in Bangladesh, 111-134.

Timsina J (2018). Can organic sources of nutrients increase crop yields to meet global food demand?. Agronomy, 8(10), 214.

Unnevehr LJ (2000). Food safety issues and fresh food product exports from LDCs. Agricultural Economics, 23(3), 231-240.

van Kooten GC (2018). Farm programs and agricultural support in Canada.

Vollrath TL, Hallahan CB & Gehlhar MJ (2006). Consumer demand and cost factors shape the global trade network in commodity and manufactured foods. Canadian Journal of Agricultural Economics/Revue Canadienne d'agroeconomie, 54(4), 497-511.

Wassmann R, Jagadish SVK, ... & Heuer S (2009). Regional vulnerability of climate change impacts on Asian rice production and scope for adaptation. Advances in agronomy, 102, 91-133.

Zahniser S, Angadjivand S, Hertz T, Kuberka L & Santos A (2015). NAFTA at 20: North America's free trade area and its impact on agriculture.

How to cite this article: Islam MA, Akter T, Ghosh K, Tamanna KI, Faried K, Amin MA, Hossain MS, Hasan MM & Sarkar SR (2024). Agribusiness Comparison of Cultivated Products and Foods Export-Import Quantity of Sub-Continental and Western Countries: Analysis Climate and Demography. Life Science Studies, 01, 46-59.