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Strengthening the Cotton Value Chain in North India

EXPERT's Column

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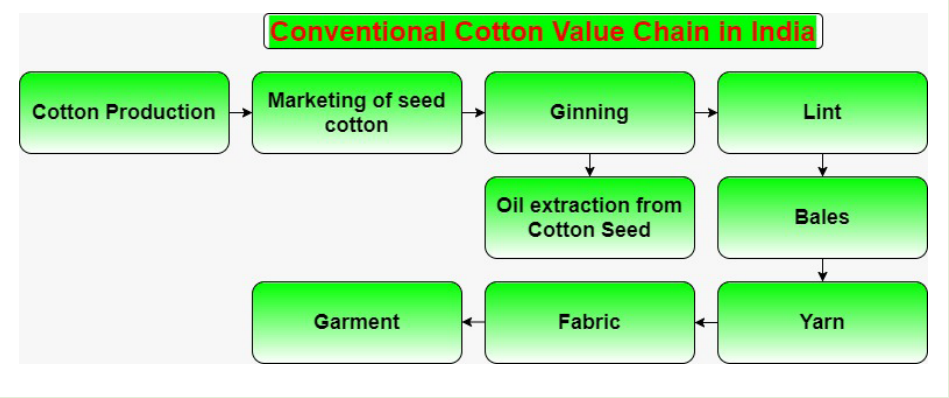
Cotton, being a commercial crop of great economic importance, has a value chain since time immemorial. The cotton value chain consists of cotton producers, traders, ginners, spinners, weavers, knitters, fabric processors, garment and apparel manufacturers and consumers. In an effective cotton value chain, all the stake holders right from cotton producers to consumers are benefitted in terms of high productivity and quality of raw material and finished goods at every stage in the chain. In the conventional cotton value chain, seed cotton is converted into lint, spun into yarn, woven into fabric and finally converted into garments and made-ups for end users and export.

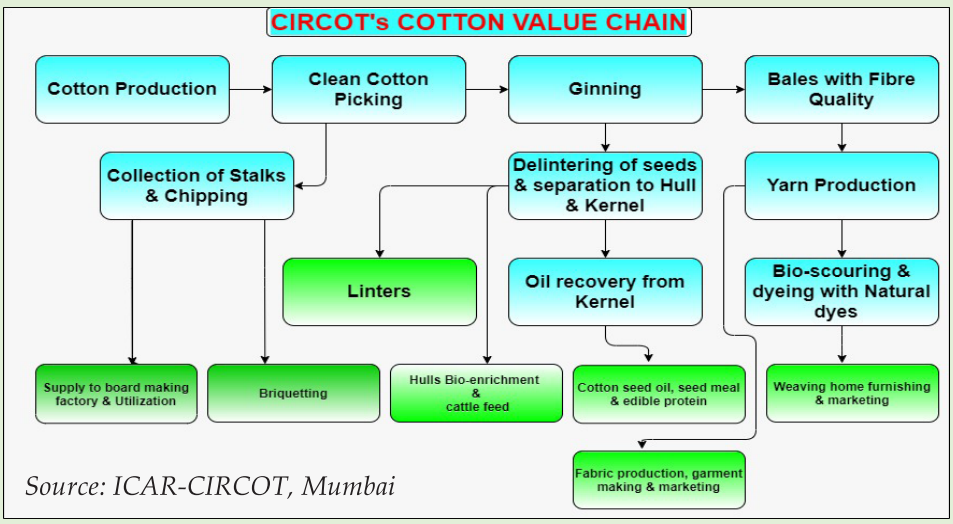
However, a conventional value chain lacks scientific utilisation of cotton and its by-products such as seed and cotton stalks and has many weak and missing links. Ginning, i.e. conversion



of seed cotton into lint, is one of the weakest links characterised by excessive energy consumption, low productivity, unclean surroundings and non-availability of quality assessment facilities for lint. Though, the spinning industry in India is considered one of the most modern sectors comparable to the progressive countries, there are many issues in weaving and knitting sectors which needs immediate attention.

ICAR-CIRCOT under a World Bank funded National Agricultural Innovation Project entitled "A Value Chain for Cotton Fibre, Seed and Stalk: An innovation for higher economic returns to farmers and allied stake holders" documented a study for technological interventions at various stages from production to consumption to address the identified weak and missing links. Impact of technological interventions made at various stages has shown realisation of multiple benefits for all stake holders. The use of scientific processing technology can strengthen the value chain in a significant way and produce valuable by-products from cottonseed and stalk.

