An Economic Analysis of Processing of Rainfed Cotton in Virudhunagar district of Tamil Nadu

Abstract

The cotton processing industry holds a significant position in the Indian economy as the second-largest labor-intensive activity after agriculture, providing direct and indirect employment to the Indian population. Given the commercial importance of cotton at the national and State levels, there is a recognized need to thoroughly examine the cotton value chain, which includes producers and various stakeholders. Hence this study was proposed and conducted in 2022 covering 90 rainfed cotton growers, seven ginners, six spinners and twenty-seven weaversin Virudhunagar district.The findings of the study revealed that the cotton producers receive a share of (Rs.7006.1 per quintal) 48.37 percent of the consumer rupee per quintal. The cost and returns analysis showed that, the stakeholders at different level i.e ginners, spinners and weavers incurred Rs.7591.11, Rs.18089.64 and Rs.31251.22to process per quintal of product i.e kapas, lint, yarn and fabrics production and received as returns of Rs.10587,Rs. 27354.16 and Rs.48934.00 by them. The weavers had the highest financial profitability (1.52) in cotton value chain, followed by spinners (1.47), ginners (1.35) and farmers (1.11).

Key words: Rainfed cotton, Cost, return, ginning, spinning, weaving, oil mill, profitability

1.Introduction

Cotton is a traditional and important cash crop. Cotton was cultivated about 7,000 years ago, by the inhabitants of the Indus Valley Civilization, which covered parts of Eastern Pakistan and North- western India. Clothes play an important role in Civilized society. From earliest times clothes are the basic necessity of a man after food(Suniti Pandey,2005). Cotton accounts for more than 70 per cent of the raw fibre use by the world textile industry and handlooms. Hence, it is called as “king of fibre”.Cotton has enormous potential sustaining rural and urban employment generation, economic and trade activity both within and outside the country.In India, cotton provides a direct livelihood to 6 million farmers, and approximately 40 to 50 million people are employed in the cotton trade and its processing. It has a direct linkage with the Industrial sector like textile, oil mill and the livestock sector. India is the world's second-largest cotton producer, accounting for around 18 per cent of global cotton production.In India, during the year of 2022-23 Industrial demand of raw cotton was 341.00 lakh bales and supply of raw cotton was 392.95 lakh bales. Therefore, India has exported 0.51 million metric tons of raw cotton to various parts of the world, with China, Bangladesh, and Vietnam being the major importers from India. Maharashtra, Gujarat, Telangana, Andhra Pradesh, Rajasthan, and Tamil Nadu are the major cotton growing States in India of which Tamil Nadu occupies 10th position by sharing around 0.86 per cent of area i.e 1.12 lakh hectare under cotton and produces 2.43 lakh metric tonnes of cotton with an average productivity of 374 kg/ha. Tamil Nadu textiles and clothing industry predominantly cotton-based, accounts for one-third of the textile business size, 45 per cent of the spinning capacity, 70 per cent of the knitted garment capacity, 40 per cent of the home textiles manufacturing capacity, 22 per cent of the powerloom capacity, 12 per cent of handloom capacity of India. It is the only State having presence across the whole textile value chain.The actual annual cotton requirement of the textile industry in Tamil Nadu is around 120 lakh bales (170 kgs per bale) while the State hardly produces 4 to 6 lakh bales from 1.12 lakh ha of area under cotton, of which 76 per cent of the cotton area under rainfed situation.The major rainfed cotton-cultivating districts in Tamil Nadu are Virudhunagar,Thiruchirapalli,Perambalur, and Madurai.Among these districts, Virudhunagar stands out as one of the leading districts in

terms of both area and production. It accounts for 19.40 per cent of the State's total area and ranked first in production with 334 metric tons in 2021 Virudhunagar district has 5.60, 1.67and22.17 per cent of ginning, spinning, weaving units of Tamil Nadu and two oil mills which showed the infrastructure facilities for cotton value chain in this district. Recently,Tamil Nadu Government announced to start Textile park at Virudhunagar district since, it is called as the textile hub of Tamil Nadu. Hence, the present study was undertaken with the specific objective of estimating the cost and returns of cotton processing at different level in cotton value chain.

