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Regenerative Cotton Farming for Combating Climate Change - Part I

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Introduction

Agriculture is increasingly becoming vulnerable to the rising threats of climate change and global warming. Regenerative agriculture (RA) is a revolutionary method that basically involves depositing carbon trapped from the air into the ground. Instead of tilling and using agrochemicals, farmers let nature do the work. RA makes use of natural processes to produce food and fibre, improve soil health and nutrient cycling and thus restore the agroecosystem. It involves employing a set of principles and practices and a range of strategies to combine biological and ecological processes, with the aim of boosting production and regaining the functionality of the landscape (Rhodes et al., 2017). The five basic principles

EXPERT'S Column

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of RA involve (i) no-till or minimal tillage; (ii) keeping the soil covered; (iii) ensuring as much live roots in the soil as possible; (iv) integrating livestock and agriculture; and (v) practicing crop and animal diversity (Brown, 2018).

Tillage is normally used to loosen and aerate the soil and to remove initial weeds. It often has a negative impact on soil life, soil structure and stability, leading to erosion. It also increases carbon mineralisation, leading to CO₂ emissions from the soil. Reducing soil disturbance helps protect soil organic matter, thus improving productivity. Organic fertilizers such as compost and solid manure with wide C/N ratios have a slow carbon turnover compared to other materials. They can be incorporated into the cotton-farming system to reduce CO₂ emissions. Including legumes in cotton cropping might increase carbon sequestration in cotton fields.

Farming practices that help store carbon in soils for longer periods lead to sustainable soil management practices. Higher carbon content in the soil improves soil health and fertility, soil structure, soil biodiversity, water-holding capacity and nutrient availability. Planting cover crops after the harvest of the main cotton crop helps fix carbon from the atmosphere by photosynthesis and enhance the biomass of the soil. This prevents soil erosion, reduces soil-borne diseases, increases water infiltration, fixes nutrients and increases biodiversity in the rhizosphere.

Regenerative cotton farming is practiced following the principles of RA. This has environmental, economic and social benefits for local communities as it creates more jobs and reduces poverty. This type of cotton farming is becoming popular among cotton growers and textile industries as demand from consumers for organic cotton is increasing. It also presents a reframing opportunity for the fabric and fashion industry, providing a sustainable alternative that can address environmental and social challenges.

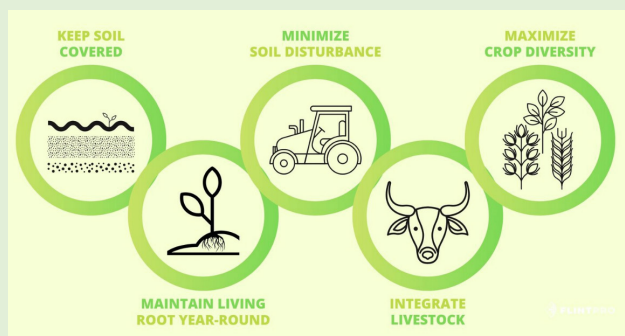


Fig1. Core principles of Regenerative Agriculture

Regenerative Cotton Farming in Enhancing Carbon Sequestration

Adopting regenerative farming globally would ensure that the carbon being emitted now is returned to the soil (Lovins, 2023). RA enhances native biodiversity and ensures reduction in the cost of cultivation of cotton. Use of water is optimised, because the carbon-rich soil ensures higher moisture retention. According to the Natural Resources Defense Council (NRDC), every 1% increase in soil organic matter (SOM) increases the soil's water-holding capacity by 75,708 liters per acre (Bryant, 2015). Thus, a 50-acre farm that improves its SOM by 2 % will hold an additional 75,70,800 liters of water after each rain. Regenerative cotton farming enables farmers to sequester vast amounts of atmospheric CO₂ as mineralised soil carbon, negating the climate crisis and still ensuring profit.

Agriculture production accounts for around 10% of annual emission (6.2 Gt) of CO₂. The food production system at large, including fertilizer and pesticide manufacturing, processing, transportation, refrigeration and waste disposal, accounts for 30% or more of total annual CO₂ emissions (Lal, 2007). Most agricultural soils have lost between 30% and 75% of their original soil organic carbon to the atmosphere due to conventional farming practices (Global Carbon Project, 2019). Improved soil management can help sequester 178 bt of atmospheric carbon by 2100 and when combined with increase in soil biomass, can help reduce atmospheric CO₂ concentrations by 157 parts per million (ppm).