A flow chart of CIRCOT's Cotton Value Chain is given below.



Source: ICAR-CIRCOT, Mumbai

A few initiatives with respect to strengthening components of cotton value chain in North India are discussed below.

Cotton Productivity Enhancement

India remains the leading country in terms of area under cotton cultivation and raw cotton production in the world. Cotton production in India during 2020-21 is expected to be around 360 lakh bales of 170 kg from 133.41 lakh hectares area with a productivity of 459 kg lint/ha (Source: Office of Textile Commissioner, GOI; http://www.txcindia.gov.in/). Haryana, Punjab and Rajasthan, constituting the Northern cotton zone of India, with a combined area of around 16.61 lakh ha during 2020-21, produced 64.0 lakh bales (each bale of 170 kg lint) with productivity of 650 kg lint per hectare.

Considerable efforts were made for cotton productivity enhancement after the setback of 2015-16 whitefly epidemic. The Hon'ble Governor of Haryana constituted a committee consisting of officials representing State agricultural universities, ICAR and State agricultural departments of Haryana and Punjab, which suggested remedies for whitefly management and improving productivity. This led to the constitution of an Interstate consultative and monitoring committee by the Punjab government in 2016 which has been functioning till date.

The committee undertook biweekly meetings during the season where the ground data of crop situation collected through scouts engaged by state agriculture departments, Krishi Vigyan Kendras and ICAR-Central Institute for Cotton Research, Regional Station was discussed, strategies finalised and their implementation was ensured. Another aspect was the recommendation of conducting multi location common trials by state agricultural universities and central

institute to screen BG II hybrids for productivity and biotic stresses along with experiments on crop production and protection aspects. The results of these trials were discussed and suitable recommendations for cultivation of BG II hybrids and other production and protection related technologies were made to state governments every year. The major thrust areas were:

- Pre-sowing weed eradication campaign
- Advocating high yielding, whitefly and cotton leaf curl virus disease tolerant BG II hybrids to state governments
- Timely release of canal water and completion of sowings before 15th May
- Use of foliar nutrient applications
- Mass campaigns for field monitoring and threshold based plant protection interventions for sucking pests management
- Use of insect growth regulators based on pre adult and adult populations of whitefly

These initiatives played a crucial role in reviving cotton production and productivity in the North zone (Table 1).

Table 1. Area, production and productivity of cotton in North India

Year	Area	Production	Productivity
2015-16	14.02	35.7	433
2016-17	13.26	46.0	590
2017-18	15.40	56.5	624
2018-19	16.05	59.0	625
2019-20	17.29*	65.0	700*
2020-21	16.61*	64.0	650*

Area-Lakh hectares; Production-Lakh bales (each bale of 170 kg); Productivity-Lint kg per hectare. Source-AICRP report 2021-22, Values corrected due to area corrections by department of agriculture, Punjab*

During the last two seasons, the production has ranged around 64-65 lakh bales. There is a possibility of improving production in the North zone partly through expansion in area and also through technological interventions. The maximum scope for area expansion is in Punjab as it has consistently been around 5.0-6.0 lakh ha for around a decade up to 2007-08 and then started declining due to shift of area to other crops mainly paddy due to faulty government policies. The area has hovered around 2.5-3.0 lakh hectares during the past five years (source-Department of Agriculture, Punjab).

Recently there have been efforts under crop diversification in Haryana to reduce area under paddy with a new initiative "Mera Pani Meri Viraasat", scheme where an incentive of Rs. 7000/- acre is given to farmers if they shift area from paddy. The main shift under the scheme has been towards cotton crop. Plans for crop diversification to shift area from paddy to other crops including cotton are underway in Punjab also. Researchable issues like breaking yield barriers through new plant breeding initiatives, improving boll weight and shattering tolerance in Desi cottons to bring more area under their cultivation, got improvement in varieties and hybrids and tackling biotic and abiotic stresses are the need of the hour.

A paradigm shift with complete package like proper plant type and population coupled with use of growth retardants and defoliants along with mechanical picking can bring about productivity enhancement in a big way. With a modest annual increase of production by 5.0 % annually and new technological interventions, a target of 100.0 lakh bales can be achieved in five years by 2025-26. These figures need to be kept in mind while strengthening the ginning, spinning and fabric making capacities in the zone.

