REVIEW ARTICLE Agricultural Reviews, Volume 45 Issue 3: 456-463 (September 2024)

India's Cotton Balance Sheet under Two Decadal Scenarios: A Review

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10.18805/ag.R-2599

ABSTRACT

India ranks second in the global cotton balance, next only China. Cotton is the mainstay of India's textile industry, accounting for roughly 74% of total textile mill usage. India's cotton production has increased due to the introduction and rapid geographical expansion of bollworm resistant Bt cotton. The objective of this paper is to compare cotton balance analyses and to investigate the factors that have influenced cotton development over the last 22 years. The pertinent arguments presented in this article support the analytical discussion of the cotton trade's yearly trends. Between 2000-01 and 2021-22, there will be an average of 30 million bales of cotton produced, 5.6 million exported and 1.4 million imported by India. By adding observable carryover stocks, the entire supply of cotton in India has consistently outperformed the total demand. However, Indian cotton farmers face a variety of issues, including increasing production costs, unmanageable debts, stagnant yields, constant pesticide use, inadequate irrigation, a lack of modern technology, manual picking, vulnerability to contamination, deterioration in genetic purity, competition from artificial fibres, particularly synthetic fibre, fluctuating market prices and lack of CCI participation. To boost cotton output, governments must provide high-yielding, high-quality hybrid seeds and appropriate irrigation infrastructure.

Key words: Carry-over stock, Cotton fibre, Mill consumption, Raw cotton, Textile demand.

India is one of the world's leading producers and exporters of cotton. The country's cotton balance sheet, which includes information on production, consumption and exports, varies depending on a variety of factors, including weather conditions, government policies and global market trends. Under a scenario where conditions are favourable for cotton production, such as good monsoon rainfall and government support for farmers, India's cotton balance sheet shows strong production numbers and increased exports. In this scenario, the country observed a surplus in its cotton balance sheet, as production exceeds domestic consumption and there is a high demand for Indian cotton on the global market. On the other hand, under a scenario where conditions are not favourable for cotton production, such as drought or pest infestations, India's cotton balance sheet negatively impacted. In this scenario, production lowered and exports declined, resulting in a deficit in the cotton balance sheet. Additionally, higher prices of cotton affected the profitability of Indian farmers. The country's ability to maintain a strong cotton balance sheet depends up on its ability to adapt to changing conditions and to take advantage of opportunities in the global market.

Cotton is often known as "White gold" because to its agricultural and industrial value (Umamaheswari *et al.*, 2022). The cotton balance sheet provides insights on the factors that have contributed to cotton trends, such as weather conditions, changes in government policies, or shifts in global demand for cotton. It provides insights on performance of the cotton industry in different regions of the country and its impact on economy. Further, it highlights the challenges facing the cotton industry in India, such as low productivity, pest attacks like aphid, a sucking pest of the cotton and competition from other countries (Tomar, 2010). Cotton balance sheet is an instrumental to provide suggestions such as investing in technology and research, promoting sustainable farming practices and developing a strong export strategy.

The Cotton Balance Sheet is prepared by the Cotton Advisory Board (CAB) under the Ministry of Textiles, Government of India. The data is collected from various sources, including government agencies, industry associations, research institutions, official government websites and All India Cottonseed Crushers Association (AICOSCA) Newsletters. The research study is carried out at Coromandel Agro Products and Oils Limited, Jandrapeta

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How to cite this article: Sekhar, S.C., Dinesh, P.S., Ruthwik, A.S.S., Sandeep, M. and Vamsi, M.Y. (2024). India's Cotton Balance Sheet under Two Decadal Scenarios: A Review. Agricultural Reviews. 45(3): 456-463. doi: 10.18805/ag.R-2599.

Submitted: 08-10-2022 **Accepted:** 03-04-2023 **Online:** 19-05-2023

during the period 2009-2017. The data is compiled and tabulated for the convenience of analysis and interpretation. In addition to the raw figures of the table, the prominent reasons for the trends in cotton production, consumption, demand, supply, export and import are gathered from several published materials. The numbers in the table concise to two decimals. A care is taken to avoid deviations in the balancing figures year-on-year. The data is interpreted on yearly basis. Direct explanation of the bare figures is averted to avoid repetition. Maximum focus put on explanation of the reasons behind changes in trends. Several published materials are touched upon to find true reasons for the changing tendencies in cotton balancing figures year-by-year. A concise analysis of the cotton balance sheet is provided and the results are discussed in a systematic way.

