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Research Article

Spill-over effect of India cotton trade on labour and household income

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Abstract
India is one of the world's largest producers and exporters of cotton, the major raw material for the textile industry, employing more than 4.5 crore people in the country. The present study aimed to analyse the impact of adverse trade in Indian cotton sector on labor and household income by employing Social Analysis Matrix based multiplier model and partial equilibrium model. Indian textile sector has strong backward linkages with primary input multiplier and household income multiplier of 4.13 and 3.44, respectively and, thus transmitting external impacts to the labour and household income. The sector has a higher multiplier effect of 10.17 on production activities, of which the impact on the cotton sector is 0.126. Fall in export and domestic demand for clothing and apparel in addition to movement restrictions around the world during the period 2020-2021, disrupted cotton supply chain and consequent fall in demand and price of the commodity. Simulations for the increase in carry-over stock and reduction in domestic consumption and cotton exports revealed that limiting the commodity's production and supply would retain the market equilibrium and increase the domestic price to the advantage of the farmers. The study reveals that dynamics in the Indian cotton sector trade significantly impacted labour and household income. Appropriate planning for areas under cotton cultivation and alternate procurement mechanisms during emergency situations would stabilise the Indian cotton economy.

Keywords: Cotton, Household Income, Partial Equilibrium, Social Accounting Matrix

INTRODUCTION

India is the largest producer and third largest exporter of cotton in the world with a production of 305 lakh bales of 480lb (Indexmundi, 2020a) and an export of 30 lakh bales of 480lb in 2019 (Indexmundi, 2020b). In India, cotton is marketed by three major groups: private traders, state cooperatives and the Cotton Corporation of India (CCI), of which private traders deal with more than 70 % of the commodity (Mohanty *et al*., 2002). Cotton remains the major raw material for the Indian textile industry, which contributes 12.65 % to Gross Domestic Product (GDP) of the manufacturing sector and 2.3 % to India's GDP (Ministry of Textiles, 2020). The country is the world's third largest exporter of textiles and the fifth-largest in the apparel export (WTO, 2019). Textile sector is the second largest employer in the country after agriculture (Textile value chain, 2020).

The sector provides employment to 4.5 crore people directly and to 6 crore people in allied sectors, including many women and rural population (Ministry of Textiles, 2020).

The movement restrictions and the consequent labour shortage during the period 2020-2021, owing to the pandemic situation, disrupted the cotton supply chain considerably. The closure of clothing and apparel stores and reduced demand from consumers due to a reduction in income resulted in a substantial decrease in demand for cotton, affecting the livelihood of cotton farmers and agricultural laborers (WTO, 2021).

Indian apparel industry, which is highly integrated with the global value chain (GVC) has been worst affected by the disruption in imports and exports. The supply chain shocks have forced many companies to halt production and stop sales. As per the report by Apparel Export Promotion Council (AEPC, 2020), uncertainty in global apparel export orders, global apparel consumption, working capital, raw material, pending refunds, labor, cost escalation and the adverse position of India vis-à-vis competitors are the broad areas impacted by the pandemic crisis.

Clothing Manufacturers Association of India predicts an unemployment level of 10-15 % in the textile and clothing industry. It expects 30 % fall in sales and profitability for most of the apparel companies in India (CMAI, 2020). Therefore, the present study aimed to analyse the spill-over effect of increasing carry-over stock empirically, declining domestic consumption and export of cotton from India, and declining textile export on labour and household income.

MATERIALS AND METHODS

Data and Methodology

The social Analysis Matrix (SAM) multiplier and partial equilibrium models were used to evaluate the impact of adverse trade effects in the Indian cotton sector, for which data were collected from 2016 to 2020.

Social Analysis Matrix

SAM for Indian textile sector was constructed based on the Input and Output (I-O) Tables of 2007-08. Multiplier matrix derived from the SAM was employed as an instrument for the analysis. It was assumed that the same forward and backward linkages would be in place for the textile sector with the rest of the economy. Hence, the input and output multipliers estimated using the SAM for India constructed during 2007-08 were utilized to draw inferences for the simulations carried out by reduction in trade under various proportions.

A Social Accounting Matrix (SAM) represents the production process, income distribution and redistribution between sectors, factors of production, institutions and the “Rest of the World” (ROW) in a single matrix format. Based on SAM for India constructed for the year 2007-08 by Pradhan *et al*. (2013), the TEX - SAM - a social accounting matrix, for the Indian textile sector was developed (Table 1). The description of activities included in TEX-SAM is provided in Table 2.