Strengthening Post Harvest Components of Cotton Value Chain

Clean Cotton Picking: Impact on Contamination and Trash Content Level

Cotton in North India is handpicked which is expected to be very clean, low in trash and contamination free. However, it is a fact that cotton produced in the North zone suffers from high level of trash and contamination. The average trash content in lint ranges around 4-6%, whereas modern textile machinery requires it to be less than

2.0%. Excessive trash and contamination in cotton grown in North India have been major causes of concern especially for spinning mills. Besides producing inferior quality yarn, it lowers the profit margin of ginners and spinners by increasing production cost on one hand and reduced production of yarn per kg of cotton spun on the other. Improper picking and bad management practices at the farm level are major contributory factors for high trash content and contamination.

ICAR-CIRCOT developed clean cotton picking technology and demonstrated it by adopting 25 small and marginal farmers from two villages in Sirsa district in Haryana under a World Bank funded National Agricultural Innovation Project. The farmers were given training in best management practices for clean cotton picking, storage and transportation. They were provided cotton picking aids like headgears, aprons, tarpaulins, bags. The clean picked seed cotton was collected on tarpaulin to avoid contact with soil and other non lint material, stored in clean and airy stores, packed in cotton cloth bags and transported to ginning factory ensuring that no contamination was added mid way. It was ginned at TMC modernised factory at Sirsa using best management practices to obtain good quality lint. Samples were drawn from each bale for trash content analysis. The trash content level in bales was around 2% as against the normal range of 4-6% in the region. Clean picked cotton also facilitated increased ginning efficiency of 2.45 h/5 quintals against 3.00 h/5 quintals of seed cotton along with increased ginning outturn of 36 per cent against the normal range of 32-33 per cent.

Clean cotton picking and best management practices also resulted in negligible contamination in lint. Pressed bales were taken to a spinning mill and spun at 24s counts. The spinning mill was asked to assess the impact of clean cotton on their output and efficiency. At the blow room stage, contaminants like body hair, pouches, jute twine, plastics, etc. were not found. Absence of contaminants increased cleaning efficiency and production efficiency of blow room and carding, which impacted the efficiency of preparatory stage. More cleaned and good quality material in preparatory stage increased the speed of ring frame by 3 per cent which resulted in increased yarn production.

The general appearance of yarn was observed on standard size blackboard and compared with ASTM Grades. The board was found on "A" Grade. Processing of yarn in Autoconer and doubling on TFO produced 0.2 per cent less hard waste due to very low breakages. This demonstrated that clean cotton picking along with good management practices was an effective tool for minimising trash content and contamination in cotton. Low trash content and low contamination level in cotton will fetch good margin of profit to spinners and ginners both, which in turn will offer better price to farmers as well.

Ginning Operations

In North India, cotton value chain is mostly unorganized consisting of many weak links. Ginning i.e. conversion of seed cotton into lint is one of the weakest links as most of the ginning factories are old, energy inefficient and have not been upgraded or modernised. The government of India had initiated Technology Mission on Cotton (TMC). in 2000, with the objective of improving cotton productivity and its quality. The mini mission IV of TMC was entrusted the job of up-gradation and modernisation of ginning and pressing factories with modern infrastructure which is capable of delivering contaminant-free quality bales with minimum trash.

Most of the ginning and pressing units located in the North zone did not avail this golden opportunity offered by the government for upgradation and modernisation under TMC. Despite the best efforts of government of India, upgradation and modernization of most of ginning factories could not be done. At present there are around 485 ginning and pressing factories in working condition in North India and out of those, only 16 factories were upgraded/modernised under Technology Mission of Cotton (Table 2).

Table 2. Ginning & Pressing Factories modernised in North Zone under TMC

State	No. of working Ginning & Pressing Units	Ginning & Pressing Factories Modernised
Punjab	75	11
Haryana	160	5
Rajasthan	250	0
North Zone	485	16

Table 3. No. of Textile Mills, Cotton Consumption and Yarn Production

State	Spinning Mill		Composite Mill		Cotton Consumption (lakh bales)	Production of Yarn ('000 kg)	
	Non-SSI	SSI	Non-SSI	SSI		Cotton	Blended
Haryana	70	114	02	01	15.24	258043	14876
Punjab	106	36	09	-	39.36	585205	141866
Rajasthan	52	17	12	-	12.47	154075	230988

Source: Office of the Textile Commissioner, Mumbai

As a consequence, trash content in lint usually hovers around 4-6% as against TMC norms of 3% for Long and Medium Long staple category.