The most significant natural fibre is cotton, which offers reliable foreign exchange to maintain the balance of payments and facilitates a sizable number of job possibilities for society. The cotton season lasts from October 1 until September 30. Large exportable surpluses and high demand from consuming nations are what propel cotton exports. Stronger mill consumption encourages cotton imports, which benefits cotton traders and mill users by saving them a significant amount of money. However, there are concerns about the production decline in exporting countries-and the decline in demand in importing countries. It is obvious that the proportion of irrigated cotton in the total area needs to be increased if cotton production is to stabilise at greater levels. The maximum yield, 567 kg/ha, was achieved in 2007-2008, much below the 785 kg average for the world. Cotton production peaked in 2013-14 with 39.8 million bales (170 kg= 1 bale), but production fell off after that and averaged 35.6 million bales from 2014-15 to 2021-22.

India's cotton production has increased tremendously during the past 22 years due to the introduction and rapid geographical expansion of bollworm resistant Bt cotton. It is a practical management strategy for growing interspecific Bt cotton that produces good yields (Baskar and Jagannathan, 2021). The pertinent arguments presented in this article support the analytical discussion of the cotton trade's yearly trends. Between 2000-01 and 2021-22, there is an average of 30 million bales of cotton produced, 5.6 million exported and 1.4 million imported. By adding observable carryover stocks, the entire supply of cotton in India has consistently outperformed the total demand. However, Indian cotton farmers face a variety of issues, including increasing production costs, unmanageable debts, stagnant yields, constant pesticide use, inadequate irrigation, a lack of modern technology, manual picking, vulnerability to contamination, deterioration in genetic purity, competition from artificial fibres, particularly synthetic fibre, fluctuating market prices and lack of Cotton Corporation of India participation. To boost cotton output, governments must provide high-yielding, high-quality hybrid seeds and appropriate irrigation infrastructure.

The cotton balance sheet of India

Within India's export portfolio, cotton was made free. China, Bangladesh, Pakistan, Vietnam, Taiwan, Indonesia and Thailand are the top destinations for Indian cotton fibre exports. Up until 2013-14, China was the top importer, but starting in 2015-16, Pakistan and Bangladesh replaced China as the top importers of Indian cotton. Currently, Bangladesh is the main country to which Indian raw cotton is exported. Even though India is a significant producer and exporter of cotton, it trails behind in the amount of imported extra-long fibre. Table 1 depicts the two-decade consolidated statement of cotton supply and demand in India. Contrary to the CAB projections, the balance sheet's import and export data for cotton are different.

According to the data in Table 1, the total supply of cotton was 20.26 million bales in the year 2000-2001, which consisted of an opening stock of 4.05 million bales, a crop (production) of 14.0 million bales and imports of 2.21 million bales. The total demand for cotton was 17.36 million bales, which was split between mill consumption (14.93 million bales), S.S.I. consumption (1.09 million bales) and non-textile consumption (1.27 million bales). There was also a small amount of exports (0.06 million bales). Finally, the closing stock was 2.9 million bales. The data indicates that the supply of cotton was sufficient to meet the demand in the year 2000-01. The difference between the total supply and total demand was 2.9 million bales, which constituted the closing stock. The mill consumption was the largest contributor to the total demand, accounting for 86% of it. The small number of exports suggests that most of the cotton was consumed domestically. The data suggests that the cotton industry in India was stable in the year 2000-01 with a sufficient supply to meet the demand. The mill consumption was the main contributor to the total demand, while exports were minimal. The closing stock indicates that there was some unused cotton, which may have been carried over to the following year.

The balancing numbers for the years 2001-2002 show an increase in imports and a decline in exports. The supply of the commodity was greater than the demand in the given financial year. The difference between the total supply and demand (21.22-17.22= 4 million bales) is equal to the closing stock, which means that the supply was greater than the demand, leading to an increase in the closing stock. The exports of the commodity contributed only 0.05 million bales to the demand, which is a small amount compared to the other forms of consumption.