If current levels of emissions of CO₂ into the atmosphere could be slowed down by reduction through soil and biomass improvements, pre-industrialisation levels, i.e. 263 ppm could be reached. Soil carbon sequestration improves biodiversity above and belowground by capturing CO₂ through photosynthesis, drawing it down underground as soil carbon, and locking it in SOM through rhizospheric microorganisms and mineral associations. In other words, soil carbon sequestration means maximising atmospheric CO₂ removal and minimising soil carbon losses. For soil carbon sequestration to occur, all of the soil organic carbon sequestered must originate from the atmospheric carbon pool and be transferred into SOM through plants, plant residues, microbial residues, and other organic solids (Olsen et al., 2014).

Regenerative Agricultural Practices Recommended by COP27

In the COP27 of United Nations Framework Convention on Climate Change held at Sharm el-Sheikh, Egypt, in November 2022, agriculture and food security were featured prominently, with governments working on stepping up action to adapt to climate change in the agriculture sector and cut greenhouse gas emissions from agricultural lands and animal husbandry.

Food and Agriculture for Sustainable Transformation (FAST) was launched on 12 November 2022 in COP27. This is a multi-stakeholder project that seeks to improve economic and food security while stepping up financing for the transformation of agriculture. It also aims to support adaptation efforts and achieve the 1.5°C global warming limit set forth in the

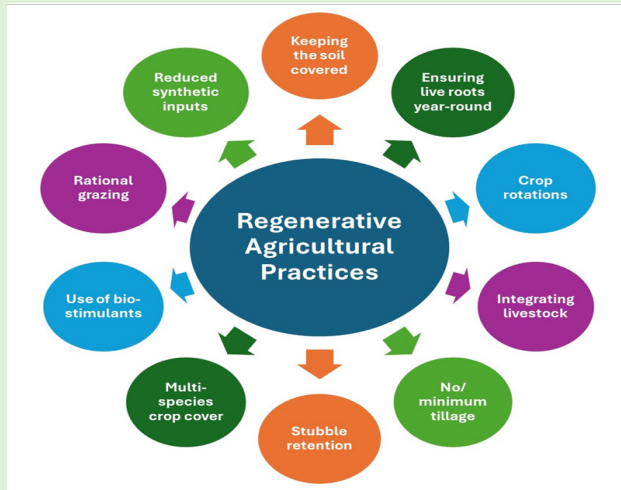


Fig. 2. Suggested practices for Regenerative Agriculture

Paris Agreement. Representatives from a variety of stakeholders, including foundations, banks, commercial sector and NGOs pledged support for the FAST initiative (Harris et al., 2022).

Recommendations of COP28

The Action Agenda of COP28 aims at improving the speed of transition of landscapes to RA practices, positively influencing the sustainability and resilience of food and agricultural systems. Twenty lead players across the agriculture value chain, along with farmers, civil society, financiers and local government representatives, were willing to consolidate efforts to collectively scale-up implementation and hectare transition commitments, especially leading up to COP30.

Regenerative Agricultural Practices Recommended by CGIAR

Climate Change, Agriculture and Food Security (CCAFA), a research program of the Consultative Group on International Agricultural Research (CGIAR) for mitigation of climate stress, advocates climate-smart laws, procedures, and services that help agriculture achieve three objectives. Considering the emerging challenges of climate change, it suggests a climate-smart-agriculture (CSA) approach that will restructure and reorient agricultural systems to ensure food security (Condur and Watson, 2018). The three objectives of CCAFA are:

- Sustainably increasing agricultural productivity to support equitable increases in incomes, food security, and development.
- Adapting and building resilience to climate change from farm to national levels.
- Reducing greenhouse gas emissions and sequestering carbon, where possible.

Agroecological Farming by UNEP

Agroecology, often known as ecological or regenerative agriculture, is one of the best ways to create a safer and more sustainable world in the post-COVID scenario. It challenges the “business-as-usual” agriculture model by relying on natural processes such as biological nitrogen fixation, biodiversity, and recycling rather than chemicals, which harm biodiversity and accelerate climate change. In addition to help achieve twelve of the 17 Sustainable Development Goals, such as ending world hunger and poverty, agroecology also gives farmers and the local community greater autonomy because it uses lesser external inputs and shortens value chains. The Food and Agriculture Organization (FAO), ICRAF, CIRAD, Biovision, CIFOR, TMG Think Tank for Sustainability, and UNEP make up the Transformative Partnership Platform (TPP) on agroecology (Al-Kaisi et al., 2020). This collaboration coordinates at the global, national, and local levels; links science, social movements, and local expertise to educate benefactors and policymakers and promotes innovation.

