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Organic and Conventional Cotton: Why Don't More Farmers Go Organic?

EXPERT's Column

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(The authors first addressed the issue of organic cotton in an article published almost a year ago (2018-19, No. 9) under the title: Organic Cotton: Hard to Grow. This article provides additional information comparing conventional and organic cotton in the Indian context with an objective of trying to understand why more farmers do not produce certified organic cotton.)

Organic cotton production continues to receive substantial attention from brands and retailers, environmental groups, and from government officials. The most recent plenary meeting of the International Cotton Advisory Committee in Abidjan featured a full-morning session devoted to organic cotton. The United Nations Industrial Development Organization (UNIDO) and agencies of governments, such

as the European Union, GIZ (Germany), IDH (Netherlands), SCO (Switzerland), Department for International Development of UK, and USDA (United States), sponsor various programs to encourage organic cotton production. Environmental organisations, including Pesticide Action Network UK, The Royal Botanic Gardens at Kew and the World Wildlife Fund have organic cotton programs. Retailers and brands (or their philanthropic arms), such as C&A Foundation and Timberland, among others, also promote organic cotton.

The value of this support must be substantial when the cost of administrative overhead, research and education, and direct subsidies to organic cotton farmers beyond price premiums, are all considered.

Further, research indicates that organic can be a profitable production system. India accounted for 50% of organic cotton production in 2016/17, and research in India indicates that net income per hectare is about the same, and is maybe even higher, in organic than in conventional cotton systems.

For example, in a paper published in 2007 by Eyhorn, Ramakrishnan and Mäder in the journal 'EarthScan', it was reported that organic cotton yields were on par with conventional yields on farms in central India over a two-year period, while production costs were lower, and prices received were higher. Organic farms achieved 10-20% higher incomes from agriculture.

According to Venugopalan, Rajendran, Chandran, Goswami, Challa and Damre in a paper published in April 2010 in the 'Indian Journal of Agricultural Sciences', the mean yield of cotton, mung bean, soybean and chickpeas in fields in a semi-arid district of Maharashtra were higher under an organic production system than under a low input, non-organic production system.

In a paper by Charyulu and Biswas also published in 2010 by the Indian Institute of Management, the authors reported that in Punjab, the unit cost of organic cotton production was lower than for conventional cotton, but because yields were also lower, the net returns per acre were about 10% lower for organic than for conventional cotton. However, in Gujarat, net returns from organic cotton production were about one-fourth higher than for conventional cotton because yields under the two systems were similar, while costs of production for organic cotton were lower and prices received by farmers were higher.

Another paper published in 2013 by Foster, Andres, Verma, Zundel, Messmer and Mäder, in the journal 'PLOS ONE', provided the results of a study in tropical and subtropical regions in Madhya Pradesh for cotton-soybean-wheat rotations under biodynamic, organic and conventional systems with and without biotech cotton. They found that in the second year of a cropping cycle gross margins for the organic systems were significantly higher than for the conventional systems because of similar yields and lower input costs.

And most recently, calculations prepared by the authors, with input from Venugopalan, Monga, and Mageshwaran, are shown in the accompanying table. The calculations are for irrigated cotton in Maharashtra, where most organic cotton in India is grown. The comparison of organic and non-organic cotton production systems indicates that both systems are profitable, but that organic farmers would reap an extraordinary 40% more net income than their conventional neighbors. The calculations assume that seed cotton yields under the two systems are within 10% of each other, that price premiums for organic cotton exceed 20%, and that labor costs for organic cotton are less than the labor costs of inorganic cotton. One can argue with these assumptions, but the point is that this is what leading researchers in India believe to be accurate.