2.Materials and Methods

Two stage purposive and random sampling methods were used in the selection of the study district, block, and sample respondents for the present study using area under rainfed cotton as one of the major criteria. At first, the district was selected purposefully since it possesses 19.40 per cent of area under rainfed cotton three blocksnamely Aruppukottai,Virudhunagar and Srivilliputhur,were selectedpurposefullysince it possesses22.43 per cent, 13.65 per cent and13.29 per cent of area under rainfed cotton respectively. From each block, two villages were selectedrandomly. From each village, 15 farmers were randomly chosen as sample respondents, in total the sample size was 90 farmers.In production of cotton cloth material as final product, cotton surpasses ginning, spinning and weaving processes. These three stages were specifically considered for the present study. Cotton seed oil is another product received from cotton.Lint and seed are the major products received from cotton kapas. From 33 kg of lint, 27.51 kg of cloth s being produced, with the total loss of 5.49 kg of lint when it moves from ginning (0.54 % of waste), spinning(4.95 % of waste).,Hence, to study the efficiencies in its value chain, a sample of five ginning units, six spinning units and 27 weaving unitswere selected for the study.The farmers were individually contacted to collect production details for rainfed cotton, utilizing a well-structured and pre-tested interview schedule. Data related to cropping patterns, cost of cultivation, net return, gross return, input cost, buying price, selling price, and other relevant factors were collected from the farmers and other stakeholders in cotton value chain. Additionally, information on the cost of raw materials, processing, returns, and value addition by the processors were gathered to estimate the economics of the production, marketing and processing activities of rainfed cotton.

Thepercentageand cost and returns analysiswere employed to assess the efficiencies stakeholders of different cotton production, marketing and processing. The analysis encompassed the costs of production,marketing processing, and the returns generated at each stage, in its value chain.In this study, value addition and net value addition in cotton was estimated as discussed below.

Value addition is the difference between the value of end product and the value of the raw material.Value addition= Value of end product- Value of raw material and Net Value additionis the difference between the value of end product and the value of the raw material plus cost of processing.Net Value addition=[Value of end product-(Value of the raw material+ Cost of processing)]

3. Results and Discussion

3.1General characteristics of sample farmers

Table1: General characteristics of sample farmers

S.No	Particulars	Mean Value
1	Age (Years)	52
2	Education status (in schooling years)	8
3	Farming experience (Years)	13

Comment [BW1]: How is it possible that 52 year old farmers with 8 years of schooling have only 13 years of farming? Is it whole farming experience or only experience as farm owner/manager?

4	Size of land holdings (in ha)	3.38
5	Area under Cotton(in ha)	1.13
6	Area under Cotton Variety (in ha)	
	RCH 659	0.72
	SVPR 2	0.19
	Bunny	0.01
	Others	0.21

From Table1, it can be seen that among the general characteristics of the sample farm households, the average age was52 years in the study area with average schooling of eight years which implied that the sample respondents had lower level of education and had less awareness in the adoption of recommended technologies in a suitable manner in cotton cultivation. The average farming experience of the sample respondents was 13 years. The average size of land holdings of the sample respondents was 3.38 ha with average area under cotton 1.13 ha. Hence it showed that small farmers were predominant in study area. Among all the cotton varieties,the major average area was under RCH 659 varietywith0.72 hafollowed by others.

Table 2 General Details of different stakeholders in cotton value chain

Particulars	No. of mills		Average capacity(quintal/year)
	Tamil Nadu	Virudhunagar	
Ginning mills	125	7 (5.60)	89809.2
Spinning mills	2032	34 (1.67)	10628.6
Weaving mills	893	198 (22.17)	694.4