Multiplier matrix model

The SAM multiplier model for the Indian textile sector was developed and solved for changes in the export of textiles (exogenous variable) (Bellu, 2012) as follows:

The endogenous and exogenous accounts were identified for the model from SAM.

Endogenous accounts: Production activities, factors, institutions and capital account

Exogenous accounts (X): Rest of the World (ROW)

Calculated the coefficients matrix (A) of endogenous accounts.

Multiplier matrix model was developed.

Solved the model to determine changes in endogenous accounts corresponding to changes in the exogenous account using the following equation system

$$Y = (I-A)^{-1} X \quad \ldots\ldots (1)$$

where, Y denotes the total expenditure and income in endogenous accounts and ‘X’ represent the exogenous account. A is coefficients matrix or matrix of average propensities to expenditures for endogenous accounts. The term $(I-A)^{-1}$ is the multipliers’ matrix (M) or matrix of aggregate accounting multipliers.

Partial equilibrium model

The partial equilibrium model employed to analyse the adverse trade effects on Indian cotton sector is as follows:

$$S_t = PRD_t + M_t + ST_t \quad \ldots.. (2)$$

$$D_t = C_t + X_t \quad \ldots.. (3)$$

$$C_t = S_t - X_t - STE_t \quad \ldots.. (4)$$

$$PD_t = a_0 + a_1 C_t + a_2 PD_{t-1} \quad \ldots.. (5)$$

$$D_t = S_t \quad \ldots.. (6)$$

Where, S_t, D_t and C_t denote the supply, demand and domestic consumption of cotton, respectively. X_t and M_t represent the export and import of cotton, while ST_t and STE_t represent beginning stock and ending stock, respectively. PRD and PD denote domestic production and the price of cotton. Equation (6) indicates the market equilibrium condition where demand equals supply.

The data on international and domestic price, production, supply, demand, and stock of cotton for the study were sourced from the official websites of Cotton Corporation of India (CCI, 2020), Ministry of Textiles (2020), United States Department of Agriculture (USDA, 2020) and Index Mundi (2020a and 2020b). Minimum Support Price for cotton was obtained from the ‘Price Policy for Kharif Crops’ issued by the Commission for Agricultural Costs and Prices (CACP, 2020).

The model was simulated for the increase in carry-over

stock and reduction in domestic consumption and export of cotton.

RESULTS AND DISCUSSION

As soured from USDA report on cotton (USDA, 2020), the variation in export, import and production of cotton in 2019-20 compared to Triennium Ending (TE) 2018-19 (Fig.1) were minimal. The drastic change was observed in the domestic consumption and ending stock of cotton. In 2019-20, domestic consumption of cotton declined by 17 percent, while the year-end stock increased by 83 % compared to TE 2018-19. The drastic increase in year-ending stock was mainly due to the decline in demand for cotton in textile manufacturing and the disruption of the cotton supply chain due to lockdown and movement restrictions imposed by the Government.

Due to the pandemic, the domestic market for textiles is expected to shrink by around 28-30 %. The value of textile and clothing exports from India was reduced by 87.69 % in April 2020 compared to April 2019. This had adverse impact on the economy by affecting India's workforce. As observed from Table 3, the textile sector is strongly integrated with the service sector, other manufacturing sectors, capital and land, labor and household income on the backward linkage, while on the forward linkage it has strong integration with its own sector, i.e., intra-sectoral linkage. Thus, this linkage chain sharply reflects any impact on the textile sector.

The impact of injection into the textile sector in terms of changes in ROW account, i.e., change in export (Table 4), on the overall production accounts as measured by total output multiplier was 10.17, while the impact on factors of production (primary input multiplier) and household (household income multiplier) were 4.13 and 3.44 respectively. The total output multiplier has the highest backward linkage as the production activities are connected by the dual impulse of final demand and intermediate demand (Khondker, 2018). Among the other production accounts, cotton, allied agricultural activities and other crops, which are the source of raw materials such as cotton, jute, wool and silk to the textile industry, have higher primary input multiplier of 4.71, 4.70 and 4.64 and household income multiplier of 3.94, 3.90 and 3.87, respectively. Thus, apart from directly affecting labor and household income, injection into the textile sector indirectly impacts factors and household income by affecting other related production activities.

Simulations based on the multiplier matrix for an expected 15-25 % reduction in the export of textiles from India revealed that the income of the domestic labor force and rural and urban households could further decline by one to two % (Table 5) in the near future. The impact is estimated to be higher on the demand for cotton, which could decline by 5-8 % as it is the major source of raw material for textile and clothing manufacturing. The impact of a 15-20 % decline in textile export would reduce the own sectoral demand by 4-7 % due to a reduction in intermediate demand within the sector.

