

# Technology Transfer in Indian Cotton Sector – Opportunities and Challenges

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yield and income of cotton growers can be enhanced. She has been dedicating since 2000 to the issue of Technology Transfer in Cotton through

conducting nationwide demonstrations and has been involved in studies on usage of Information and Communication tools viz., web portal, mobile phone, social media etc., in dissemination of agricultural technologies and gender mainstreaming in cotton sector.

"Cotton is almost pure cellulose, with softness and breathability that have made it the world's most popular natural fibre" was the famous saying of ancient Greek historian Herodotus (485-425 BC). He also mentioned about Indian cotton as "the wild trees in that country bear fleeces as their fruit, surpassing those of sheep in beauty and excellence; and the Indians use cloth made



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from these trees". It confirms that Indian cotton is ancient and antique in nature. The archaeological evidences and ancient writings validate that the cultivation of Asiatic cotton in India

is time immemorial. However, presently, India cultivates all the four cultivated species of cotton. Exploring the reach of other species to the country reveals that the spread of American and Egyptian cotton in Indian soil was purely by the extension efforts of British Government to meet the demand

> of Lancashire textile industry. The rigorous and tireless extension efforts combined with superior cotton production technologies made the country

lead during the British Empire and now in the contemporary world.

Technology transfer in Indian cotton sector is most often considered as a public activity but over the past two decades, due to rapid development of biotechnology of cotton, globalisation and liberalisation of global economy, private institutions started investing in cotton research and technology transfer. But the public cotton extension sector still has major role to play particularly in managing the implications of new technologies spread by both public and private sectors, supporting the research sector to fill the research gaps through relevant feedback, regulating the technology diffusion and consequences, ensuring the safety of the environment and society by proper assessment and improving the livelihood of small and marginal cotton growers. These changes and new-fangled roles throw enormous challenges on cotton extension sector and there is a pressing need to bring out desirable changes in the way cotton technology transfer being carried out. It is also undeniable that due to recent changes in the requirements of technology senders and receivers in Indian cotton sector, plenty of new opportunities emerge for cotton extension sector. This paper makes an attempt to explore both the challenges and opportunities ahead of Indian cotton Transfer of Technology (TOT) sector and suggests ways to utilize it.

# Transfer of Technology among Cotton Growers in India

Technology transfer is a multi-level process of communication involving senders of technologies, change agents of diffusion and end users of adoption. In Indian cotton sector, the technology generators are cotton scientists with Indian Council of Agricultural Research (ICAR), State Agricultural Universities (SAU) and Private Research and Development institutions. Few of cotton technologies are imported from comparable countries, refined for Indian situation and then diffused for large scale adoption. The change agents of diffusion of cotton technologies in India at Central level are generally ICAR -Central Institute of Cotton Research (CICR), Central Research Institute for Cotton Technology (CIRCOT), Krishi Vigyan Kendra (KVK), Directorate of Cotton Development (DCD), Non Government Organisation (NGO) and Private Industries. At state level, the State Ministry of Agriculture through State Department of Agriculture and State Agricultural Universities partake in technology transfer of all crops including cotton. Both at central and state level, the private industries involved in cotton seed production and manufacture of other inputs also do extension work through their Corporate Social Responsibility (CSR). The Non Profit Organisations viz., Better Cotton Initiative (BCI) also shares information and knowledge in cotton. For all these change agents and knowledge spreaders, the clients are cotton farmers and other cotton stakeholders.

Few technologies reach the farmers by accident and but majority of the technologies reach them through purposive interventions. Cotton Extension Scheme, Grow More Cotton, Package program or Intensive Cotton Cultivation Scheme (ICCS), Intensive Cotton Development Program (ICDP), Technology Mission on Cotton (TMC), National Food Security Mission (NFSM) - Commercial crops (CC) are the popular cotton technology transfer interventions attempted by the Government of India. The well defined extension approaches used in these interventions are both conventional and contemporary which include field demonstrations like Front Line Demonstration (FLD) and Farmers Field Schools (FFS); the print media, radio talks, television (TV) Cotton Decision Support System (DSS), interactive videos / cds / voice modules, web and mobile based cotton advisory services including the well-known "e-Kapas" advisory service and mobile apps. The private sectors make use of contract farming approach and Corporate Social Responsibility (CSR) for extending cotton technologies to farmers. Commodity Interest Group (CIG), Farmers Interest Group (FIG), Farmers Association, Farmers Producers Organisation (FPO) and Self Help Group (SHG) are the popular collective organisational structures used as means by the public and private cotton extension functionaries to reach cotton growers for technology transfer.