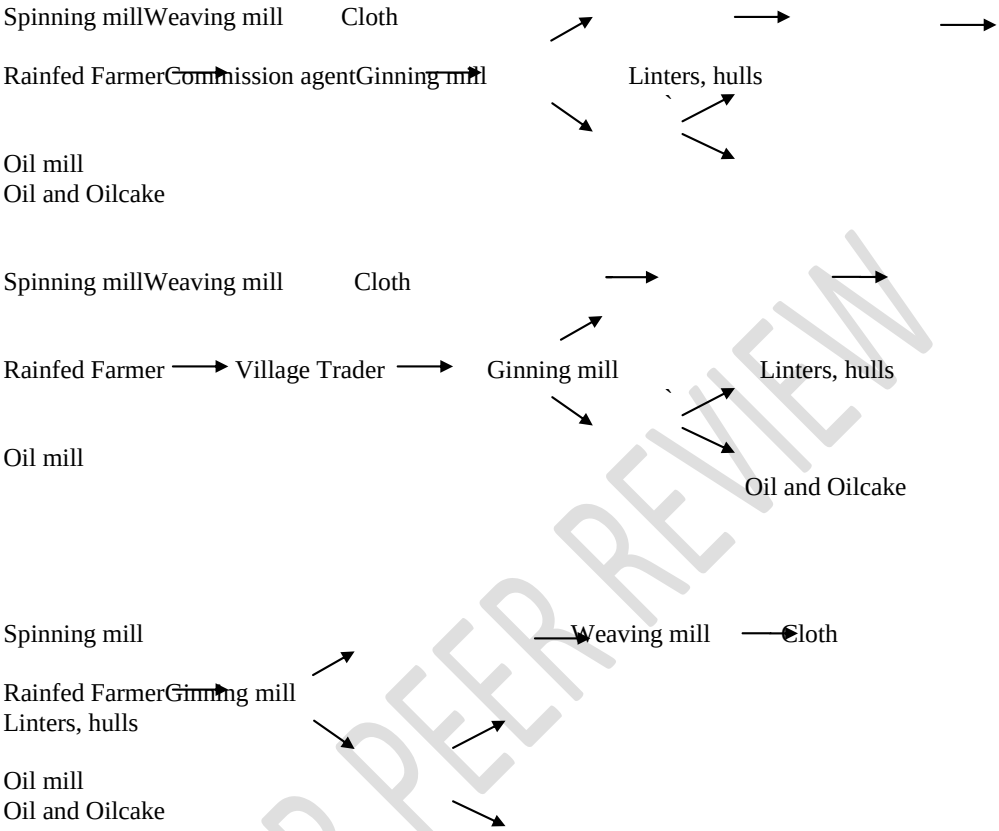
(Figures in parantheses indicate percentage to total)

Table 2shows thegeneral details of different stakeholders in cotton value chain considered for the study. The number of weaving mills in Virudhunagar (198) constitutes about 22.17% of the total weaving mills in Tamil Nadu (893) depicting the prominence of the industry in Virudhunagar.

3.2. Identify and outline the cotton value chain

Thecotton value chain in the study area consists of different stakeholders, including farmers, ginning mills, spinning mills and weaving mills (Fig.1). At the beginning of the chain, farmers serve as cotton seed producers. As first level of processing cotton kapas is removed from its stalk, grading which is the preliminary stage in value addition also the varieties preferred by farmers with an aim to earn higher profit.They sell their harvested output, known as "kapas," to ginners throughcommission agents to some extent by their own. Cotton seeds, which are separated from cotton lint during the ginning process, undergo further processing in mills. These mills reduce the seeds into four products: cottonseed oil, linters, hulls and oil cake.

Figure 1: Flow diagram of rainfed cotton chain



The lint is then transported to textile mills which undergoes spinning to produce yarn and subsequently woven into various types of fabric and the by-product, the seed, is directed to oil mills. Spinning is the next stage after ginning in the cotton processing chain which play a crucial role in the textile industry by creating yarn that is used for various textile applications, including weaving, knitting, and other processes.Weaving mill processing is a crucial aspect of the textile industry which serves ~~as~~ a significant role by converting yarn into a diverse range of woven fabrics.