All agriculture was organic until the end of World War II, and any farmer could learn to grow organic cotton if he or she wanted to. With all the interest in organic, you would think that many farmers would choose that production system. And yet, according to the Textile Exchange (http://textileexchange.org/publications/) only 220,000 farmers produced just 117,525 tons of certified organic cotton lint in 2016/17. The ICAC estimates that there are about 50 million

Economics of Organic and Conventional Cotton Cultivation				
			Inorganic	Organic
			Subtotal Rs/Acre	Subtotal Rs/Acre
A	Material/Input Costs			
	1	Seed	1,480	100
	2	Fertilizer	2,982	4,800
	3	Plant Protection Products	3,525	1,300
	4	Irrigation Water charges	2,250	900
	Subtotal Material/Input Costs		10,237	7,100
B	Labour Costs			
	1	Human Labor	8,930	8,615
	2	Machinery Operation Costs (Tractor Use)	4,842	3,267
	Subtotal Labour Costs		13,772	11,882
C.	Marketing Costs			
	Tansportation to Market		1,000	1,000
	Total of All Costs per Acre		25,009	19,982
D.	Income			
	Yield Seed Cotton: kgs/acre		840	750
	Price Received: Rs/kg		53	65
	Income from Seed Cotton		44,520	48,750
	Sale of Stalks		2,000	2,000
	Gross Income		46,520	50,750
	Net Income per Acre		21,511	30,768

households worldwide producing cotton. Thus, only about 0.5% of all farmers chose to grow organic cotton in 2016/17.

Statistics beg the question, why don't more farmers choose to grow organic cotton?

With an estimated 50 million households growing cotton around the world, there are probably about 50 million reasons why farmers do what they do. Agriculture is complex and constantly changing, economic and policy environments are parochial to each country/state/district and village, resource endowments differ, and traditions vary. Therefore, no one can say with precision why more farmers do not grow organic cotton. Nevertheless, there must be some reasons besides simple economic calculations that inhibit organic conversions, and a few broad observations might be attempted:

- Insufficient biomass,
- Boll weevil in the Western Hemisphere,
- All pests on larger fields,
- Knowledge intensity,
- Yield variation,
- Uncertain price premiums,
- Transition costs,
- Certification costs.

Insufficient Biomass:

Cotton is often grown in water-deficit regions. Grain crops are in the grass family and have horizontal roots, good for stabilising soil but leaving crops vulnerable to water stress. Cotton is a woody perennial with vertical roots that typically descend 1.5 meters, allowing it to provide an economic yield in semi-arid and arid regions where food crops would fail. This is why cotton is grown in the middle of Maharashtra, around Lubbock, around Narrabri, and in Central Asia. In these environments there is just not enough biomass to support organic cotton production.

On average, one hectare of organic cotton requires 15 tons of green material, composted to 3 tons of fertilizer, to replace the nutrient requirements of cotton production each season. In areas with less than 900 millimeters of rainfall a year, there is not going to be enough biomass in the environment for organic cotton to work. Consequently, there are large areas of the world cotton industry in which organic cotton will never be grown in volume.

Boll Weevil in the Western Hemisphere:

The Western Hemisphere accounts for one-fourth of world cotton production, but just 4% of world organic cotton production, and 90% of that is in the United States. The boll weevil is the reason. The boll weevil exists only in the Western Hemisphere. It is a pernicious pest that can destroy cotton production in an entire region. Since organic cotton farmers are not able to use the tools of modern agriculture to control pests, organic cotton will never expand in the Americas. The only reason there is any organic cotton in the Western Hemisphere is because about 4,500 tons are being grown in the United States, and this is possible only because conventional cotton producers in the United States pay for area-wide boll weevil suppression with traps and insecticide sprays. If it were not for the efforts of conventional cotton producers, organic cotton production would be essentially zero in the United States.

All Pests on Larger Fields:

Cotton is a perennial, broad-leafed, drought tolerant plant with a taproot. The cotton genome has evolved over 60 million years to survive in harsh, desert conditions, and in almost any ecosystem, cotton will be among the healthier, lusher, greener plants. All animals are attracted to food, making cotton a magnet for any herbivore, from ruminants to insects.