Simulation was also done on carry-over stock and domestic cotton consumption, which showed huge varia-

Table 1. Social Accounting Matrix (SAM) – A Schematic structure

	Production activities	**Factors**	**Institutions**	**Capital account**	**Rest of the World**	**Row Total**
Production activities	Domestic production/ intermediate consumption		Consumption/ Subsidies	Gross fixed capital formation	Exports	Aggregate demand
Factors	Value-added				Net factor income from abroad	Factor income
Institutions	Household income/ Taxes on intermediary goods	Wages and salaries to household	Intra-house transfers/ Taxes/Social security/ Profit distribution		Net current & capital transfer from abroad, taxes on exports	Institutions' total income
Capital account		Depreciation	Institutions' savings	Foreign savings	Gross savings of the economy	
Rest of the World	Imports	Renumeration of ext. Labor	Transfers to ROW			Foreign exchange payments
Column Total	Total cost of production	Total factor endowments	Institutions total expenditure	Aggregate investment	Foreign exchange payments	

Source: A Social Analysis Matrix for India 2007-08 (Pradhan *et al.*, 2013)

Table 2. Description of Activities included in SAM for Indian Textile Economy (TEX -SAM)

Major Activities	Set	Elements
Production activities	Cotton	
	Other crops	Paddy, wheat, jowar, bajara, maize, gram and pulses, sugarcane, groundnut, coconut, other oil seeds, jute, tea, coffee, rubber, tobacco, fruits, vegetables, other crops
	Allied agricultural activities	Animal husbandry and livestock, forestry and logging, fishing
	Textiles	Textile and textile products
	Other manufacturing activities	
	Services	
Factors	Labor	
	Capital & Land	
Institutions	Rural household	
	Urban household	
	Private corporations & public enterprises	
	Government	
	Indirect tax	
Capital account		
Rest of the World (RoW)		

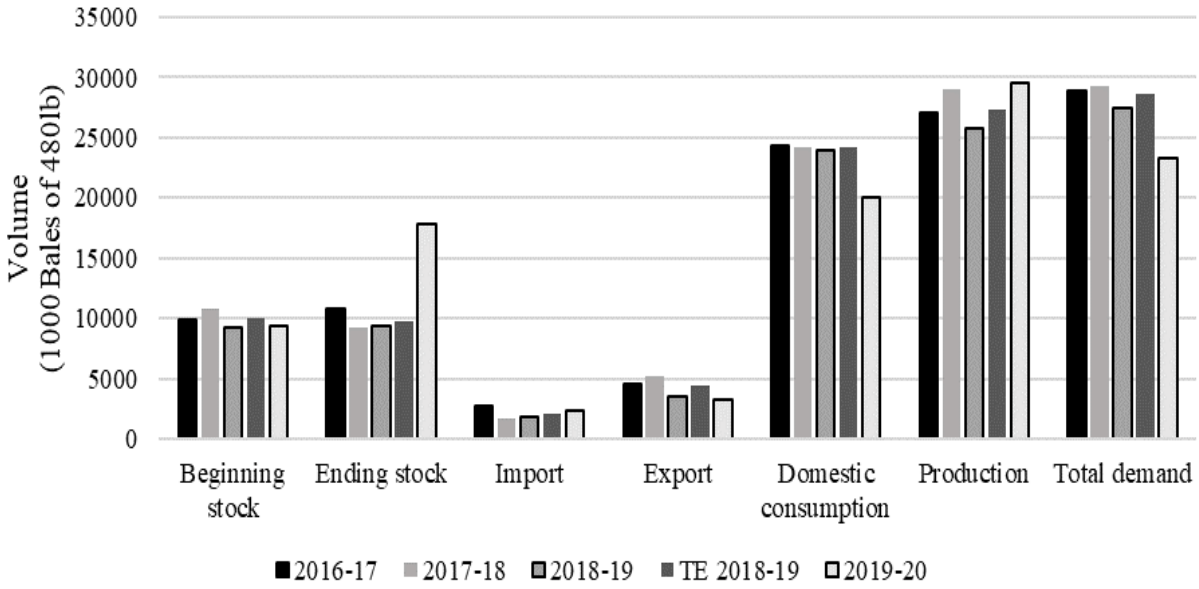

Fig. 1. *Supply and demand of cotton in India*

tions in the years 2019-20. By comparing the year 2019 -20 with 2018-19, a simulation was done for various combinations of carry-over stock and domestic consumption, in addition to a 25 % reduction in exports.