3.3. Cost and Returns of cotton processing at different level in cotton value chain

Table 3: Cost and returns at farm level for production and marketing of cotton

S.No	Particulars	Rs/ha	Rs/qtl
I.	**Production Cost**		
1.	Fixed cost	15000.05 (12.42)	833.33 (12.42)
2.	Variable cost	97320.93 (80.59)	5406.71 (80.59)

	Subtotal I	112321.0 (93.01)	6240.04 (93.01)
II.	**Marketing Cost**		
1.	Post harvest activities (separation from its stalk, drying, grading and storage)	1802.16 (1.49)	100.12 (1.49)
2.	Packing charges	543.78 (0.45)	30.21 (0.45)
3.	Loadingand unloading charges	453.78 (0.37)	25.21 (0.37)
4.	Transportation cost	1443.60 (1.19)	80.20 (1.19)
5.	Weighing charges	171.90 (0.14)	9.55 (0.14)
6.	Commission charges	4019.40 (3.28)	223.3 (3.28)
	Subtotal II	8434.62 (6.98)	468.59 (6.98)
	Total Cost (I+II)	120755.60 (100.00)	6708.63 (100.00)
III	**Returns**		
1	**Gross Returns**	134038.80	7446.6
	Yield(qtl /ha)	18	1
	Price (Rs/ha)	7446.6	7446.6
2.	Total Costs	120755.6	6708.63
3.	Net returns	13283.2	737.97
4.	B-C Ratio	1.11	1.11

The cost of cultivation of cotton computed from the data collected from sample farmers of Virudhunagar district revealed that the average total cost per hectare of rainfed cotton was Rs 120755.60of which variable cost constituted80.59 per cent, followed by fixed cost around 12.42per cent and total marketing cost around 6.99 per cent.The total cost of production to produce one quintal of cotton was Rs.6708.63comprising variable cost of Rs.5406.71and a fixed cost of Rs.833.33 per quintal. The sample farmers in Virudhunagar district has incurred Rs.8434.62 as the marketing cost of rainfed cotton of which commission charges(Rs.4019.40) was the major component which was accounting for3.28 per cent followed by Post harvest activities cost(Rs.1802.16), transportation cost(Rs.1443.60), packing charges(Rs.543.78), loading and unloading charges(Rs.453.78) and weighing charges(Rs.171.90) accounting for1.49,1.19, 0.45, 0.37 and 0.14 per centof the total marketing cost, respectively. The marketing cost per quintal of rainfed cotton in Virudhunagar district was estimated as Rs.468.59 of which commission charges and Post harvest operation costs (Rs.100.12), transportation cost (Rs. 80.20), packing charges (Rs. 30.21), loading and unloading charges (Rs. 25.21), and weighing charges (Rs. 9.55) accounting for 1.49,1.19, 0.45, 0.37and 0.14per cent, respectively. The gross returnper hectare of rainfed cotton cultivation was Rs.134038.80with Rs.7446.60 as perquintal return**.** The net return obtained per hectare and per quintal of cotton over cost were Rs.13283.2 per hectare and Rs.737.95 per quintal, respectively with B:C ratio 1.11.(Table 3).

3.3.1. Cost and returns of Ginning process

GinningProcessisneededtoseparatethelintandseed.At Firststage, the cotton is gettingpreparedforitsvaluechain.The first step in the ginning process is where the cotton is vacuumed into tubes that carry it to a dryer, grading and checking the quality of the cotton (classing) are the activities carried out to in the ginning unit. CostofprocessingofkapastolintforGinningprocess(to separate cotton kapas into lint and seed Perquintal)is presented in (Table 4).

Table 4: Cost and returns of per unit processing of kapas in Ginning unit (Per quintal)

S.No	Particulars	Rs/qtl
I.	**Raw material Cost**	7446.6 (93.00)
II.	**Processing Cost**	
1	Fixed cost	39.75 (0.49)
2	Variable cost	104.76 (1.30)
3	Activities (vacuuming, Drying, grading, classing)	150.00 (1.87)
	Subtotal II	294.51 (3.67)
III	**Marketing Cost**	
1.	Commission charge	240.00 (2.99)
2.	Sales tax	25.50 (0.31)
	Subtotal III	265.50 (3.31)
	Total Cost (I+II+III)	8006.61 (100)
IV	**Returns**	
1	Returns from main product(lint)	9050
2	Returns from by-product(seed)	1807
3	Gross returns	10857
4	Value addition	3140.4
5	Net Value addition	2845.89
6	Benefit Cost Ratio	**1.35**

