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Regenerative Cotton Production

EXPERT's Column

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On 19th November 2022, the Centre for Responsible Business, New Delhi, a crusader for realising the UN Sustainable Development Goals along with Solidaridad, a Civil Society Organization promoting sustainable identity cotton and Regenagri an international regenerative agriculture initiative, joined hands and launched the Alliance of Cotton and Textile Stakeholders on Regenerative Agriculture (ACRE). ACRE is the first regenerative cotton platform in India aimed at promoting regenerative cotton farming practices by encouraging consumers and brands to engage with cotton farmers adopting regenerative cotton production practices. Before addressing the business agenda of regenerative cotton as a novel raw material for textile supply chain, this article introduces regenerative agriculture in the context of cotton.

Regenerative Agriculture in the Context of Current Cotton Production

Today majority of the cotton farmers aim to produce the highest yield and maximise profits. In this process, they manipulate the land resources through repeated mono-cropping, unrestricted primary and secondary tillage for soil tilth and weed control, imbalanced fertilizer use for crop nutrition and synthetic pesticides for pest management. For instance, the fertilizer

consumption by cotton in India has increased from 44 kg/ha in 1978-79 to 94.7 kg/ha in 2002-03 to 184 kg/ha at present. Often, these practices adversely affect soil health, accelerate degradation of land resources (soil and water), compromise below and above ground biodiversity and contribute to green house gas (GHG) emissions. Obviously, such a system cannot sustain cotton production in the long run.

Despite high inputs, this production system does not offer resilience against the vagaries of weather, adding to the economic risk. This challenge has created several new narratives for sustainable agriculture. Regenerative agriculture is one such initiative being promoted as an alternative system of crop production aimed at sustaining high yield while simultaneously improving soil health, increasing biodiversity, closing nutrient and water cycle and mitigating GHG induced climate change.

What Is Regenerative Agriculture - A Historical Perspective

During the pre-industrial era, regenerative agricultural practices were in vogue worldwide. Post green revolution, in the 1960s, the most dominant agricultural practices are tillage and input intensive open system where in both grain/seed cotton and crop residues are removed from the field. Along with it, soil, water, nutrients and energy are depleted creating a negative balance between inputs and outputs. Although this was realised much earlier, since 1970s several semi close and close designed alternate agricultural practices have been advocated. These systems embrace the concept of agro-ecology and aim at optimising the use of agro-ecosystem resources. Such systems include organic agriculture, sustainable agriculture, integrated farming, agro-forestry, permaculture, natural farming, conservation agriculture, biodynamic agriculture, rishi-krishi farming, vedic agriculture, etc. Regenerative agriculture is one such system; a semi-closed system designed to reduce external inputs and harmful impact on the farm and ecosystem.

Medard Gabel (USA) in 1979 first mentioned the term regenerative food system. In 1982, R.N Sampson (USA) documented that the current high input -high output, open ended tillage

Crop residue mulch

Bed planting in cotton

Cotton crop in Polymulch + Drip

Polymulching

PB Knot mating disruption for Pink bollworm control

Alley cropping in cotton

Goat penning in cotton field

Mechanical de-topping in cotton

Multitier cropping in cotton

dominated production systems are depleting the natural resources. A year later, in 1983, Robert Rodale articulated the term Regenerative Agriculture in its present context. Over the last three decades, the concept of Regenerative Agriculture has garnered intensive academic, public, political, producer (farmer) and consumer interest. Recently, the General Assembly of UN declared the decade 2021-2023 as UN decade of Ecosystem Restoration and gave a clarion call to prevent, halt and reverse degradation of ecosystems. The Regenerative Agriculture fits perfectly into this agenda. Today consumers are demanding cotton cultivated adopting regenerative agricultural practices. Despite these advances, a comprehensive definition still eludes Regenerative Agriculture. Based on 28 peer reviewed articles, Schreefel and co-workers from Netherlands in 2020 proposed a provisional definition of Regenerative Agriculture as an approach to farming that uses soil conservation as an entry to regenerate and contribute to multiply ecosystem services. While the terminology and definition of Regenerative Agriculture are relatively new, the philosophy of Regenerative Agriculture is deeply rooted in our traditional indigenous farming practices.