Most organic cotton produced around the world is grown on small plots that are not large enough to attract and support pest populations. However, large areas of cotton create a habitat congenial to insects, even in arid regions. Consequently, organic cotton farming is inherently self-limiting and can never occur within large-scale agricultural production systems for more than a few seasons before pest pressures doom the enterprise. Accordingly, there is never going to be much organic cotton production in Australia, Brazil, Greece, Israel, Spain, the United States, Uzbekistan or any other region where contiguous areas of cotton exceed approximately 5 hectares, no matter what price premiums are offered.

Knowledge Intensity and Yield Variation:

Organic production is to agriculture like traditional cabinetry with hand tools is to furniture making, it is hard and requires extensive knowledge. Modern agriculture is complex, but at least fertilizer is labeled, pesticides are formulated, and GMO seeds are certified, enabling farmers to know with precision how much of an input to use, when to use it, how to use it, and where to use it. Not

so with organic systems. Farmers must carefully balance the biomass going into organic compost to produce the proper balance of nitrogen, phosphorous and potassium. Organic farmers must have extensive knowledge of insect life cycles to know when to time planting and harvesting to avoid peak pressure. They must balance plant growth with insect and disease management; too much nitrogen or water enhances the growth of green material and attracts insects. They must understand the complexities of intercropping and much more. Just as it is much easier to produce furniture using modern tools and materials, it is much easier to grow conventional cotton than it is to grow organic cotton. One of the glaring limitations of the research cited above, is that the yield comparisons assume that organic farmers are well trained. The reality is that many organic farmers are not trained enough, and that is why organic systems tend to function farther below yield potential than non-organic systems.

A related issue is that organic farmers have fewer tools of crop protection at their disposal, and so the year-to-year variation in yields is greater than for conventional farmers. In years of beneficial weather and low pest pressure, all farmers are able to do well. However, in any five-year period in any region, there will be seasons of adverse weather and/or heavy pest infestation. For any two farmers growing cotton side-by-side, the farmer with more tools will have a better crop in the years of adverse circumstances than the farmer with fewer tools. Another shortcoming of the research cited above is that the side-by-side comparisons are based on average crop conditions and do not consider extremes of either weather or pest pressure.

Uncertain Price Premiums:

In the research cited above, the authors assume that organic cotton will fetch a price premium of 10% to 20% over conventional cotton. In reality, premiums are not always paid. Only about 60% of the certified organic cotton produced in 2016/17 was actually purchased as organic cotton, the rest was marketed as regular cotton without any premium. Even cotton that is purchased as organic does not always receive a significant premium. Absent price premiums, the economic attractiveness of organic cotton is much weaker than indicated in the research above.

Transition and Certification Costs:

Farmers cannot just go from producing conventional crops one year to organic crops the next, and then back again if market conditions change. Organic certification standards require that land be free of prohibited inputs for three years before the resulting produce can sold as organic. During those three years, yields will be lower, but there will be no price premium, and so the cost of transition is substantial. In addition, there is the cost of certification itself, which is also not considered in the side-by-side comparisons cited above.

Conclusion

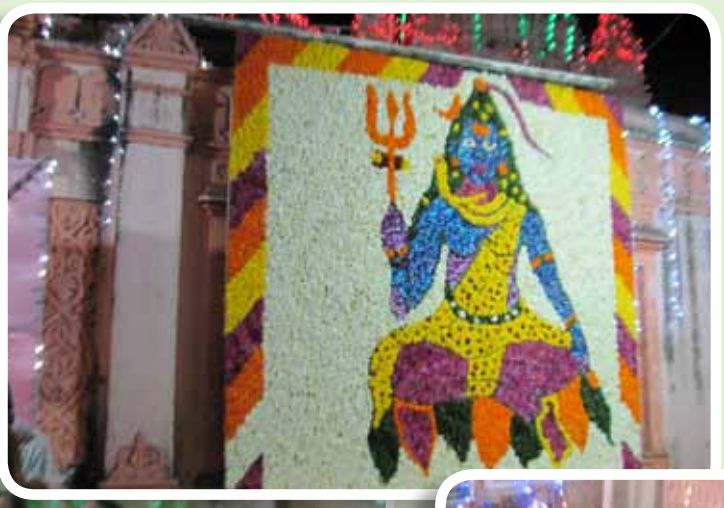
Organic cotton is a creature of the brands, retailers, government officials and environmental organizations that wish to support it. Because of agronomic limitations, year-to-year variations in yields, variable market conditions, increased knowledge requirements and the costs of transition and certification, organic cotton will never be commercially viable on any significant scale.