# **Challenges in Indian Cotton Sector**

The weather, yield, price and policy uncertainties pose major challenges in Indian cotton which reflects in its acreage and production. Every year India cultivates about 10 to 12 million hectares of cotton and produces around 35 million bales with an average yield range of 500 - 540 kg / ha. The gap between global average productivity (ranged from 700 to 800 kg/ha) and India's productivity is always a concern for cotton researchers, extension functionaries, development workers and policy makers. Cultivating cotton crop under 60 % of rain fed areas where uncertain monsoon and deficit rainfall more frequently occur is another challenge. High input costs and low market prices are ever present challenges faced by Indian cotton growers which lead few of the rainfed cotton growers to opt for below optimum input use fearing crop failures. Labour scarcity is a mounting setback in many of Indian cotton growing states, because the sector is dominated by family, seasonal and community exchange laborers. In majority of the places, the soils are becoming less productive due to imbalanced nutrients management, further limiting cotton yields. Susceptibility to wide range of biotic and abiotic factors are other factors that intimidate cotton production. Mechanisation lacunae in cotton cultivation is another key concern for cotton farming.

The social issues viz., child labor, displaced workers, forced labor, less cared women sector, indebtedness, farmers' distress etc., and environmental concerns viz., pesticide traces, water depletion, degradation of soil etc., coupled with ethical and traceability issues threaten the Indian cotton sector enormously. Maintaining "Bales traceability" with proper labeling is also a challenge in India.

#### **Challenges in Cotton Technology Transfer**

Published literature say that India has around 9.0 million cotton growers' mostly small and marginal farmers and the average cotton farm size is 1.2 ha. Reaching these farmers who are scattered in eleven cotton growing states and are highly heterogeneous in nature by one common TOT platform, is always a challenge. Planning a universal TOT mechanism to increase the average productivity of such a vast and varied acreage of cotton is always a big concern. Guiding cotton growers to cultivate suitable cultivars in the era of multiplicity of genotypes with mushrooming of private seed companies is the most vital predicament for extension workers. Influencing farmers to adopt refugee crops in Bt cotton fields, monitoring the resistance development of insect pests and addressing the new demands of widely grown biotech cotton is always a challenge for these village level functionaries. Addressing the emerging pests, diseases and deficiencies at cotton farms demands recurrent skill oriented programs for field level extension functionaries. Grouping the cotton growers for bargaining power and smooth transition of technology transfer is always a Himalayan task for the change agents. Utilising the ICT tools for technology transfer is many times a problem with the extension workers due to limited awareness of IT tools. Approaching women cotton growers at village level, demands the need of women extension workers. Addressing the issues faced by newer thrust areas viz., organic cotton, Extra Long Staple cotton and surgical cotton, calls for additional knowledge update of extension workers. Dealing with the indebtedness accrued by small holder cotton growers due to crop failures, delayed payment and unaffordable rate of interest, new crop insurance schemes etc. demand much financial know-how from the field level extension functionaries.

All the technologies developed are not absorbed by the farmers. Few technologies which find ways into consideration of farmers is often modified or adapted to local conditions and preferences. So cotton TOT sector needs peculiar discernment to transfer the desired and needed technologies. Added to all these, lacking a composite extension mechanism to address all these ground level issues is the top most challenge faced by the current cotton TOT sector.

#### **Opportunities Ahead**

- Recent stress on orienting the crop's agronomic patterns to obtain higher yields under rain fed conditions with lesser chemical inputs gives an opportunity to the cotton TOT sector to plan for large scale demonstration of these yield enhancing technologies.
- The revival of desi cotton cultivation which is considered as a treasure and insurance for the future of cotton cultivation offers immense opportunity for the cotton TOT sector to focus in near future.
- Integrated nutrient, water, weed, diseases and pest management strategies including pesticide application techniques developed by the research system are still relevant and have to be intensely diffused through appropriate extension mechanism.
- Bringing out desirable changes in knowledge, attitude and skill is a key to achieving change in cultivation behavior especially on proper and efficient use of inputs; need based chemical sprays and good management practices. This has been addressed through cotton extension sector since time immemorial but needs to be strengthened.
- The ever promising traditional extension approaches viz., field demonstrations, FFS, print media, radio talks, TV documentaries, video films, exposure visits, cotton fairs and exhibitions, focused publicity campaigns, kisan melas and on/off campus capacity building programs, etc., may be reinforced in the coming years. Added to that, the presently available ICT tools-based extension approaches viz., cotton portals, Cotton Decision Support System (DSS), interactive videos / cds / voice modules, web and mobile based cotton advisory services, Kisan Call Centers (KCCs), Kisan SMS Portal, DD Kisan TV Channel, community radio stations and mobile apps must be harnessed well for cotton technology transfer. Further new extension innovations viz., Agri-Clinics and Agri-Business Centres (ACABC) of entrepreneurs,