Spinning and Weaving

The annual consumption of spinning mills in Haryana, Punjab and Rajasthan is approximately 67 lakh bales of 170 kg each which is more or less the same as the total cotton production in the North zone. The installed capacity of 6.12 million spindles in these states accounts for nearly 11% of the total capacity at national level. According to industry sources, contamination, inconsistent fibre quality and non-homogeneity in cotton lint, are big issues for spinning mills. Multi stage tax on value addition also makes Indian yarn less competitive in international market.

Though the weaving sector is the backbone of the textile industry, most fabric production is from decentralised sector and is dominated by small scale enterprises. It lacks technology upgradation, adequate knowledge and innovative approach for new product development apart from low productivity. It is also one of the weakest links of the cotton value chain and needs to be taken care of.

Cottonseed Processing

Around 21 lakh tons of cottonseed is produced annually in the North zone. Besides this, a sizable quantity of cottonseed is brought from Southern states particularly Andhra Pradesh, Karnataka and Telangana to North zone for crushing. There is a lack of scientific processing of cottonseed

Table 4. No. of Weaving Mills (Non-SSI) and Fabric Production

State	Weaving Mills	Looms	Fabric Production ('000 sq. mt.)	
			Cotton	Blended
Haryana	6	83	----	30374
Punjab	7	423	97648	49491
Rajasthan	15	1671	106230	209640

Source: Office of the Textile Commissioner, Mumbai

in the region and almost the entire cottonseed is processed by traditional crude method of crushing without delinting in undecorticated form.

This results in around 7% less oil recovery besides losing important by-products such as linters and hull. This loss of oil goes waste as animals do not require it. Cottonseed crushers also deliberately go for traditional crushing because of misperceptions among dairymen who demand cake with high oil content along with linters. Scientific processing involves cleaning, delinting, dehulling, seed meal purification and drying, oil extraction by pressure and solvent, oil refining and bleaching. Instead of adopting scientific processing, many oil extraction units in the zone have started making cake as the primary product, delegating oil extraction to secondary ones. They prepare their own brand of cake by mixing cottonseed brought from different regions with increased leftover oil content in cake. This results in huge loss of oil content besides other valuable by-products.

Linters

Ginned cotton seeds contain short fuzzy fibres forming a dense mat on its surface called linters. Linters are removed from the seed surface by delinting machines and constitute about 6-8% of the weight of cottonseed. These are very rich source of high quality cellulose and can be used as raw material for various industrial products. Linters can be used in manufacture of nitrated cellulose-gun powder, rocket propellant; paper-tissue paper, currency paper; films-packaging; felts-upholstery, mattresses; yarn-twain; cellulose, esters, ethers-paints; modified cellulose-regenerated MCC and nanocellulose. These can also be used in the preparation of absorbent cotton.

Comber Noil

Comber Noil is a by-product of the ring spun yarn making process. These short fibres are obtained as mill waste when cotton is combed in a comber machine. Being trash, free Comber Noil is used as raw material to manufacture technical textiles, surgical grade absorbent cotton, medicated cotton, ear buds, waddings, security paper, currency notes, blends for coarse yarn, and open-end spinning for denim production.

Utilisation of Cotton Stalk

Around 5 million tons of dry cotton stalks (10% moisture) is produced annually in North India. Except for a small portion being used as domestic fuel in rural areas, most of the stalk was being used as a fuel in brick kilns which is banned by the government now on account of environmental pollution, thus, rendering it a total waste. Timely disposal of cotton stalk after uprooting is a major challenge for farmers, as storing it in the field harbors harmful insects and diseases. Sometimes cotton stalks are mulched in the soil that requires heavy machinery and additional fertilizer to enhance decaying process which further involves high energy and cost.

ICAR-CIRCOT has developed technologies for converting cotton stalk into bio enriched compost, particle board, briquettes/pallets and many more useful products. It can also be used for production of edible oyster mushroom. Depleting organic matter and nutrient level is one of the major causes for soil health deterioration in the North zone. A rapid process for preparation of bio enriched compost from cotton stalk developed by ICAR-CIRCOT will not only solve the disposal problem but also help in arresting deteriorating soil health. The technology has been successfully demonstrated to and adopted by some farmers in Sirsa area. The NPK content of bio enriched compost is almost three times higher than farmyard manure. Compost enriched with nutrients and plant growth promoting microorganisms is very good alternative to farmyard manure (FYM) which is scarcely available nowadays. Significant increase in yield has also been observed at farmer's field as compared to normal farmer practices.