Principles and Practices of Regenerative Agriculture with Reference to Cotton

The principles of Regenerative Agriculture are universal with a focus on soil health. In practice, Regenerative Agriculture advocates both indigenous and innovative techniques of land stewardship based on the local biophysical and socioeconomic landscape. Its broad principles include-

i. Minimising soil disturbance

ii. Maintaining a living root system in the soil

iii. Keeping the soil surface covered

iv. Maximising biodiversity-crops, soil microbes and pollinators

v. Integrating livestock where ever it is feasible

vi. Adding C sources and closing nutrient cycles as long as possible.

vii. Reducing agrochemicals

Table 1: Good cotton growing practices that qualify as Regenerative Agricultural practices

Principles of Regenerative Agriculture	Good Cotton growing practices recommended
Minimising tillage	Reduced tillage, bed planting, intercropping, polymulching, post emergence herbicides (to minimise interculture), restricted deep ploughing in summer
Keeping the soil surface covered	Crop residue mulch, inter and cover crops, multitier cropping, polymulching, shredding cotton stalks in the field after harvest
Adding C sources and closing nutrient cycles	Adding organic manures (FYM, Vermicompost, compost), in-situ green manuring, addition of bio-char, sheep/goat penning, organic cotton production, biofertilizers
Maximising bio-diversity	Mixed/inter-cropping, trap cropping, planting refugia with Bt cotton, microbial inoculation (seed and soil), inundative release of bio-agents (parasites and predators),
Reducing agro-chemicals	Integrated nutrient management, integrated pest management, integrated weed management, mass trapping/mating disruption techniques, mechanical de-topping, ETL based spray scheduling, growing early maturing varieties with short fruiting window
Integrating livestock	Sheep/goat manure, integrated farming system, bullock (animal) power for farm operations
Maintaining living roots	Cotton-wheat/paddy double cropping, alley cropping in cotton

The benefits of Regenerative Agriculture include increased C sequestration, lower soil and water pollution, reduced GHG emission and reduced adverse impact of climate change and variability. However, adoption of Regenerative Agriculture by farmers would primarily depend on higher profits. Fortunately, some of the good agricultural practices recommended for cotton cultivation addresses these very core principles of Regenerative Agriculture. Some of these are listed in Table 1. These practices have evolved to reconstruct the soil borne and natural enemies of pests in the cotton ecosystem and reduce the use of inputs- chemical fertilizers, pesticides and water. Regenerative Agriculture does not prohibit the use of fertilizers or pesticides but advocates their judicious use.

Most of these principles except keeping living roots are already incorporated as cotton BMPs in India. Limitation in the length of crop growing period due to soil moisture availability does not permit maintaining of living roots around the year in rainfed cotton production systems. This is feasible only under irrigated cropping systems like cotton-wheat, cotton - paddy double

In-situ green manuring

Intercropping in cotton

Vermicompost unit

Shredding cotton stalks

cropping. In alley cropping system, the roots of perennial crop remain alive throughout the year.

The Regenerative Agriculture System Is Not Without Criticism

Its critics argue that agriculture becomes regenerative only when soil health is the primary product and the agricultural produce is secondary. The whole economics then becomes questionable. Are we trading the crop or carbon or both? Farmers who are now practicing conventional agriculture need to unlearn and acquire new knowledge and skills to switch over to regenerative production system. Moreover, Regenerative Agriculture claims extraordinary benefits but there are very few peer-reviewed, verified evidences that are replicable across cotton growing conditions.