farmers producer organisations, etc., may be included in cotton technology transfer.

- The emerging social media provides plenty of opportunities to harness the groups for cotton technology transfer.
- Web based cotton schools or education programs may be conducted for various stakeholders by the central institutes. A series of lectures on cotton technologies with pictorial representation may be posted on the website for the benefit of various stakeholders. Small video films in different vernacular languages detailing specific cotton technologies may also be posted in the website.
- There are great opportunities for up scaling the well established e-Kapas mobile phone based cotton advisory service to PAN India. Similarly the weekly advisory services provided by ICAR-CICR can be strengthened. New mobile apps on various cotton improvement, production, protection and marketing may be developed.
- Amongst the major cotton growing countries, the cost spent for TOT or getting cotton related information by the end users in India is always free or comparatively lesser than other countries in the world. With proper linkage and connecting interventions, it is possible to build the cotton growers to make use of it for enhancing the yield and minimizing the cost. Given chances, a new approach may be planned for less paid cotton extension services in near future.

# Changes Needed in Cotton Extension Research to Overcome the Challenges and Utilise the Opportunities

 Considering the diversity in forms of climate, soil, production systems, socio economic status etc., in Indian cotton farms, to start with, there is an urgent need for a broad framework of extension research, which must be able to address all the above stated concerns and capture impacts on livelihoods of Indian cotton growers. The research on cotton extension needs to come out with extension innovations that spread good cotton cultivation practices, water / input use efficiency / precision farming, adaptation strategies to climate change impact, measures to reduce cost of production and increase net income, usage of robotics, autonomous and intelligent machines to share information and labor and novel structured buy back system. Similarly, the extension research must consider the various approaches like participatory, farming system, agro climate zone based, value chain based, issues based and focused group approach for implementing the extension innovations.

- Considering the changing trends, an exclusive research for bring out an extension program to create awareness, teach and inculcate ethical values in the traceability era may be attempted.
- Considering the changing view of extension services as a public-private initiative or partnership, meaning inviting more and more private companies to join with the public sector for strengthening the cotton extension services right from national level to the rural community, a field tested and refined TOT model with novel structured buy back system to transfer cotton technologies through industries may be developed in near future like sugarcane cultivation in India.
- The cotton research institutes must design continuous capacity building programs like trainers training / master's training at various levels (international, national, state, district and block level), on various aspects (crop improvement, crop production and crop protection) to various stakeholders (scientists, extension officials, farmers, students, etc.) for continuous out flow of cotton know-how.

#### Conclusion

Technology transfer in Indian cotton sector is most often considered as public activity but over the past two decades, there are many changes in the way it was viewed earlier. These changes throw many challenges on cotton extension sector to bring out desirable alterations in the way cotton technology transfer being carried out and also offer plenty of new opportunities to transform. This paper recommends few ways to Indian cotton extension sector to overcome the challenges and utilise the opportunities. Finding out ways to fulfill the suggestions may bring out sustainable and profitable cotton farming in India through a renewed cotton TOT sector.

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

# **COTTON EXCHANGE MARCHES AHEAD**

Madhoo Pavaskar, Rama Pavaskar

# **Chapter 9** In Service of King Cotton

#### (Contd. from Issue No. 45 ...)

### **Crop Estimation**

To overcome this disconcerting situation, the East India Cotton Association took a lead more than two decades back to estimate the cotton production independently with the help of the upcountry cotton trade associations. The Statewise first trade estimates of the cotton crop are released by the Cotton Exchange sometime in November/December at a meeting of all the

upcountry associations. These first estimates are based on the assessment of the different associations on the prospects of the crop in their respective States or regions. Such assessment is based on the field visits by cotton merchants, the weather conditions during the growing season and the pace of market arrivals.