From the results of the simulation given in Table 6, it could be observed that when beginning stock increases by 92 % and domestic consumption declines by 17 %, in order to keep the system in equilibrium, the production and supply of cotton are expected to be reduced by 41 and 8 %, respectively. While the simulation for a 92 % increase in carry-over stock and 17 percent decline in domestic consumption, together with an anticipated 25 % reduction in export showed that, to maintain the market equilibrium, the production and supply of cotton

Table 3. Backward and forward linkages of Indian Textile Sector

	Cotton	Other crops	Allied agricultural activities	Textiles	Other manufacturing activities	Services	Labour	Capital & Land	Rural household	Urban household
Cotton	1.029	0.019	0.020	0.126	0.012	0.018	0.021	0.019	0.022	0.020
Other crops	1.273	2.706	1.471	1.138	0.889	1.160	1.332	1.231	1.315	1.346
Allied agricultural activities	0.493	0.392	1.344	0.321	0.232	0.317	0.353	0.332	0.379	0.333
Textiles	0.248	0.247	0.258	1.491	0.158	0.230	0.268	0.250	0.283	0.255
Other manufacturing activities	3.356	3.290	3.287	3.207	3.630	3.237	3.337	3.361	3.341	3.334
Services	3.953	3.908	3.987	3.889	2.672	4.740	4.072	3.988	4.034	4.103
Labour	2.241	2.207	2.177	1.910	1.274	2.003	2.867	1.805	1.860	1.872
Capital & Land	2.472	2.429	2.518	2.224	1.607	2.260	2.172	3.130	2.159	2.183
Rural household	1.849	1.819	1.837	1.618	1.123	1.674	2.031	1.877	2.578	1.596
Urban household	2.090	2.054	2.068	1.824	1.262	1.893	2.359	2.053	1.787	2.813

Source: TEX-SAM multiplier analysis,2020 (author's own calculation)

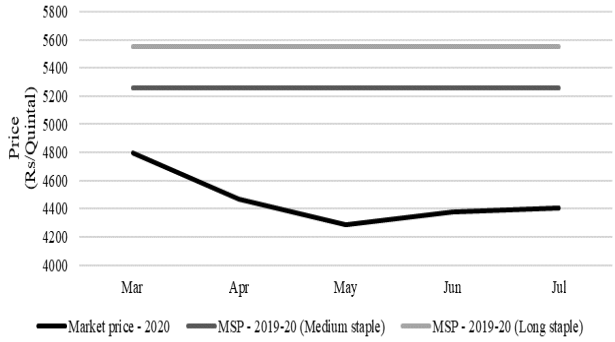

Fig. 2. *Market price and MSP for Cotton*

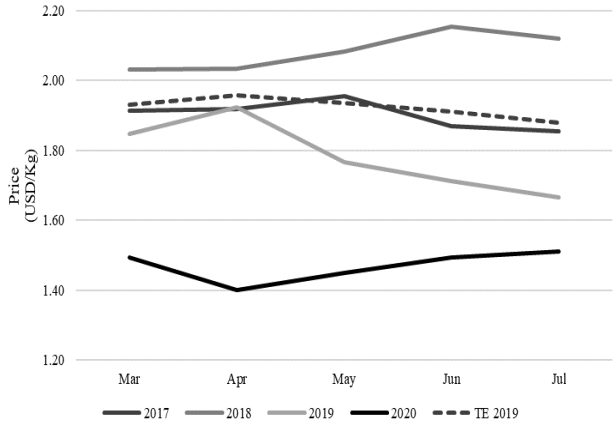

Fig. 3. *International price of cotton*

are expected to be reduced by 43 % and 10 %, respectively. As the domestic consumption of cotton is expected to decline further in the forthcoming year due to declining demand in the country's textile sector, a simulation for 25 % reduction in domestic consumption has also been carried out. An increase in carry-over stock by 92 % and a reduction in domestic consumption by 25 % indicated that the production and supply of cotton need to be reduced by 46 and 12 %, respectively, to retain the market equilibrium. While in addition to 25 % decline in exports, the production and supply of cotton are estimated to be reduced by 49 % and 14 %, respectively.

During the lockdown period from March 2020 to July 2020, the average price of cotton in the country's major markets remained well below the Minimum Support Price (MSP) announced by the Government of India for the year 2019-20 (Fig. 2). As seen from Table 7, on average, the domestic market price prevailed from March 2020 to July 2020 was 15 % less than the MSP announced for cotton. With piling of cotton stock due to low demand, any increase in production could reduce the domestic price further, leaving the farmers in distress. But, as seen from Table 6, with reduced production and supply, the domestic price of cotton increases by 11 - 16 %, which could help farmers get an appropriate price for their produce.