Regenerative Cotton Cultivation- The Way Forward and The Role of Different Stakeholders

Despite criticism, it is now believed that adopting regenerative agricultural practices is an option for Indian cotton farmers for pursuing a more healthy and resilient production system. Such a system would ensure long term environmental, social and economic benefits. Transition of farmers to regenerative cotton production system would require location specific technologies and land holding during the initial years. All the stakeholders in the cotton value chain should engage with the farmers for a smooth transition of this production system.

Researchers need to establish Regenerative Agriculture systems in research farms and quantify the process and extent of C sequestered under representative soil and agro-climatic conditions of cotton growing areas. The effect of Regenerative Agriculture systems in imparting climate resilience must be quantified. Since Regenerative Agriculture practices are location specific in terms of climate, soil type, farmer preference, etc. Researchers need to validate the global Regenerative Agriculture practices, refine them and package them to suit local conditions. Reliable, simple but robust indicators are to be developed to quantify benefits of Regenerative Agriculture at farm level. The outcomes of these researches should be effectively communicated to different stakeholders.

National policies have to be formulated based on sound agro-ecological frameworks to promote RA. Socio-economic security of farmers should be included these policies.

Brands/industry should encourage, partner and invest in pilot projects in partnership with farmer producer groups/NGOs to popularise regenerative cotton production. Industry can also assist cotton farmers in the benefits from global carbon projects involved in trading carbon sequestered in regenerative cotton farms and help farmers maximise farm profits.

Conclusion

Environmental and socio-economic concerns of stakeholders along the cotton value chain have promoted several identity niche cotton initiatives. Regenerative cotton is one such initiative primarily focussing on nurturing the soils and promoting cotton ecosystem services contributing to improved cotton yield and profits. All the stakeholders along the cotton value chain have definite roles to promote Regenerative agricultural practices and make the cotton production system robust and climate resilient. Ultimately the ecosystem services provided by regenerative cotton farmers must be suitably recognised and rewarded.

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

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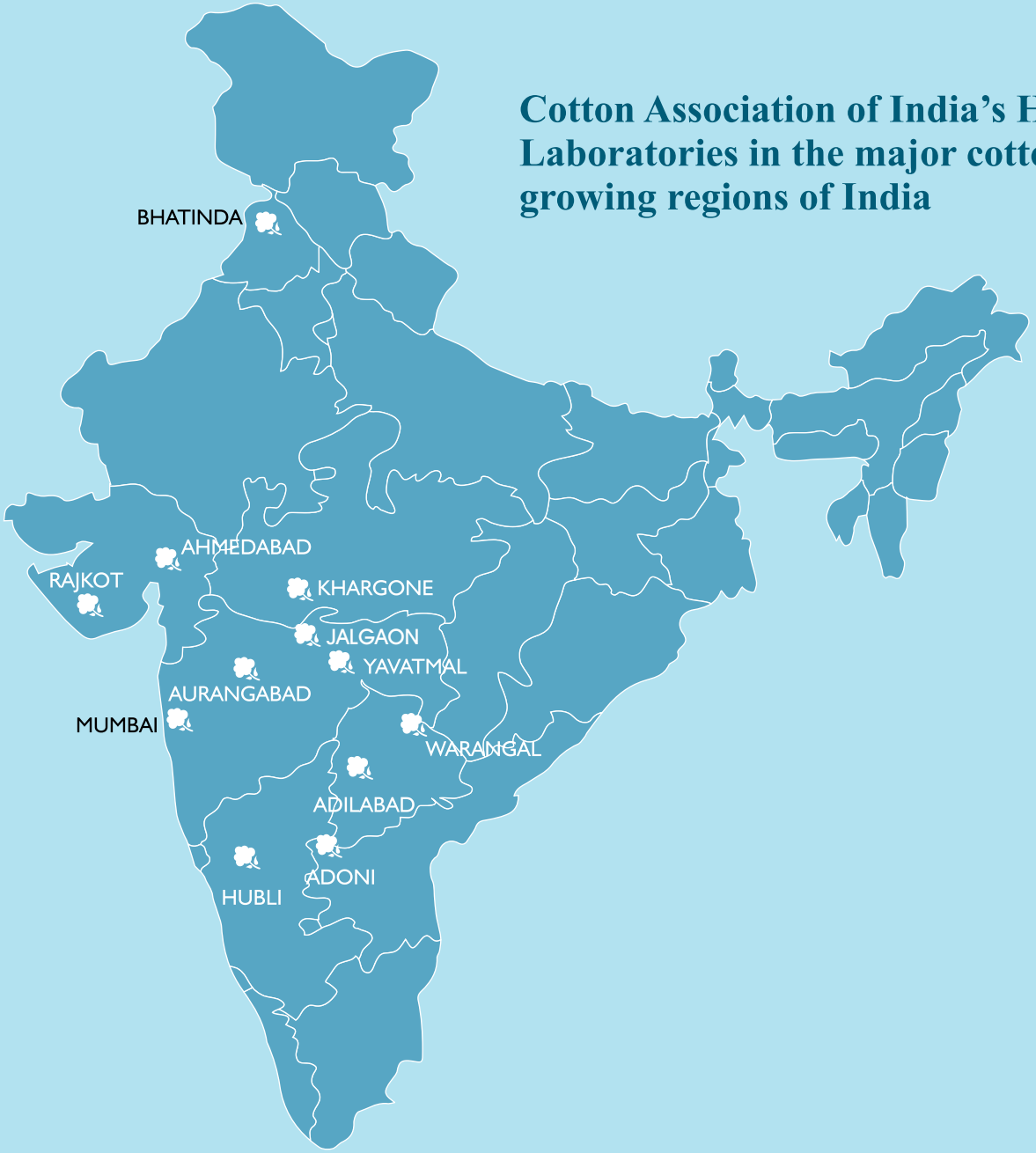