These early estimates, drawn immediately after the commencement of the crop movement, are revised from time to time by the Cotton Exchange as it receives more up-todate data on the market arrivals and

pressing details from the different States. The final trade estimates are brought out towards the end of July after the pressing operations are over in the southern States. In the northern and central regions, cotton pressing is generally completed before the onset of the monsoon in June. At the end of the pressing season in different States/ regions, the East India Cotton Association and the concerned upcountry associations send their representatives to each and every pressing factory to collect the final pressing figures. Such data are gathered from the seven major cotton growing States, namely Punjab, Rajasthan, Haryana, Gujarat, Madhya Pradesh, Karnataka and Andhra Pradesh. The South India Cotton Association, Coimbatore, supplies reports on the factory-wise cotton ginned in Tamil Nadu. In Maharashtra where the monopoly procurement scheme for kapas exists, the figures of pressed bales are obtained from the Maharashtra State Cooperative Cotton Growers' Marketing Federation. average weight of the running pressed bales in different areas is ascertained. The Cotton Exchange also seeks from its members the net weight of the bales pressed in different areas as delivered by them to the mills. These details are collected from the merchant members of the Exchange on a sample basis and cover approximately five per cent of the total crop. Based on such cross-verification

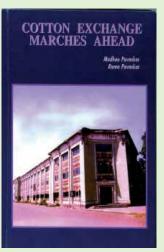
While gathering the pressing statistics, the

of weights for the running bales, the Exchange calculates conversion ratios for the different cotton producing States separately to estimate the standard bales of 170 kg each from the gathered data on the total running pressed bales for each State.

The final trade estimates of the cotton crop thus compiled have, by and large, turned out to be closer to the first estimates arrived at by the Cotton Exchange at the beginning of each season, unless the crop is damaged subsequently by unfavourable weather. Such instances of crop

damages are rare. The timely estimates brought out by the Cotton Exchange have therefore proved to be of immense value to the trade, industry and policy makers.

More importantly, the trade estimates of cotton production have found to be higher than the official estimates released by the Ministry of Agriculture. That makes them more realistic, since they compare favourably with the final data on the utilization of cotton by the mill and non-mill sectors. Unsurprisingly, even the Cotton Advisory Board (CAB) comprising all the cotton interests, including the government departments involved in framing the cotton policies and the public sector marketing agencies, rely on the Cotton Exchange estimates to determine the crop size for making the policy recommendations to the authorities. As the CAB estimates of cotton crop are derived primarily from the trade estimates, they differ from the latter but slightly.



By the mid-1990s, it was realized that even the final estimates compiled by the Cotton Exchange and agreed to by all the upcountry cotton associations by consensus at the second annual meet of such associations in July of each cotton season were also underestimates, as some cotton consumed by both the mill and non-mill sectors in loose form (i.e. without being pressed) was not reflected in the pressing statistics gathered by the Exchange. To rectify this omission, the East India Cotton Association the Indian Cotton Mills Federation and sponsored jointly a survey in 1997 to assess the off-take of loose cotton in the country and entrusted this task to the Ahmedabad Textile Industry Research Association (ATIRA). Based on the survey report of ATIRA and its estimates of proportions of loose cotton consumed in different States by mills and others, the final cotton crop estimate derived from the pressing statistics is now adjusted suitably for the quantity of loose cotton consumed directly. Such loose cotton off-take works out to roughly 3.75 per cent of the all-India crop.

The inclusion of loose cotton has led to the further upward revision of the trade estimates. This reaffirms the underestimation of the cotton crop by the Union Ministry of Agriculture, and its consequent unreliability. In contrast, the crop estimates of the Cotton Exchange released from almost the beginning of each cotton marketing season and updated periodically have fulfilled the long standing need of the cotton market functionaries as well as the planners and policy makers in the government. The Cotton Exchange rightly takes a pride in its crop estimation exercise, which is extraordinarily practical, though not based on any sophisticated statistical technique. It is nevertheless quite realistic, since it involves a virtual census of the cotton bale pressing activity in the country.