Due to decreased domestic production, cotton imports were noticeably lower in 2002-2003 than they were the prior year. According to reports, the total supply of the item exceeded the total demand, leading to an increase in the closing stock. This indicates that there was an oversupply of the item in the market. On the other hand, if the total demand had exceeded the total supply, it would have indicated a shortage of the item in the market.

Table 1: The cotton balance sheet in India from 2000-2001 to 2021-2022. (In million bales of 170 Kg each)

Particulars	2000 -01	2001 -02	2002 -03	2003 -04	2004 -05	2005 -06	2006 -07	2007 -08	2008 -09	2009 -10	2010 -11	2011 -12	2012 -13	2013 -14	2014 -15	2015 -16	2016 -17	2017 -18	2018 -19	2019 -20 (P)*	2020 -21 (P)*	2021 -22 (P)*
Supply																						
Opening Stock	4.05	2.90	4.00	2.40	2.10	7.20	5.20	4.75	4.30	7.20	4.05	4.57	4.00	4.00	3.30	6.62	3.64	4.37	4.29	5.65	12.07	7.32
Crop (Production)	14.00	15.80	13.60	17.70	24.30	24.10	28.00	31.50	29.00	29.50	33.90	36.70	37.00	39.80	38.60	33.20	34.50	37.00	33.30	36.50	35.30	36.20
Imports	2.21	2.52	1.60	0.72	1.20	0.50	0.55	0.65	0.90	0.70	0.23	0.75	1.45	1.15	1.43	2.27	3.09	1.58	3.53	1.55	1.10	1.05
Total supply	20.26	21.22	19.20	20.82	27.60	31.80	33.75	36.90	34.20	37.40	38.18	42.02	42.45	44.95	43.33	42.07	41.23	42.95	41.12	43.70	48.56	44.58
Demand																						
Mill Consumption	14.93	14.70	14.50	15.03	16.30	18.00	20.00	20.30	19.50	20.70	22.17	22.35	25.17	26.80	27.80	27.02	26.27	28.01	27.07	23.37	29.74	29.90
S.S.I Consumption	1.09	1.17	1.10	1.30	1.70	1.90	2.00	2.30	2.00	2.30	2.44	2.21	2.35	2.52	2.63	2.70	2.62	2.61	2.24	2.04	2.24	2.30
Non-Textile consumption	1.27	1.30	1.15	1.05	1.40	2.00	1.50	1.50	1.50	2.00	1.33	0.50	0.78	0.63	0.50	1.80	2.15	1.27	1.80	1.50	1.50	1.60
Total consumption	17.30	17.17	16.75	17.39	19.40	21.90	23.50	24.10	23.00	25.00	25.96	25.07	28.31	29.95	30.94	31.52	31.04	31.90	31.12	26.91	33.48	33.80
Exports	0.06	0.05	0.05	1.32	1.00	4.70	5.50	8.50	4.00	8.35	7.65	12.95	10.14	11.69	5.77	6.90	5.82	6.75	4.35	4.70	7.75	4.50
Total demand	17.36	17.22	16.80	18.72	20.40	26.60	29.00	32.60	27.00	33.35	33.61	38.02	38.45	41.65	36.71	38.43	36.86	38.66	35.47	31.62	41.24	38.30
Closing stock	2.90	4.00	2.40	2.10	7.20	5.20	4.75	4.30	7.20	4.05	4.57	4.00	4.00	3.30	6.62	3.64	4.37	4.29	5.65	12.07	7.32	6.28

Source: Cotton Advisory Board; Meeting of Committee on Cotton Production and Consumption (COCPC) held on 12-11-2021.

The cotton years of 2003-2004 are exceptional since about equal amounts of cotton were imported and exported. There has been an increase in both the supply and demand of the item. The total supply exceeded the total demand, leading to an increase in the closing stock. The increase in exports could be a positive sign, suggesting growing demand for the item in international markets.