In the Ginning unit, single roller technology was used. It produced only 25 to 35 kg of lint per hour, and the wastage was high.Raw material cost (93.00%) constitute the major one. Fixed cost includes(Depreciation on buildings, machines and equipments, salary to permanent staff and license fee) and Variable cost includes(electricity charges, repair and maintenance, office maintenance, wages to casual labour, telephone charges and packing material)**.** The total cost incurred in the process of vacuuming, drying, grading, classing was Rs.150.00. On an average, the total cost incurred in processing kapas into lint amounted to Rs.8006.61per quintal of kapas.Commission charges (2.99%) constitute the major one followed by sales tax in marketing cost.The gross returns obtained from processing (ginning) one quintal of kapas was Rs.10587 primarily derived from lint (Rs.8780) and seed(Rs. 1,807). The net value added as a result of processing kapas into lint was Rs.2955.8 per quintal of kapas processed. The resulting benefit-cost ratio was 1.35.

3.3.2. Cost and returns of Spinning process

The spinning process is needed to convert the fibre into yarn.Opening, blending, cleaning and storing are primary activities being carried out to get prepared for processing of cotton.

Table 5: Cost and returns of per unit processing of lint in Spinning unit (Per quintal)

S.No	Particulars	Rs/qtl
I.	**Raw material Cost**	15533.33 (83.83)
II.	**Processing Cost**	
1	Fixed cost	1165.45 (6.28)
2	Variable cost	1390.86 (7.50)
3	Activities (opening, blending, cleaning and storing)	170.00 (0.19)
	Subtotal II	2726.31 (14.71)
III	**Marketing Cost**	
1	Loading and unloading charges	55.90 (0.05)
2	Transportation cost	178.02 (0.96)
3.	Weighing charges	10.44 (0.05)
4	Sales tax	24.96 (0.13)
	Subtotal III	269.32 (1.45)
	Total Cost (I+II+III)	18528.96 (100)
IV	**Returns**	
1	Returns from main product(yarn)	26987.50
2	Returns from wastage	366.66
3	Gross returns	27354.16
4	Value addition	11820.83
5	Net Value addition	9265.53
6	Benefit Cost Ratio	1.47

In the spinning unit, Ring spinning technology is being used by all the spinners in study area. It produced only 100 meters of yarn per second, and the wastage was high. Raw material cost (83.33%) constitute the major one.Fixed cost includes(Depreciation on buildings, machines and equipments, salary to permanent staff and license fee) and Variable cost includes(electricity charges, repair and maintenance, office maintenance, wages to casual labour, telephone charges and packing material)**.** The total cost incurred in the process of opening, blending, cleaning and storing was Rs.170.00. The average total cost incurred in the processing of lint to yarn was Rs. 18528.96 per quintal. Transportation cost (0.96%) constitute the major one followed by loading and unloading charges, sales tax and weighing charges respectively in marketing cost. The gross returns obtained from processing (ginning) one quintal of kapas was Rs.10587 primarily derived

from lint (Rs.8780) and seed(Rs. 1,807). The net value added as a result of processing kapas into lint was Rs.2955.8 per quintal of kapas processed. The resulting benefit-cost ratio was 1.35. The gross returns obtained from processing (spinning) one quintal of lint was Rs. 27354.16, which comprised mainly the returns from yarn (Rs. 26987.5) and wastage (Rs. 366.66).The value added in the process was Rs.11820.83. The net value added as a result of the processing of lint into yarn was Rs. 9265.53 per quintal of lint processed. The resultant benefit-cost ratio was 1.47.

3.3.3Cost and returns of weaving process

Weaving is needed to convert the yarn into fabrics. Grading, storing and pre testing are the activities done before the processing of yarn.