#### **Meetings of Cotton Associations**

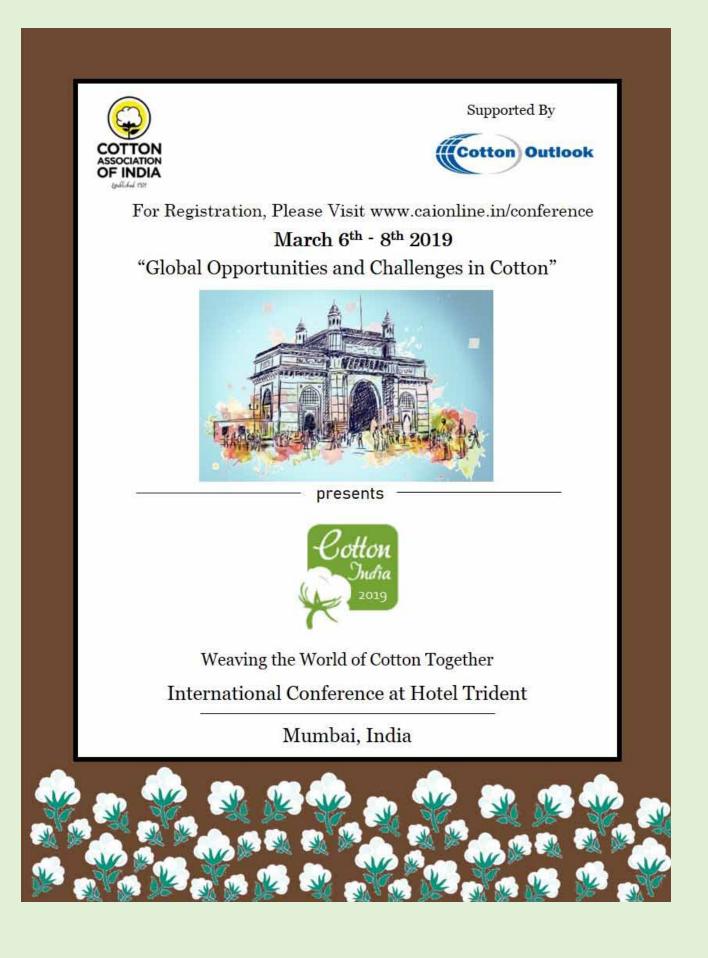
The State-wise estimates of cotton crop prepared by the East India Cotton Association receive their final seal of approval at the biannual meetings of the upcountry cotton associations, the first one of which is held at a major upcountry trading centre and the next one mostly in Mumbai. These meetings have assumed considerable importance in recent years for not only do they serve to disseminate reliable crop estimates, but also provide a forum for the upcountry cotton merchants to ventilate their grievances, which the Cotton Exchange takes up with the appropriate authorities.

These meetings are well attended by the upcountry cotton merchants and the representatives of different cotton sectors like the ginning and pressing industry, the textile industry, etc. At the second meeting, the senior officials in the Union Ministries of Textiles, Civil Supplies and Agriculture and the Textile Commissioner are invited as Chief Guest and Guests of Honour. At times, even the Union Ministers are invited. These meetings thus provide an unique forum to the upcountry cotton trade to express their hardships directly to the ministers and the government officials.

Several well documented research papers on subjects of topical interest to the cotton trade and industry are presented by scholars at these meetings. The object of these research papers is usually to improve the cotton productivity, quality and marketing. The papers are therefore of educative value and practical help to the different cotton sectors.

In many of these meetings and forums, the East India Cotton Association has been pleading repeatedly for a legislation to protect the suppliers of cotton on the lines of the Consumer Protection Act, in view of the frequent delays and defaults in the payment of dues to such suppliers by several mills in recent years. These meetings often serve as forums for releasing some of the important publications of the Cotton Exchange. Thus, at the meeting held on July 27, 2002 in Mumbai, a research volume entitled "Towards Development of Commodity Exchanges" was released at the hands of Mr.Rajaram Jaipuria, the Chairman of the Indian Cotton Mills Federation. The publication was prepared by one of the joint authors of the present book, Dr. Madhoo Pavaskar.

The volume comprises a series of articles underlying the need for free and flexible physical, futures and their derivaties markets in commodities. More importantly, it suggests to the government authorities and the commodity exchanges to initiate suitable steps for promoting and developing different markets on sound lines so that the commodity futures markets can perform their economic functions of price discovery and risk management effectively and efficiently.