Due to record production, there were more cotton bales carried over for the 2004-2005 season, *i.e.*, 7.2 million bales as against 2.1 million bales from the previous year. This is a result of an increase in mill usage of roughly 9%. Compared to the previous year, there has been a significant increase in both the supply and demand of the item. However, the supply still exceeded the demand, leading to a significant increase in the closing stock. This suggests that the market experienced an oversupply of the item. The export demand remained stable, which could be interpreted as a sign of stable demand for the item in international markets.

A sizable carryover stock of 7.2 million bales of cotton was present when the 2005-06 cotton season began. Cotton availability increased because of the bumper harvest. However, despite the unheard-of increase in cotton exports during the years 2005-2006, the season-ending stock for this year is not higher. Over the previous year, there was a huge increase in mill usage of nearly 12%. The significant volume of exports and increased mill utilisation seem to have stabilised cotton prices. In the first half of this season, the average cotton prices for all major types of cotton continued to be higher than the average from the previous season by 5.8 to 39%. The record cotton export of 4.7 million bales, up from just one million bales the year before, is a noteworthy development this year. Imports decreased from 1.2 million bales the year before to 0.5 million bales this year.

Due to the abundant crop, cotton exports increased from 4.7 million bales in 2005-2006 to 5.5 million bales in 2006-2007. From 0.5 million bales the year before, imports were reported to have increased by a little over 0.55 million bales. This is brought on by higher mill consumption and cheaper cotton.

The highest output of cotton since 2000-01, 31.5 million bales, was produced in 2007-2008, marking a new production record. Due to the high demand for Indian cotton products in international markets, exports increased by 55% from the previous year. Due to increased local textile demand for long-staple cotton fibre, imports increased to 0.65 million bales, an 18% increase over the previous year.

Unfortunately, there was a setback in 2008-09 when productivity fell by the same percentage to 526 kg and production fell by 7% to 29 million bales. The unpredictable rainfall patterns are the biggest contributing cause to this fall's weather. This demonstrates that, despite advances in the dissemination of modern production technology, such as biotech varieties of cotton, crop outcomes are still influenced by seasonal conditions. This is understandable given that the cotton-growing region is entirely dependent on rainfall and lacks facilities for supplemental irrigation. Cotton exports are doing well, though not better than they did the year before. About 7.5 million bales of raw cotton will be exported during the year. The situation has changed, though, because of the abrupt increase in cotton's minimum support prices by as much as 40%. Since Indian costs remained higher than those in other countries, the industry was essentially priced out of the global market. As a result, the export total was dramatically reduced from 8.5 million bales the previous year to just four million bales. As foreign prices were slightly lower than domestic prices, cotton imports were recorded at 0.9 million bales.

A record increase in cotton exports from India occurred in 2009-2010 because of pricing advantages and the availability of an export surplus. The greatest producers of cotton in the world, China, as well as the USA, are both seeing a fall in production. There are production issues in Australia and Uzbekistan, among other countries. Due to the high export of 8.35 million bales of raw cotton during the year, these developments are positive for India. Unprecedented high exports were praised by competing sectors of the economy, including cotton producers, cotton mills and users of the product. This resulted in the imposition of a Rs. 2500/-per tonne export duty on the export of raw cotton, the registration of the export contract, the prohibition of the export of contracts that had already been registered and restrictions on the export of goods under licence. Due to the ample domestic supply and decreased textile demand for long-staple fibre, imports are hindered.

The carryover stock of cotton in 2010-11 decreased to 4.05 million bales from 7.2 million bales the year before because of record production. This is because of a 7% increase in mill consumption. Cotton exports decreased by 8% from the previous year because of an excess in global cotton production. Due to the continuous economic collapse that has shattered the world cotton market, imports sharply decreased to 0.23 million bales from 0.7 million bales.

A remarkable production of 36.7 million bales was produced in 2011-12 because of factors including reliable unseasonal rains, effective pest control methods, widespread use of high yield varieties, a global shortage, significant export demand and profitable prices for cotton fibre in the prior year (Pattanayak, 2011). Due to the relaxation of the shipment size cap, the weakening of the rupee and high global consumption, cotton exports have increased by 69% to 12.9 million bales.