Table 6: Cost and returns of processing of yarn in weaving unit
(Per quintal)

S.No	Particulars	Rs/qtl
I.	**Raw material Cost**	27142.86 (84.47)
II.	**Processing Cost**	
1	Fixed cost	2801.74 (8.76)
2	Variable cost	1306.62 (4.08)
3	Activities (grading, storing and pre - testing)	250.00 (0.78)
	Subtotal II	4358.36 (13.76)
III	**Marketing Cost**	
1	Loading and unloading charges	61.80 (0.19)
2	Transportation cost	274.50 (0.85)
3	Sales tax	137.50 (0.43)
	Subtotal III	473.80 (1.48)
	Total Cost (I+II+III)	31975.02 (100)
IV	**Returns**	
1	Returns from main product (fabric)	48774
2	Returns from wastage	160
3	Gross returns	48934
4	Value addition	21791.14
5	Net Value addition	17635.45
6	Benefit Cost Ratio	1.52

In the weaving unit, powerloom technology was used, producing 30 meters per second at 150 rpm. It consumed 33 kilowatts of electricity.Raw material cost (84.47%) constitute the major one. Fixed cost includes(Depreciation on buildings, machines and equipments, salary to permanent staff and license fee) and Variable cost includes(electricity charges, repair and maintenance, office maintenance, wages to casual labour, telephone charges and packing material)**.**The total cost incurred in the process of grading, storing and pre – testing activities was Rs.250.00.The average total cost incurred in the processing of yarn into fabric was Rs.31975.02

per quintal.Transportation cost (0.85%) constitute the major one followed by sales tax and loading and unloading charges respectively in marketing cost. The gross returns obtained from processing (weaving) one quintal of yarn was Rs.,48934 primarily consisting of returns from fabric (Rs. 48774) and wastage (Rs. 160). The value addition in the process amounted to Rs.21791.14. The net value added as a result of processing yarn into fabric was Rs.17635.45 per quintal of yarn processed. The resulting benefit-cost ratio was 1.52.

3.4 Financial profitability of agents

The analysis of the cotton value chain indicates that rainfed cotton production and processing, under the current price and cost settings, are profitable and the details are presented in Table 7.

Table 7: Profitability of the agents in cotton value chain

(Per quintal)

S.No	Members in cotton value chain	BC ratio	Profitability rank
1	Farmer	1.11	4
2	Ginners	1.35	3
3	Spinners	1.47	2
4	Weavers	1.52	1

Among all the members in the chain, weavers possess the highest benefit-cost ratio of 1.52, securing the first profitability rank since it moves in value chain the processors in higher order processing they are earning higher profit as the fabric form of product is converted into high value (cloth) commodity. The second profitability rank was occupied by spinners with a benefit-cost ratio of 1.47 followed by ginners and farmers with benefit-cost ratio of 1.35 and 1.11 respectively.

4. Conclusion

The findings of the study revealed that the average total cost of cultivation and net returns of rainfed cotton in Virudhunagar district around Rs.120755.60 and Rs.13283.20per ha, respectively. The average total cost incurred in the processing of kapas to lint, lint to yarn, yarn to fabricsworked out to Rs.7591.11per quintal of kapas, Rs.18089.64 per quintal of lint and Rs.31251.22per quintal of yarn. The weavers had the highest financial profitability (1.52), followed by spinners (1.47), ginners (1.35), and farmers (1.11).

5. Policy implications

From the results derived from the study and by comparing with the reviewed studies, it is opined that cotton farmers who are the starting point in value chain can reap more profit by growing cotton for which irrigation facilities can be provided to take up extra long staple cotton hybrids preferred by the cotton mills for getting increased yield and higher prices than at the present thus maintaining the sustainability of the cotton system in Virudhunagar district. The next stakeholder in the value chain, i.e., the ginning sector, it is recommended to upgrade saw ginning technology that efficiently separate 4400kg lint per hour from seeds, reducing wastage and enhancing lint quality. For spinning, friction spinning technologyis recommended for higherquality output and reduced energy consumption. In weaving sector, air jet loom technologycan be introduced to produce 225000 meter cloth per day higher than the present capacity. In essence, technology in these industries encompasses the use of innovative tools and processes to optimize production, improve quality, and enhance overall efficiency.

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