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CAI LABORATORIES AT DIFFERENT LOCATIONS

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UPCOUNTRY SPOT RATES

(Rs./Qtl)

Sr. No.	Growth	Grade Standard	Grade	Staple	Micronaire	Gravimetric Trash	Strength /GPT	Spot Rate (Upcountry) 2022-23 Crop February 2023 13th	14th	15th	16th	17th	18th
1	P/H/R	ICS-101	Fine	Below 22mm	5.0 – 7.0	4%	15	18081 (64300)	18081 (64300)	18137 (64500)	18053 (64200)	17969 (63900)	
2	P/H/R (SG)	ICS-201	Fine	Below 22mm	5.0 – 7.0	4.5%	15	18222 (64800)	18222 (64800)	18278 (65000)	18194 (64700)	18109 (64400)	
3	GUJ	ICS-102	Fine	22mm	4.0 – 6.0	13%	20	13273 (47200)	13469 (47900)	13385 (47600)	13104 (46600)	12963 (46100)	H
4	KAR	ICS-103	Fine	23mm	4.0 – 5.5	4.5%	21	- -	- -	- -	- -	- -	
5	M/M (P)	ICS-104	Fine	23mm	4.5 – 7.0	4%	22	16928 (60200)	17153 (61000)	17238 (61300)	17238 (61300)	17153 (61000)	
6	P/H/R (U) (SG)	ICS-202	Fine	27mm	3.5 – 4.9	4.5%	26	16872 (60000)	16956 (60300)	17013 (60500)	16984 (60400)	17013 (60500)	
7	M/M(P)/ SA/TL	ICS-105	Fine	26mm	3.0 – 3.4	4%	25	- -	- -	- -	- -	- -	O
8	P/H/R(U)	ICS-105	Fine	27mm	3.5 – 4.9	4%	26	17013 (60500)	17097 (60800)	17153 (61000)	17125 (60900)	17181 (61100)	
9	M/M(P)/ SA/TL/G	ICS-105	Fine	27mm	3.0 – 3.4	4%	25	16591 (59000)	16591 (59000)	16591 (59000)	16450 (58500)	16450 (58500)	
10	M/M(P)/ SA/TL	ICS-105	Fine	27mm	3.5 – 4.9	3.5%	26	16872 (60000)	16872 (60000)	16872 (60000)	16731 (59500)	16731 (59500)	L
11	P/H/R(U)	ICS-105	Fine	28mm	3.5 – 4.9	4%	27	17491 (62200)	17575 (62500)	17631 (62700)	17603 (62600)	17603 (62600)	
12	M/M(P)	ICS-105	Fine	28mm	3.7 – 4.5	3.5%	27	17013 (60500)	17153 (61000)	17294 (61500)	17266 (61400)	17181 (61100)	
13	SA/TL/K	ICS-105	Fine	28mm	3.7 – 4.5	3.5%	27	17153 (61000)	17294 (61500)	17434 (62000)	17406 (61900)	17322 (61600)	
14	GUJ	ICS-105	Fine	28mm	3.7 – 4.5	3%	27	17209 (61200)	17350 (61700)	17378 (61800)	17350 (61700)	17209 (61200)	I
15	R(L)	ICS-105	Fine	29mm	3.7 – 4.5	3.5%	28	17378 (61800)	17519 (62300)	17575 (62500)	17547 (62400)	17547 (62400)	
16	M/M(P)	ICS-105	Fine	29mm	3.7 – 4.5	3.5%	28	17434 (62000)	17519 (62300)	17631 (62700)	17603 (62600)	17519 (62300)	
17	SA/TL/K	ICS-105	Fine	29mm	3.7 – 4.5	3%	28	17491 (62200)	17575 (62500)	17687 (62900)	17659 (62800)	17575 (62500)	D
18	GUJ	ICS-105	Fine	29mm	3.7 – 4.5	3%	28	17575 (62500)	17716 (63000)	17744 (63100)	17716 (63000)	17575 (62500)	
19	M/M(P)	ICS-105	Fine	30mm	3.7 – 4.5	3.5%	29	17575 (62500)	17716 (63000)	17828 (63400)	17772 (63200)	17687 (62900)	
20	SA/TL/K/O	ICS-105	Fine	30mm	3.7 – 4.5	3%	29	17631 (62700)	17772 (63200)	17884 (63600)	17828 (63400)	17744 (63100)	
21	M/M(P)	ICS-105	Fine	31mm	3.7 – 4.5	3%	30	17716 (63000)	17856 (63500)	17969 (63900)	17912 (63700)	17856 (63500)	A
22	SA/TL/ K / TN/O	ICS-105	Fine	31mm	3.7 – 4.5	3%	30	17772 (63200)	17912 (63700)	18025 (64100)	17969 (63900)	17912 (63700)	
23	SA/TL/K/ TN/O	ICS-106	Fine	32mm	3.5 – 4.2	3%	31	17997 (64000)	18137 (64500)	18165 (64600)	18137 (64500)	18109 (64400)	
24	M/M(P)	ICS-107	Fine	34mm	2.8 - 3.7	4%	33	19825 (70500)	19965 (71000)	19965 (71000)	19965 (71000)	19965 (71000)	Y
25	K/TN	ICS-107	Fine	34mm	2.8 - 3.7	3.5%	34	20106 (71500)	20246 (72000)	20246 (72000)	20246 (72000)	20246 (72000)	
26	M/M(P)	ICS-107	Fine	35mm	2.8 - 3.7	4%	35	20387 (72500)	20528 (73000)	20528 (73000)	20528 (73000)	20528 (73000)	
27	K/TN	ICS-107	Fine	35mm	2.8 - 3.7	3.5%	35	20528 (73000)	20668 (73500)	20668 (73500)	20668 (73500)	20668 (73500)	

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