

# COMPARATIVE ANALYSIS OF CEREAL PRODUCTION: A WAY TOWARDS REALIZING SUSTAINABILITY IN SOUTH ASIA

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## Abstract

The paper aims at undertaking a cross-country analysis of the sustainability of cereal production in parts of South Asia. Countries within the purview of investigation are India and Bangladesh. The paper uses secondary sources of data to make interpretations and draw requisite conclusions. The Agricultural sector stands as the backbone of the economy in South Asian nations. Moreover, cereals play a significant role in escalating the nutritional levels of consumers and have been considered a major driver of food security. Therefore, the characteristic of being an agrarian economy has certainly contributed to the development of the region.

**Keywords:** sustainability, cereal production, South Asian countries

## 1. Introduction

Characterized by multiple topographies and ethnicities, South Asia is home to about one-fourth of the global population, the majority of whom live in rural areas and are dependent on agriculture and other allied activities as a means of livelihood. According to statistics, South Asia harbors 1.749 billion people and 67% of them are living in rural areas. Almost half of the workforce is employed in the agriculture sector and around 42% of South Asia's landmass is under agricultural operation (SAARC, 2020). Even though the share of agriculture to GDP growth has relatively declined over the years, it still holds tremendous importance in meeting the ever-increasing demands of food and nutrition of such a vast population and thereby, ensuring food security. Under agriculture, cereal production forms an integral area of study, considering cereal is the staple food of South Asians. Cereals are a major source of dietary energy and nutrients. Wide varieties of such crops like rice, maize, wheat, sorghum, millets etc. are cultivated and consumed all over the region. Moreover, archaeologists have found mentions of cereal crops in ancient texts like the Vedas that clearly depict the significance they bore for our ancestors.

The focus of our study would be to perform an inter-country analysis of India and Bangladesh in terms of levels of sustainability achieved in the area of cereal yield. The reason for the selection of these two countries of South Asia is that their economies are complementary to a

large extent and stand to benefit substantially from economic integration (De and Bhattacharyay, 2007, 44). Due to the availability of apt data and certitude that rice and wheat are the rudimentary as well as salient cereal crops (Joshi et al., 2004) that are cultivated in Bangladesh and India, the paper studies these aforementioned cereals.

The objective of the paper is to compare the countries based on the level of sustainability these have attained in cereal production.

## **2. Literature Review**

The basic responsibility of a nation is to satiate the demand for food and eradicate hunger in each section of society. It is relatively easier for rich economies to import agricultural yield (cereals being an indispensable part of the consumption basket in most countries) in case they lack agricultural output in self-production. However, developing nations have their last resort to maximize their agricultural yield in the most sustainable and economically feasible way. South Asian countries have agriculture as their mainstay for economic development. This sector has a huge support base for the provision of employment and it majorly contributes to the food supply (Bashir and Ahmad, 2001).

One of the invincible impediments that come while increasing agricultural yield is that the land area suitable for agriculture is fixed and cannot be increased beyond a certain extent. Therefore, the role of science and technology takes the lead to develop methods for more productive cultivation methods (Guryay et al., 2005).

Resources are frequently described by economists as finite, largely natural means of production that must be exploited in an efficient, sustainable manner in order to save money and lower long-term risks (Berger and Herdenberg, 2018). From this vantage point, cereals are crucial agricultural resources, and sustainability in their cultivation cannot be discarded.

The paper studies the two focal cereal crops, rice and wheat. These form the top of the seven agricultural crops that are cultivated on the largest proportion of the world's total land area (Hayati, n.d.). The largest agricultural production system in the world, the rice-wheat cropping sequence (RWCS), covers approximately 12.3 million hectares in India and 0.8 million hectares in Bangladesh. Approximately 85% of this area is in the Indo-Gangetic plains (IGP) (Bhatt et al., 2016).

### 3. Research Methodology

Goal 2 of the Sustainable Development Goals (SDGs) of the United Nations is 'Zero Hunger', which clearly states one of its targets as Sustainable food production and resilient agricultural practices (United Nations, n.d.). Sustainable agriculture is a multi-dimensional concept and these dimensions will be examined under the following three sub-indicators, Land Productivity, Food Security Index, and Irrigation (water use), as directed by the UN (Sustainable Development Goals, n.d.). These sub-indicators are modified in accordance with the area of study chosen under agricultural production, i.e., cereal production to measure the level of sustainability in the same.