Table 4. Impact analysis of Injection into India Production Activities

Multipliers	Cotton	Other crops	Allied agricultural Activities	Textiles	Other manufacturing activities	Services
Total output multiplier	10.35	10.56	10.37	10.17	7.59	9.70
Primary input multiplier	4.71	4.64	4.70	4.13	2.88	4.26
Household income multiplier	3.94	3.87	3.90	3.44	2.39	3.57
Institution multiplier (excluding household)	1.63	1.56	1.65	1.53	1.16	1.61
Capital account multiplier	1.68	1.65	1.68	1.49	1.05	1.53
Total backward linkage	22.32	22.28	22.30	20.77	15.07	20.67

Source: TEX-SAM multiplier analysis, 2020 (author's own calculation)

Table 5. Impact of reduction in India Textile Export

	%age reduction		
	15%	20%	25%
Cotton	-4.59	-6.12	-7.65
Other crops	-0.81	-1.08	-1.35
Allied agricultural activities	-0.84	-1.12	-1.39
Textiles	-4.33	-5.78	-7.22
Other manufacturing activities	-0.79	-1.05	-1.31
Services	-0.84	-1.12	-1.40
Labor	-0.91	-1.21	-1.52
Capital & Land	-0.92	-1.22	-1.53
Rural household	-0.86	-1.14	-1.43
Urban household	-0.85	-1.14	-1.42

Source: Computed from TEX-SAM multiplier analysis,2020

As per the CACP (2020), the Government of India hiked the MSP for the year 2020-21 by Rs.260 per quintal and Rs.275 per quintal for medium and long staple varieties, respectively, to support the cotton farmers. But, owing to lower demand for clothing and apparel both in domestic and international markets, the spinning mills were affected due to higher MSP. As seen in Fig. 3, the international price of cotton during the period from March 2020 to July 2020 dropped by an average of 24 % compared to TE 2019 due to a fall in demand globally and the expectation of higher carry-over stocks from the cotton is likely to reduce the international price further. This could negatively affect the competitiveness of Indian cotton and textiles in the international market when the domestic price increases due to higher MSP. To reduce the accumulation of stock and help farmers to sell their produce at a profitable rate, Government needs to activate institutional procurement by the Cotton Corporation of India and combine it with PDPS (Price Deficiency Payment Scheme). The area under cotton cultivation also needs to be planned based on global market trends to avoid distress sales by farmers.

Conclusion

The present study concluded that in the long-term, 100 % FDI in the textile sector is expected to attract more foreign investments into the Indian cotton sector. The textile industry, being consumer-driven, depends on the overall growth of the economy. In spite of the logjam in the sector, India is expected to reach USD 70 billion in exports by 2024 and achieve a higher share of the global market. Provided there is no crop failure, the area under cotton needs to be pre-planned and alternative crops can be preferred; in addition, the Govern-

Table 6. Impact of fall in demand on supply and price of cotton in India

Simulations	Components	Production (1000 Bales of 480 lb)	Supply (1000 Bales of 480 lb)	Domestic Price (Rs/Bale)
	Base	**29500**	**41114**	**10674**
92 % increase in carry over stock and 17 % reduction in domestic consumption	Value	17531	37714	11864
	Growth rate	-41	-8	11
92 % increase in carry over stock, 17 % reduction in domestic consumption and 25 % reduction in export	Value	16718	36902	11864
	Growth rate	-43	-10	11
92 % increase in carry over stock and 25 % reduction in domestic consumption	Value	15931	36114	12424
	Growth rate	-46	-12	16
92 % increase in carry over stock, 25 % reduction in domestic consumption and 25 % reduction in export	Value	15119	35302	12424
	Growth rate	-49	-14	16

Note: Base values correspond to the year 2019-20

Table 7. Price of cotton in major markets of India and Minimum Support Price for the period from March 2020 to July 2020

Particulars	Mar	Apr	May	Jun	Jul
Gondal, Gujarat	4334	3845	3500	3706	4069
Khammam, Telangana	4578	4456	4333	4400	4400
Akola, Maharashtra	5350	5350	5350	5350	5355
Raichur, Karnataka	4525	4329	3962	4570	4492
Konganapuram, Tamil Nadu	5200	4371	4300	3875	3700
MSP for medium staple variety	5255				
MSP for long staple variety	5550				

ment should actively set off the institutional procurement by Cotton Corporation of India and combine it with PDPS to safeguard the interests of cotton farmers.

Conflict of interest

The authors declare that they have no conflict of interest.

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