Cotton production increased by 0.81 percent to 37 million bales in 2012-13, despite lower forecasts at the start of the cotton season. The amount of cotton exported fell by around 22% to 10.14 million bales, but imports dramatically increased by 94% to 1.45 million bales. This is a result of larger mills' minor financial concerns being mitigated by either domestic or imported supply (PTI, 2013). China, Vietnam and Bangladesh are the main cotton exporters, whereas West Africa provides most of the cotton imports. The 2013-14 harvest was a bountiful one that marked an important turning point in Indian cotton history, with a record-

breaking production of 39.8 million bales, up 7.56 per cent from the previous year. Gujarat, Maharashtra and Andhra Pradesh are India's top three cotton-producing states. Exports of cotton increased by 15% to 11.69 million bales, while imports fell by 21% to 1.15 million bales. Strong external demand, an open general licencing policy and a depreciating rupee are all factors that have helped cotton exports improve (PTI, 2014b). The decline in imports was brought on by a decrease in textile demand and the availability of domestic production. Due to rising domestic consumption and high export levels, closing stock has reached its lowest point with 3.3 million bales.

In 2014-15, the cotton crop decreased by 3% to 38.6 million bales from the previous marketing year. Imports increased by 24% to 1.43 million bales, while exports fell by 51% to 5.77 million bales. The decline in exports is attributed to lower production, constrained local textile demand, high domestic prices and China's new cotton policy. Additionally, to increase local supplies for the manufacturing and re-export of high-end textiles, India imported excellent long-staple, extra-long-staple and occasionally medium and short-staple cotton (PTI, 2014a).

In 2015-16, the total amount of cotton produced decreased for the second year in a row by 14%, reaching 33.2 million bales. Lower planting acreage, plenty of rain, whitefly infestations and pink bollworm attacks are the main causes of this reduction. In comparison to the prior fiscal year, exports increased by 20% to 6.9 million bales and imports by 58% to 2.27 million bales, respectively. This situation is a result of several factors, including an increase in local prices over the minimum support price; poor demand from China; Pakistan's purchase strategy for raw cotton because of domestic crop failure; and increasing shipments to Bangladesh and Vietnam (Jadhav, 2015). High domestic demand resulted in a 3.64-million-bale closing stock.

Cotton production increased by 4% to 34.5 million bales in 2016-17, thanks to timely monsoons and fewer pest attacks. Due to a decline in Chinese demand, cotton exports were down approximately 16% while imports increased by about 36% due to a stronger rupee (Skymetweather.com, 2017).

The cotton year 2017-18 reported a bumper harvest of 37 million bales, which is equivalent to the output in 2012-13, a growth rate of 7% from the year before. The primary factor causing this improvement is a significant increase in yield per hectare to 506 kg, from a long-term average of 300 kg lint/ha (Kasabe, 2017). Because domestic cotton prices were lower than world cotton prices, exports of cotton climbed by 16% to 6.75 million bales, while imports fell by 50% to 1.58 million bales (Bhosale, 2018).

A total of 33.3 million bales of cotton were produced in 2018-19, which is a 10% decrease from the year before. The main reason for the lower productivity is that there is no longer a chance for third and fourth pickings because farmers in the southern region uprooted their cotton plants because of a lack of moisture (Bureau, 2019). In comparison to the prior year, exports decreased by around 36% while imports rose by nearly 124%. A spike in imports was brought on by a lack of cotton fibre, reduced domestic pricing, stalled shipments and an increase in the estimated global stock (Vora, 2019a).

A group assembled by the Ministry of Textiles has forecast that cotton production will increase by nearly 10% from the previous year to 36.5 million bales in 2019-20, following CAB's elimination. Farmers were enticed to grow cotton on additional acres by higher MSP combined with favourable monsoons (Vora, 2019b). All the favourable circumstances led to an increase in exports of 8%, while the percentage decline in imports for the year was more than halved. A global pandemic influenced the cotton trade throughout the year.