Production and productivity enhancement followed by technological improvements at various levels of post harvest operations to make them sustainable and profitable will be mutually beneficial to all the stake holders of cotton value chain. Further upgradation/modernisation of ginning industry followed by greater emphasis on establishing fabric, garment and apparel making units for consumption of raw material being produced in the North zone will lead to strengthening of cotton value chain in the region.

Reference

Final Report of NAIP Component -2 Sub – project "A Value Chain for Cotton Fibre, Seed and Stalk: An Innovation for Higher Economic returns to farmers and Allied Stake holders". Central Institute for Research on Cotton technology (ICAR), Mumbai, India.

Acknowledgements

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(The views expressed in this column are of the authors and not that of Cotton Association of India)

Update on Cotton Acreage (As on 15.07.2021)

(Area in Lakh Ha)

Sr. No.	State	Normal Area (DES)*	Normal Area as on Date (2016-2020)	Area Covered (SDA)					
				2021-22	2020-21	2019-20	2018-19	2017-18	2016-17
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
1	Andhra Pradesh	6.12	2.118	1.140	2.735	1.550	1.420	2.854	2.030
2	Telangana	18.09	13.450	18.781	20.401	13.532	11.127	12.780	9.410
3	Gujarat	26.09	17.351	18.433	20.334	21.428	11.441	19.900	13.650
4	Haryana	6.56	6.464	6.880	7.370	6.760	6.650	6.560	4.980
5	Karnataka	6.47	2.355	3.300	3.225	2.170	2.260	2.410	1.710
6	Madhya Pradesh	6.06	5.372	5.531	6.010	5.730	5.240	4.880	5.000
7	Maharashtra	42.13	33.034	33.894	39.832	33.219	30.847	31.360	29.910
8	Odisha	1.47	1.020	1.148	1.241	1.280	0.730	1.050	0.800
9	Punjab	2.86	3.656	3.034	5.010	4.020	2.840	3.850	2.560
10	Rajasthan	5.78	5.252	5.823	6.581	6.360	4.740	4.900	3.680
11	Tamil Nadu	1.54	0.040	0.047	0.050	0.034	0.033	0.050	0.031
12	Others	0.42	0.223	0.371	0.216	0.271	0.172	0.286	0.170
All India		**123.591**	**90.334**	**98.382**	**113.005**	**96.354**	**77.500**	**90.880**	**73.931**

** Directorate of Economics & Statistics, Ministry of Agriculture and Farmers Welfare, Krishi Bhavan, New Delhi*
Source : Directorate of Cotton Development, Nagpur

UPCOUNTRY SPOT RATES

(Rs./Qtl)