				UPC	OUNTRY	SPOT F	RATES				(R	ls./Qtl)	
	Standard Descriptions with Basic Grade & Staple in Millimetres based on Upper Half Mean Length [ By law 66 (A) (a) (4) ]							Spot Rate (Upcountry) 2018-19 Crop February 2019					
Sr. No.	Growth	Grade Standard	Grade	Staple	Micronaire	Strength /GPT	18th	19th	20th	21st	22nd	23rd	
1	P/H/R	ICS-101	Fine	Below 22mm	5.0-7.0	15	11164 (39700)	11164 (39700)	11107 (39500)	11107 (39500)	11107 (39500)	11107 (39500)	
2	P/H/R	ICS-201	Fine	Below 22mm	5.0-7.0	15	11304 (40200)	11304 (40200)	11248 (40000)	11248 (40000)	11248 (40000)	11248 (40000)	
3	GUJ	ICS-102	Fine	22mm	4.0-6.0	20	8436 (30000)	8577 (30500)	8520 (30300)	8548 (30400)	8548 (30400)	8548 (30400)	
4	KAR	ICS-103	Fine	23mm	4.0-5.5	21	10179 (36200)	10208 (36300)	10208 (36300)	10208 (36300)	10208 (36300)	10208 (36300)	
5	M/M	ICS-104	Fine	24mm	4.0-5.0	23	10657 (37900)	10657 (37900)	10657 (37900)	10657 (37900)	10657 (37900)	10657 (37900)	
6	P/H/R	ICS-202	Fine	26mm	3.5-4.9	26	11585 (41200)	11585 (41200)	11473 (40800)	11473 (40800)	11557 (41100)	11529 (41000)	
7	M/M/A	ICS-105	Fine	26mm	3.0-3.4	25	10517 (37400)	10517 (37400)	10517 (37400)	10517 (37400)	10545 (37500)	10517 (37400)	
8	M/M/A	ICS-105	Fine	26mm	3.5-4.9	25	10714 (38100)	10714 (38100)	10714 (38100)	10714 (38100)	10742 (38200)	10714 (38100)	
9	P/H/R	ICS-105	Fine	27mm	3.5.4.9	26	11867 (42200)	11867 (42200)	11754 (41800)	11754 (41800)	11810 (42000)	11782 (41900)	
10	M/M/A	ICS-105	Fine	27mm	3.0-3.4	26	10742 (38200)	10686 (38000)	10686 (38000)	10686 (38000)	10714 (38100)	10686 (38000)	
11	M/M/A	ICS-105	Fine	27mm	3.5-4.9	26	10967 (39000)	10967 (39000)	10967 (39000)	10967 (39000)	11023 (39200)	10995 (39100)	
12	P/H/R	ICS-105	Fine	28mm	3.5-4.9	27	11979 (42600)	11979 (42600)	11867 (42200)	11867 (42200)	11951 (42500)	11923 (42400)	
13	M/M/A	ICS-105	Fine	28mm	3.5-4.9	27	11276 (40100)	11248 (40000)	11248 (40000)	11248 (40000)	11332 (40300)	11304 (40200)	
14	GUJ	ICS-105	Fine	28mm	3.5-4.9	27	11389 (40500)	11360 (40400)	11332 (40300)	11389 (40500)	11473 (40800)	11445 (40700)	
15	M/M/A/K	ICS-105	Fine	29mm	3.5-4.9	28	11529 (41000)	11501 (40900)	11501 (40900)	11501 (40900)	11585 (41200)	11557 (41100)	
16	GUJ	ICS-105	Fine	29mm	3.5-4.9	28	11670 (41500)	11670 (41500)	11642 (41400)	11642 (41400)	11726 (41700)	11698 (41600)	
17	M/M/A/K	ICS-105	Fine	30mm	3.5-4.9	29	11810 (42000)	11782 (41900)	11782 (41900)	11782 (41900)	11838 (42100)	11810 (42000)	
18	M/M/A/K/T/O	ICS-105	Fine	31mm	3.5-4.9	30	12092 (43000)	12092 (43000)	12092 (43000)	12092 (43000)	12148 (43200)	12120 (43100)	
19	A/K/T/O	ICS-106	Fine	32mm	3.5-4.9	31	12429 (44200)	12429 (44200)	12429 (44200)	12429 (44200)	12485 (44400)	12457 (44300)	
20	M(P)/K/T	ICS-107	Fine	34mm	3.0-3.8	33	14650 (52100)	14650 (52100)	14650 (52100)	14650 (52100)	14650 (52100)	14650 (52100)	

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