#### 3.1 Land Productivity

Land Productivity refers to the amount of agricultural output per unit of land (UNESCWA, n.d.). Particularly, cereal yield per unit of land will be computed for India and Bangladesh and the data obtained will be subject to comparison through tabular and graphical representations. The units of measurement for yield and land are tonnes and hectares respectively.

**Table 1: Cereal Production (Rice and Wheat) in Tonnes (2011-2020)**

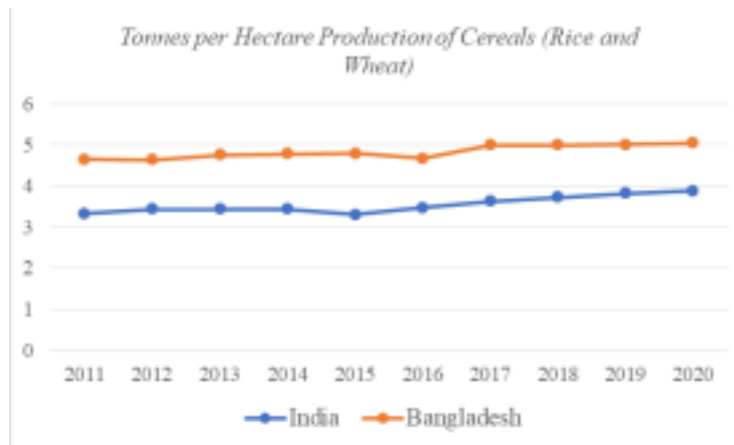
	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
<b>India</b>	24477 4000	25268 0000	25271 0000	25305 0000	24307 0000	25599 0000	26701 0220	27458 6250	28124 1230	28589 5000
<b>Bangladesh</b>	51599 085	51492 356	52789 000	53109 593	53153 464	51801 052	55459 473	55515 373	55603 155	55934 891

Source: Food and Agriculture Organization of United Nations, n.d.

The data from Table 1 was used to compute the Cereal Yield (Tonnes) per Hectare of India and Bangladesh (2011-2020). The ground assumption taken is that the area under rice, as well as wheat cultivation, is fixed for the years of study (2011-2020). It is 73.66 million hectares and 11.091 million hectares for India and Bangladesh, respectively.

**Table 2: Cereal Yield (Tonnes) per Hectare of India and Bangladesh (2011-2020)**

	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
<b>India</b>	3.32	3.43	3.43	3.43	3.29	3.47	3.62	3.72	3.81	3.88
<b>Bangladesh</b>	4.65	4.64	4.75	4.78	4.79	4.67	5.00	5.00	5.01	5.04



Graph 1: Graphical representation of Table 2

From Table 1 and Graph 1, it is evident that Bangladesh has a greater per-hectare cereal production than India. In 2011, Bangladesh's per-hectare cereal yield was about 4.65 tonnes while it was only 3.32 tonnes for India. A similar trend of differences can be seen in the data after a period of 10 years in 2020 when the former was able to produce about 5.04 tonnes of cereals per hectare while the latter could yield only 3.88 tonnes of cereals per hectare. The Compound Annual Growth Rate (CAGR) is the average increase in the value of a measure over a specific interval of time (Gil et al., 2018). The CAGR of India is 1.755 while it is 0.90 for Bangladesh, indicating a better yet slow growth in the indicator for India than for Bangladesh.

### 3.2 Food Security Index

The Global Food Security Index (GFSI), developed by Economist Impact and supported by Corteva Agriscience, considers food affordability, availability, quality and safety, and sustainability and adaptation across 113 countries. (Economist Impact, n.d)

For the purpose of the study, the paper mainly considers the availability of food as a measure of food security. A rice-wheat (RW) system is highly prevalent in the South Asian region, covering 26 million hectares of the Indo-Gangetic Plains (one-third of the total area under rice and wheat cultivation in South Asia). It provides staple food for more than 20% of the world's population (Chauhan et al., n.d.). As wheat and rice are the pivotal cereal crops in India and Bangladesh (Joshi et al., 2004), their contribution to providing basic grains is significant towards food security.