The record level of organic cotton production of about 200,000 tons of lint was achieved ten years ago. If one looks at a map of world cotton production and subtracts all the regions where there is insufficient biomass to provide organic fertilizer for adequate soil fertility, subtracts the Western Hemisphere, and subtracts regions where bollworm pressure can be severe, the result is a theoretical ceiling on organic cotton production of about 1 million tons, or around 5% of total production. Further, when one considers the cost involved in training small-holders, the costs of transition, and the costs of certification, it seems highly unlikely that world production of certified organic cotton will ever surpass the previous record of 200,000 tons.

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

Glimpses of Mahashivratri Festival

Mahashivratri was celebrated at the Bhid Bhanjan Mahadev Temple at Colaba, Mumbai, on March 4, 2019.



UPCOUNTRY SPOT RATES

(₹\Quintal)

February 2019

2018-19 Crop

Growth	P/H/R	P/H/R	GUJ	KAR	M/M	P/H/R	M/M/A	M/M/A	P/H/R	M/M/A	M/M/A	P/H/R	M/M/A	GUJ	M/M/A/K	GUJ	M/M/A/K	M/M/A/K/T/O	A/K/T/O	M(P)/K/T
G. Standard	ICS-101	ICS-201	ICS-102	ICS-103	ICS-104	ICS-202	ICS-105	ICS-105	ICS-105	ICS-105	ICS-105	ICS-105	ICS-105	ICS-105	ICS-105	ICS-105	ICS-105	ICS-105	ICS-106	ICS-107
Grade	Fine	Fine	Fine	Fine	Fine	Fine	Fine	Fine	Fine	Fine	Fine	Fine	Fine	Fine	Fine	Fine	Fine	Fine	Fine	Fine
Staple	22 mm	22 mm	22 mm	23 mm	24 mm	26 mm	26 mm	26 mm	27 mm	27 mm	27 mm	28 mm	28 mm	28 mm	29 mm	29 mm	30 mm	31 mm	32 mm	34 mm
Micronaire	5.0-7.0	5.0-7.0	4.0-6.0	4.0-5.5	4.0-5.5	3.5-4.9	3.0-3.4	3.5-4.9	3.5-4.9	3.0-3.4	3.5-4.9	3.5-4.9	3.5-4.9	3.5-4.9	3.5-4.9	3.5-4.9	3.5-4.9	3.5-4.9	3.5-4.9	3.0-3.8
Strength/GPT	15	15	20	21	23	26	25	25	26	26	26	27	27	27	28	28	29	30	31	33
1	11360	11501	8408	10264	10826	11670	10686	10882	12035	10995	11164	12120	11529	11726	11810	11923	12007	12317	12654	15185
2	11360	11501	8436	10264	10826	11614	10686	10882	11979	10967	11135	12063	11473	11726	11782	11923	12007	12317	12654	15185
4	11360	11501	8436	10264	10826	11614	10601	10826	11895	10911	11135	12035	11473	11726	11726	11895	11951	12232	12654	14904
5	11360	11501	8436	10264	10742	11529	10573	10770	11810	10854	11079	11951	11417	11642	11614	11754	11838	12120	12513	14622
6	11360	11501	8436	10264	10742	11585	10629	10826	11867	10911	11135	12007	11473	11726	11670	11838	11923	12204	12570	14341
7	11360	11501	8436	10264	10742	11585	10629	10826	11867	10911	11135	12007	11473	11754	11670	11867	11923	12204	12570	14060
8	11360	11501	8436	10264	10742	11585	10601	10798	11867	10882	11107	12007	11445	11754	11642	11867	11895	12176	12513	14060