Despite a 3% decrease in production from the previous year, a healthy crop of 35.3 million bales of cotton was produced in the cotton year 2020-21. There are worries about this drop because of crop inequalities in important zones. The overall cotton supply reached 48.56 million bales, the greatest level in the past 20 years, with the highest carry-over stock of 12.07 million bales because of the suspension of foreign trade owing to COVID-19 terms. Despite the global pandemic, cotton exports have increased by 65% to 7.75 million bales from 4.70 million bales in the previous year. Following Bangladesh in importance as a market for Indian raw cotton are China, Vietnam and Indonesia (Dsouza, 2021). Due to a record level of mill consumption, which in turn resulted in a record level of domestic supply consumption, imports were reduced by nearly 29% to 1.1 million bales.

The total supply of the commodity in the cotton year 2021-22 is 44.58 million bales and it is made up of opening stock (7.32 million bales), crop production (36.2 million bales) and imports (1.05 million bales). The total demand for the commodity is 38.3 million bales which is comprised of mill consumption (29.9 million bales), S.S.I consumption (2.3 million bales), non-textile consumption (1.6 million bales) and exports (4.5 million bales). The closing stock of the commodity is 6.28 million bales. The difference between the total supply and total demand is 5.28 (44.58 - 38.3), indicating that there is a surplus of the commodity in the market. The closing stock (6.28) is slightly lower than the opening stock (7.32), which could suggest that the surplus may not be sustained in the future if demand continues to remain lower than supply (Bureau, 2022). Overall, the data suggests that there is a current surplus in the market for the commodity, but it may not be sustained in the future if demand does not increase.

Findings

Cotton production: Production reached an all-time high of 39.8 million bales in 2013-14, up from 14 million bales in 2000-01. Thanks to the development of high yielding hybrid seed varieties and boll worm resistant Bt cotton. Over the past 22 years, a production of 30 million bales

has been reported on average. During the time, the yield per hectare is positively correlated.

Cotton consumption: From 17.3 million bales in 2000-01 to 33.8 million bales in 2021-22, the total consumption increased by almost 49 per cent. Over the previous 22 years, there have been about 26 million bales consumed annually on average. Mill consumption accounts for the lion's share of total consumption, accounting for 22.25 million bales on average over the previous 22 years, compared to 1.365 million bales of non-textile consumption and 2.08 million bales of SSI consumption.

Cotton trade: The amount of cotton imported over the period decreases from 2.21 million bales in 2000-01 to 1.05 million bales in 2021-22, with an average of 1.4 million bales. While the amount of cotton exported increased, from 0.06 million bales in 2000-01 to 4.5 million bales in 2021-22, with an average of 5.56 million bales over the years. It is obvious that cotton exports outnumber cotton imports.

Cotton stock: Opening stock underwent a variety of adjustments. Over the past 22 years, opening stock reports have been made for 4.77 million bales on average. While the closing stock average recorded 5 million bales. It reveals that the closing stock exceeds opening stock.

Cotton demand and supply: The country's overall cotton demand climbed from 17.36 million bales in 2000-01 to 38.3 million bales in 2021-22, with an average of 31.27 million bales. During the period, the country's total cotton supply climbed from 20.26 million bales to 44.58 million bales, with an average of 36.28 million bales. It demonstrates that cotton supply exceeds demand.

Recommendations

1. It is recommended to continue investing in improving yield per hectare as it seems to be a key factor in increasing production. Also, monitoring the market trends and demands to make sure that the production will be profitable and sustainable.
2. It is recommended to focus on increasing mill consumption as it appears to be the most significant contributor to total consumption. This could be achieved by targeting the textile industry and promoting the use of cotton in their products. Additionally, it would be beneficial to monitor the market trends and demands for non-textile and SSI consumption and invest in research and development to increase the production of cotton for those specific markets.
3. It is recommended to continue focusing on increasing cotton exports as it seems to be a profitable and sustainable strategy. This can be achieved by identifying and targeting new export markets, as well as promoting the quality and reliability of cotton grown in the country. Additionally, it would be beneficial to monitor the market trends and demands in the import market and invest in research and development to increase the competitiveness of domestic cotton in those markets.
4. It is recommended to focus on strategies to increase the opening stock, such as investing in research and development to improve crop yields and storage methods, as well as increasing the efficiency of the supply chain. Additionally, it may be beneficial to monitor market trends and demands to ensure that the opening stock is sufficient to meet market needs. It also important to look into the factors that contribute to the difference between opening and closing stock and find ways to optimize the inventory management.
5. It is recommended to focus on strategies to increase demand for cotton, such as promoting the use of cotton in various industries and targeting new markets. Additionally, it may be beneficial to monitor market trends and demands to ensure that the supply of cotton is aligned with market needs. It is also important to investigate ways to optimize the use of excess supply, such as seeking new export opportunities or storing the excess supply for future use.