**Table 3: Global Food Security Index Rankings (2012-2020)**

	2012	2013	2014	2015	2016	2017	2018	2019	2020
<b>India</b>	66	70	69	68	75	74	76	72	71
<b>Bangladesh</b>	N/A	N/A	N/A	N/A	N/A	N/A	N/A	83	84

Source: Economist Impact, n.d.



Graph 2: Graphical Representation of Table 3

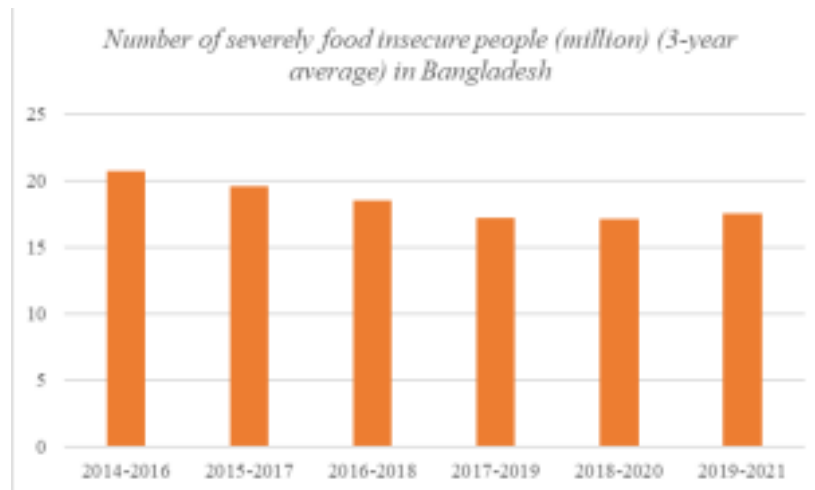
As per the report of the Global Food Security Index over the year 2012-2020 (Table-3), it could be seen that India has had its position around the 70s. Overall, the rank has fallen from 66 in 2012 to 71 in 2020. Due to the unavailability of data, a systematic comparison cannot be drawn for both countries, except for the years 2019 and 2020. India has secured a better position than Bangladesh in the aforementioned years.

Following seven years of progress towards the Sustainable Development Goal of eradicating hunger by 2030, there has been a drop in global food security. Although nations have made tremendous progress in the previous 10 years to combat food insecurity, food systems are nevertheless susceptible to economic, climatic, and geopolitical shocks (Economist Impact, n.d.).

**Table-4: Number of severely food insecure people (million) (3-year average) in Bangladesh**

	2014-2016	2015-2017	2016-2018	2017-2019	2018-2020	2019-20
<b>Bangladesh</b>	20.7	18.5	17.2	17.1	19.6	17.5

Source: Food and Agriculture Organization of United Nations, n.d.



Graph 3: Graphical Representation of Table 4

The paper clearly shows that Bangladesh has progressed in reducing the number of severely food insecure people over the years 2014-2020. However, a slight rise is witnessed during the triennial 2019-2021. The data for India for the same period is unavailable, so the analysis cannot be drawn.

### 3.3 Irrigation

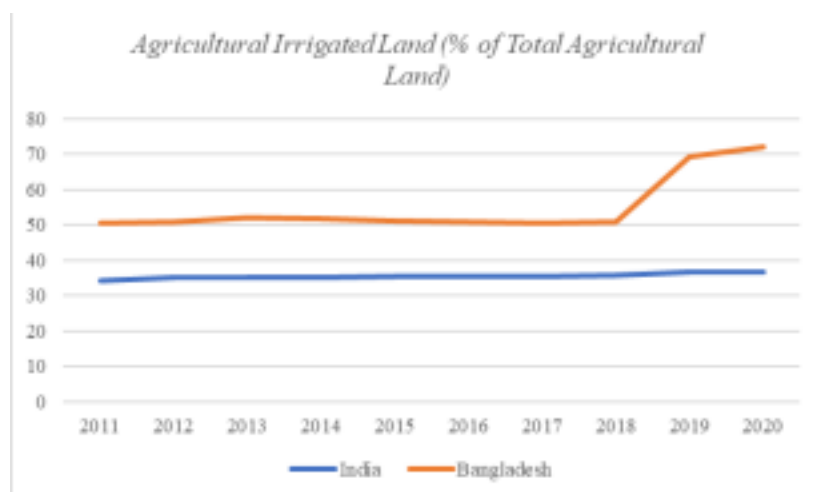
Agriculture ecosystems are the principal suppliers of food but they are also the main users of water resources on a global level (Almeria et al., 2019).