9	11360	11501	8436	10264	10742	11585	10601	10798	11867	10882	11107	12007	11417	11754	11614	11867	11895	12176	12513	14060
11	11360	11501	8436	10264	10742	11698	10601	10798	11979	10882	11107	12092	11417	11754	11614	11867	11895	12176	12513	14060
12	11276	11417	8352	10179	10657	11614	10517	10714	11895	10798	11023	12007	11332	11670	11529	11782	11810	12092	12429	13976
13	11276	11417	8352	10179	10657	11614	10517	10714	11895	10798	11023	12007	11332	11614	11529	11726	11810	12092	12429	14257
14	11276	11417	8436	10179	10657	11614	10517	10714	11895	10798	11023	12007	11332	11529	11529	11726	11810	12092	12429	14538
15	11304	11445	8436	10179	10657	11642	10517	10714	11923	10798	11023	12035	11332	11445	11529	11726	11810	12092	12429	14622
16	11304	11445	8436	10179	10657	11642	10517	10714	11923	10798	11023	12035	11332	11389	11529	11726	11810	12092	12429	14650
18	11164	11304	8436	10179	10657	11585	10517	10714	11867	10742	10967	11979	11276	11389	11529	11670	11810	12092	12429	14650
19	11164	11304	8577	10208	10657	11585	10517	10714	11867	10686	10967	11979	11248	11360	11501	11670	11782	12092	12429	14650
20	11107	11248	8520	10208	10657	11473	10517	10714	11754	10686	10967	11867	11248	11332	11501	11642	11782	12092	12429	14650
21	11107	11248	8548	10208	10657	11473	10517	10714	11754	10686	10967	11867	11248	11389	11501	11642	11782	12092	12429	14650
22	11107	11248	8548	10208	10657	11557	10545	10742	11810	10714	11023	11951	11332	11473	11585	11726	11838	12148	12485	14650
23	11107	11248	8548	10208	10657	11529	10517	10714	11782	10686	10995	11923	11304	11445	11557	11698	11810	12120	12457	14650
25	11107	11248	8577	10236	10714	11585	10517	10714	11838	10686	10995	11923	11332	11501	11557	11754	11810	12120	12457	14791
26	11107	11248	8577	10236	10714	11614	10517	10714	11867	10686	10995	11923	11332	11501	11557	11754	11810	12120	12457	14791
27	11107	11248	8577	10236	10686	11585	10461	10686	11838	10657	10967	11895	11276	11445	11501	11698	11810	12092	12401	14791
28	11107	11248	8577	10236	10686	11529	10461	10686	11810	10657	10967	11867	11276	11445	11501	11698	11810	12063	12373	14791
H	**11360**	**11501**	**8577**	**10264**	**10826**	**11698**	**10686**	**10882**	**12035**	**10995**	**11164**	**12120**	**11529**	**11754**	**11810**	**11923**	**12007**	**12317**	**12654**	**15185**
L	**11107**	**11248**	**8352**	**10179**	**10657**	**11473**	**10461**	**10686**	**11754**	**10657**	**10967**	**11867**	**11248**	**11332**	**11501**	**11642**	**11782**	**12063**	**12373**	**13976**
A	**11244**	**11385**	**8475**	**10226**	**10707**	**11588**	**10553**	**10754**	**11870**	**10795**	**11043**	**11981**	**11360**	**11562**	**11587**	**11768**	**11851**	**12142**	**12485**	**14566**

H = Highest L = Lowest A = Average

UPCOUNTRY SPOT RATES

(Rs./Qtl)