Glitches in cotton cultivation

Cotton cultivation in India frequently varies from season to season due to unfavourable weather conditions, drought and/or flood-like conditions, inadequate irrigation facilities, farming community illiteracy, soil erosion, improper manuring and low fertiliser application, non-mechanized and outdated farm implements, a lack of capital and adequate credit facilities, a lack of a proper marketing system, *etc*. India's agricultural productivity is growing at a moderate rate face in comparison to China. There are many problems that Indian cotton farmers must deal with, such as rising production costs, unmanageable debts, stagnant yields, constant pesticide use, insufficient irrigation, a lack of modern technology, manual picking, susceptibility to contamination, deterioration in genetic purity, competition from artificial fibres, particularly synthetic fibre, fluctuating market prices and lack of CCI participation (Pah, 2014). The Indian cotton sector is also highly concerned about issues including low productivity, pest infestations, foreign competition, climate change, a lack of credit and insurance, a lack of research and development and low profitability.

Steps to improve cotton productivity

Cotton in India has enormous unrealized economic potential. The country's soil and prevailing weather conditions are excellent for growing cotton. To raise cotton productivity in India, the government has implemented numerous initiatives. The National Textile Policy (2000), the Technology Upgradation Fund Scheme (1990-2012), the Draft National Fibre Policy, the Technology Mission on Cotton (TMC) (2000), the Minimum Support Price (MSP), the directives to CCI to purchase cotton if the price falls below the MSP and others are a few of them. The TMC needs to pay close attention to encouraging farmers to produce better cotton by utilising cutting-edge production technology, lowering the cost per unit of production, lowering the use of pesticides and increasing yield per hectare, in addition to the timely implementation of government programmes. Additionally, to help cotton growers, the government should establish a cotton marketing system with fair pricing and offer sufficient

financing facilities. A workable solution for broad-spectrum weed control and improving cotton productivity is the integration of various weed management techniques (Sathishkumar *et al*., 2022). Cotton-greengram farming system is more productive and profitable than cotton monoculture (Sravanthi *et al.,* 2022).

Advantages of cotton balance sheet

The cotton balance sheet provides opportunities for the cotton industry in India in several ways. It helps to identify trends and patterns in cotton production, consumption and trade, which can inform policy decisions and business strategies. It identifies important export markets for Indian cotton, such as those with significant demand or with which the United States has advantageous trade agreements. It recognizes the crucial areas of low productivity, such as regions or farming practices, which can inform investment in research and development to improve productivity. It highlights the areas where promoting sustainable techniques, including integrated pest control, can lower the need for pesticides and increase productivity. It acknowledges the areas that call for innovation, such as seed development, automation and technology, which can guide investments in R and D. It identifies ways to increase cotton farming's profitability, such as by promoting better seed kinds, increasing yields and cutting costs. It points forth ways to grow the cotton textile business, like encouraging investment in spinning, weaving and clothing production facilities. It offers information on the export possibilities, the countries to which Indian cotton can be shipped and the markets with the highest demand.

CONCLUSION

India's cotton balance sheet provides comprehensive information on the cotton industry in India and its dependence on various factors. Despite facing challenges such as low productivity and competition, the cotton industry in India has an average output of 30 million bales and exports to major markets like Bangladesh, Vietnam and China. To increase cotton production and address challenges, the government needs to implement cost-effective techniques like encouraging the growth of Bt cotton and high-yield hybrid varieties, which would benefit farmers, traders and the government alike.

Conflict of interest

All authors declare that they have no conflict of interest.

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