Sr. No.	Growth	Grade Standard	Grade	Staple	Micronaire	Gravimetric Trash	Strength /GPT	Spot Rate (Upcountry) 2020-21 Crop July 2021 12th	13th	14th	15th	16th	17th
	Standard Descriptions with Basic Grade & Staple in Millimetres based on Upper Half Mean Length [By law 66 (A) (a) (4)]												
1	P/H/R	ICS-101	Fine	Below 22mm	5.0 – 7.0	4%	15	11698 (41600)	11698 (41600)	11698 (41600)	11698 (41600)	11698 (41600)	11698 (41600)
2	P/H/R (SG)	ICS-201	Fine	Below 22mm	5.0 – 7.0	4.5%	15	11867 (42200)	11867 (42200)	11867 (42200)	11867 (42200)	11867 (42200)	11867 (42200)
3	GUJ	ICS-102	Fine	22mm	4.0 – 6.0	13%	20	9729 (34600)	9729 (34600)	9729 (34600)	9729 (34600)	9729 (34600)	9729 (34600)
4	KAR	ICS-103	Fine	23mm	4.0 – 5.5	4.5%	21	10320 (36700)	10320 (36700)	10320 (36700)	10320 (36700)	10320 (36700)	10320 (36700)
5	M/M (P)	ICS-104	Fine	24mm	4.0 – 5.5	4%	23	11838 (42100)	11838 (42100)	11838 (42100)	11838 (42100)	11838 (42100)	11838 (42100)
6	P/H/R (U) (SG)	ICS-202	Fine	27mm	3.5 – 4.9	4.5%	26	13751 (48900)	13751 (48900)	13835 (49200)	13947 (49600)	13947 (49600)	14088 (50100)
7	M/M(P)/ SA/TL	ICS-105	Fine	26mm	3.0 – 3.4	4%	25	11951 (42500)	11951 (42500)	12035 (42800)	12120 (43100)	12232 (43500)	12373 (44000)
8	P/H/R(U)	ICS-105	Fine	27mm	3.5 – 4.9	4%	26	13891 (49400)	13891 (49400)	13976 (49700)	14088 (50100)	14088 (50100)	14229 (50600)
9	M/M(P)/ SA/TL/G	ICS-105	Fine	27mm	3.0 – 3.4	4%	25	12232 (43500)	12232 (43500)	12317 (43800)	12401 (44100)	12513 (44500)	12654 (45000)
10	M/M(P)/ SA/TL	ICS-105	Fine	27mm	3.5 – 4.9	3.5%	26	13413 (47700)	13413 (47700)	13498 (48000)	13582 (48300)	13694 (48700)	13835 (49200)
11	P/H/R(U)	ICS-105	Fine	28mm	3.5 – 4.9	4%	27	14116 (50200)	14116 (50200)	14201 (50500)	14313 (50900)	14313 (50900)	14454 (51400)
12	M/M(P)	ICS-105	Fine	28mm	3.7 – 4.5	3.5%	27	14060 (50000)	14060 (50000)	14172 (50400)	14257 (50700)	14369 (51100)	14510 (51600)
13	SA/TL/K	ICS-105	Fine	28mm	3.7 – 4.5	3.5%	27	14088 (50100)	14088 (50100)	14201 (50500)	14285 (50800)	14397 (51200)	14538 (51700)
14	GUJ	ICS-105	Fine	28mm	3.7 – 4.5	3%	27	14285 (50800)	14285 (50800)	14369 (51100)	14454 (51400)	14566 (51800)	14707 (52300)
15	R(L)	ICS-105	Fine	29mm	3.7 – 4.5	3.5%	28	14341 (51000)	14341 (51000)	14426 (51300)	14510 (51600)	14566 (51800)	14707 (52300)
16	M/M(P)	ICS-105	Fine	29mm	3.7 – 4.5	3.5%	28	14426 (51300)	14426 (51300)	14538 (51700)	14622 (52000)	14735 (52400)	14875 (52900)
17	SA/TL/K	ICS-105	Fine	29mm	3.7 – 4.5	3%	28	14454 (51400)	14454 (51400)	14566 (51800)	14650 (52100)	14763 (52500)	14904 (53000)
18	GUJ	ICS-105	Fine	29mm	3.7 – 4.5	3%	28	14763 (52500)	14763 (52500)	14847 (52800)	14932 (53100)	15044 (53500)	15185 (54000)
19	M/M(P)	ICS-105	Fine	30mm	3.7 – 4.5	3.5%	29	15016 (53400)	15016 (53400)	15072 (53600)	15157 (53900)	15269 (54300)	15410 (54800)
20	SA/TL/K/O	ICS-105	Fine	30mm	3.7 – 4.5	3%	29	15044 (53500)	15044 (53500)	15100 (53700)	15185 (54000)	15297 (54400)	15438 (54900)
21	M/M(P)	ICS-105	Fine	31mm	3.7 – 4.5	3%	30	15213 (54100)	15213 (54100)	15297 (54400)	15382 (54700)	15494 (55100)	15635 (55600)
22	SA/TL/ K / TN/O	ICS-105	Fine	31mm	3.7 – 4.5	3%	30	15241 (54200)	15241 (54200)	15325 (54500)	15410 (54800)	15522 (55200)	15663 (55700)
23	SA/TL/K/ TN/O	ICS-106	Fine	32mm	3.5 – 4.2	3%	31	15522 (55200)	15522 (55200)	15578 (55400)	15578 (55400)	15691 (55800)	15832 (56300)
24	M/M(P)	ICS-107	Fine	34mm	2.8 - 3.7	4%	33	24746 (88000)	24746 (88000)	24858 (88400)	24858 (88400)	24858 (88400)	24858 (88400)
25	K/TN	ICS-107	Fine	34mm	2.8 - 3.7	3.5%	34	25449 (90500)	25449 (90500)	25561 (90900)	25561 (90900)	25561 (90900)	25561 (90900)
26	M/M(P)	ICS-107	Fine	35mm	2.8 - 3.7	4%	35	26011 (92500)	26011 (92500)	26123 (92900)	26123 (92900)	26123 (92900)	26123 (92900)
27	K/TN	ICS-107	Fine	35mm	2.8 - 3.7	3.5%	35	26433 (94000)	26433 (94000)	26545 (94400)	26545 (94400)	26545 94400	26545 (94400)

(Note: Figures in bracket indicate prices in Rs./Candy)