Sr. No.	Growth	Grade Standard	Grade	Staple	Micronaire	Strength /GPT	Spot Rate (Upcountry) 2018-19 Crop February – March 2019					
	Standard Descriptions with Basic Grade & Staple in Millimetres based on Upper Half Mean Length [By law 66 (A) (a) (4)]						25th	26th	27th	28th	1st	2nd
1	P/H/R	ICS-101	Fine	Below 22mm	5.0-7.0	15	11107 (39500)	11107 (39500)	11107 (39500)	11107 (39500)	11107 (39500)	11107 (39500)
2	P/H/R	ICS-201	Fine	Below 22mm	5.0-7.0	15	11248 (40000)	11248 (40000)	11248 (40000)	11248 (40000)	11248 (40000)	11248 (40000)
3	GUJ	ICS-102	Fine	22mm	4.0-6.0	20	8577 (30500)	8577 (30500)	8577 (30500)	8577 (30500)	8577 (30500)	8633 (30700)
4	KAR	ICS-103	Fine	23mm	4.0-5.5	21	10236 (36400)	10236 (36400)	10236 (36400)	10236 (36400)	10236 (36400)	10264 (36500)
5	M/M	ICS-104	Fine	24mm	4.0-5.0	23	10714 (38100)	10714 (38100)	10686 (38000)	10686 (38000)	10686 (38000)	10686 (38000)
6	P/H/R	ICS-202	Fine	26mm	3.5-4.9	26	11585 (41200)	11614 (41300)	11585 (41200)	11529 (41000)	11557 (41100)	11642 (41400)
7	M/M/A	ICS-105	Fine	26mm	3.0-3.4	25	10517 (37400)	10517 (37400)	10461 (37200)	10461 (37200)	10461 (37200)	10461 (37200)
8	M/M/A	ICS-105	Fine	26mm	3.5-4.9	25	10714 (38100)	10714 (38100)	10686 (38000)	10686 (38000)	10686 (38000)	10686 (38000)
9	P/H/R	ICS-105	Fine	27mm	3.5.4.9	26	11838 (42100)	11867 (42200)	11838 (42100)	11810 (42000)	11838 (42100)	11895 (42300)
10	M/M/A	ICS-105	Fine	27mm	3.0-3.4	26	10686 (38000)	10686 (38000)	10657 (37900)	10657 (37900)	10657 (37900)	10657 (37900)
11	M/M/A	ICS-105	Fine	27mm	3.5-4.9	26	10995 (39100)	10995 (39100)	10967 (39000)	10967 (39000)	10967 (39000)	10967 (39000)
12	P/H/R	ICS-105	Fine	28mm	3.5-4.9	27	11923 (42400)	11923 (42400)	11895 (42300)	11867 (42200)	11895 (42300)	11951 (42500)
13	M/M/A	ICS-105	Fine	28mm	3.5-4.9	27	11332 (40300)	11332 (40300)	11276 (40100)	11276 (40100)	11304 (40200)	11332 (40300)
14	GUJ	ICS-105	Fine	28mm	3.5-4.9	27	11501 (40900)	11501 (40900)	11445 (40700)	11445 (40700)	11473 (40800)	11501 (40900)
15	M/M/A/K	ICS-105	Fine	29mm	3.5-4.9	28	11557 (41100)	11557 (41100)	11501 (40900)	11501 (40900)	11529 (41000)	11557 (41100)
16	GUJ	ICS-105	Fine	29mm	3.5-4.9	28	11754 (41800)	11754 (41800)	11698 (41600)	11698 (41600)	11726 (41700)	11754 (41800)
17	M/M/A/K	ICS-105	Fine	30mm	3.5-4.9	29	11810 (42000)	11810 (42000)	11810 (42000)	11810 (42000)	11838 (42100)	11867 (42200)
18	M/M/A/K/T/O	ICS-105	Fine	31mm	3.5-4.9	30	12120 (43100)	12120 (43100)	12092 (43000)	12063 (42900)	12092 (43000)	12092 (43000)
19	A/K/T/O	ICS-106	Fine	32mm	3.5-4.9	31	12457 (44300)	12457 (44300)	12401 (44100)	12373 (44000)	12373 (44000)	12373 (44000)
20	M(P)/K/T	ICS-107	Fine	34mm	3.0-3.8	33	14791 (52600)	14791 (52600)	14791 (52600)	14791 (52600)	14791 (52600)	14791 (52600)

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