For a comparison of water availability for agriculture in Bangladesh and India, this paper considers the percentage of agricultural irrigated land as an indicator. As defined by Food and Agricultural Organization (FAO), agricultural irrigated land refers to agricultural areas purposely provided with water, including land irrigated by controlled flooding.

**Table-5: Agricultural Irrigated Land (% of Total Agricultural Land)**

	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
<b>India</b>	34.15	35.04	35.13	36.64	35.21	35.29	35.37	35.51	35.57	36.64
<b>Bangladesh</b>	50.58	50.92	51.95	51.74	51.16	50.74	50.54	50.74	69.29	71.9

Source: The World Bank, n.d.



Graph 4: Graphical Representation of Table 5

As per the report published by the Food and Agricultural Organization (FAO), the irrigation pattern of Bangladesh is higher than that of India. India has experienced a constant rate of agricultural irrigated land of around 35% to 36% for all ten consecutive years and this trend is similar to that of Bangladesh till 2018 with a different figure of 50% to 51%. We can see a tremendous increase in land irrigated in 2019 as the percentage skyrocketed to 69.2 from 50.7.

Cereals play a dominant role in an Indian diet and contribute to approximately 50% of the total water used in the agricultural production of food in India (Kayatz et al., 2019). Similarly, in Bangladesh, rice production covers 77% of total agricultural lands (Ahmed et al., n.d.). Also, wheat acre-age ranks second after rice (Rahman and Hasan, 2008). So, the situation of irrigation for agricultural land as a whole can be narrowed down to the land under cereal production. Most of the farmers in these nations face drought or flood as an upshot of climate change which raises the threat to food security, this also points towards why adequate irrigation plays a notable role.

#### 4. Results and Discussions

Section 3.1 shows the cereal-yielding capacity of land in India and Bangladesh. According to the report by the FAO, Bangladesh has focused on raising the level of productivity of its agricultural land to produce cereals (rice and wheat) by employing better agricultural methods and implements than India. While Bangladesh needs to make its agricultural system resilient enough to maintain this better state of productivity, India must work on augmenting the level of land productivity to produce cereals for a population of more than a billion. (The World Bank, n.d.).

It can be inferred from section 3.2 and the reports of the Global Food Security Index that India has performed better than Bangladesh in recent years. Although India holds a better rank, Bangladesh has also progressed in reducing the number of severely food-insecure people. Action is imperative at all scales—local, national, and international—to end hunger and malnutrition and guarantee food security for all. Intervention in the form of increased investment and better technology can change the situation for the good.

Section 3.3 provides insight into the percentage of land irrigated as an indicator to show the situation of irrigation for better cereal yield. According to the data computed on irrigation for analysis, Bangladesh possesses a higher percentage of irrigated land (out of the total agricultural land) than India. India has a lot to improve in the area of irrigation to accelerate the path to sustainability.

## **5. Conclusion**

After monitoring the progress of the two countries against the three sub-indicators, the research derives varied results for each of the three sub-indicators of ‘Sustainable Food Production and Resilient Agricultural Practices’. While for land productivity and irrigation, Bangladesh showed a more promising growth than India, the latter surpassed the former in terms of the prevalence of food security. Relying solely on the data considered for the study might not be helpful for policy implementation but a few important conclusions regarding the current situation of sustainable agriculture in these nations can definitely be drawn.

Thus, the only way forward for these agrarian economies is to work on their loopholes. India should focus on raising the productivity of its land and elevating the level of irrigation by judicious use of modern agricultural methods and investment in technology and innovation. This will, further, improve the situation of food security in the country. Despite the fact that Bangladesh is in a better position than India in terms of irrigation and land productivity, it has not been able to save its population from the ill fate of food insecurity. Thus, the way forward for Bangladesh is to focus on diversification in cereal production and the development of efficient food distribution systems to ensure that the food reaches even the poorest of the poor.



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