Regenerative Farming by World Wildlife Foundation

World Wildlife Foundation (WWF) aims to reduce agriculture’s contribution to climate change and promote more environmentally, economically and socially resilient farms. WWF India along with Laudes Foundation and IDH (Sustainable Trade Initiative) launched a programme “Regenerative Production Landscape: People, Nature, Economy”, based on regenerative and restorative farming principles in Chhindwara district of Madhya Pradesh. Under this program, producers grow agricultural commodities by following natural and RA principles that restore natural resources and reduce emissions from farming systems. In addition, smallholder farmers and communities thrive through improved economic stability, enhanced livelihoods and greater participation in decision making. Businesses are able to source raw materials responsibly, while creating inclusive supply-chain relationships (Khanna, 2020). In collaboration with partners, WWF India is coordinating an RA project to make cotton farming in the Satpura-Pench corridor more profitable and sustainable for local communities.

(To be continued)

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

Sr. No.	Parameters	Grade				Staple				Micronaire	
		Premium		Discounts		Premium		Discounts		Micronaire	Discount
		Grade	Premium Amount	Grade	Discount Amount	Staple	Premium Amount	Staple	Discount Amount		
16	M/M(P)	Superfine	+500	Fully Good	-700					3.0 - 3.2	-1200
	ICS-105										
	(Staple length 29mm)										
	Micronaire 3.7 - 4.5										
	(Grade:Fine)	Extra S. Fine	+800	Good	-1000					3.3 - 3.4	-800 (1.23)
Trash-3.5%Strength/GPT28		(1.23)		(1.53)					3.5 - 3.6	-400 (0.61)	
17	SA/TL/K	Superfine	+500	Fully Good	-700					3.0 - 3.2	-1200
	ICS-105										
	(Staple length 29mm)										
	Micronaire 3.7 - 4.5	Extra S. Fine	+800 (1.23)	Good	-1000 (1.53)					3.3 - 3.4	-800 (1.23)
	(Grade:Fine)										
Trash - 3% Strength/GPT 28									3.5 - 3.6	-400 (0.61)	
18	GUJ	Superfine	+500	Fully Good	-700	30	+700			3.0 - 3.2	-1200
	ICS-105										
	(Staple length 29mm)										
	Micronaire 3.7 - 4.5										
	(Grade:Fine)	Extra S. Fine	+800 (1.23)	Good	-1000 (1.53)					3.3 - 3.4	-800 (1.23)
Trash - 3% Strength/GPT 28									3.5 - 3.6	-400 (0.61)	
19	M/M(P)	Superfine	+500	Fully Good	-700					3.0 - 3.2	-1200
	ICS-105										
	(Staple length 30mm)										
	Micronaire 3.7 - 4.5	Extra S. Fine	+800	Good	-1000					3.3 - 3.4	-800 (1.23)
	(Grade:Fine)										
Trash-3.5%Strength/GPT29		(1.23)		(1.53)					3.5 - 3.6	-400 (0.61)	
20	SA/TL/K/O	Superfine	+500	Fully Good	-700					3.0 - 3.2	-1200
	ICS-105										
	(Staple length 30mm)										
	Micronaire 3.7 - 4.5										
	(Grade:Fine)	Extra S. Fine	+800	Good	-1000					3.3 - 3.4	-800 (1.23)
Trash - 3% Strength/GPT 29		(1.23)		(1.53)					3.5 - 3.6	-400 (0.61)	
21	M/M(P)	Superfine	+500	Fully Good	-700					3.0 - 3.2	-1200
	ICS-105										
	(Staple length 31mm)										
	Micronaire 3.7 - 4.5	Extra S. Fine	+800	Good	-1000					3.3 - 3.4	-800 (1.23)
	(Grade : Fine) Trash - 3% Strength/GPT 30										
		(1.23)		(1.53)					3.5 - 3.6	-400 (0.61)	
22	SA/TL/K/IN/O	Superfine	+500	Fully Good	-700					3.0 - 3.2	-1200
	ICS-105										
	(Staple length 31mm)										
	Micronaire 3.7 - 4.5	Extra S. Fine	+800	Good	-1000					3.3 - 3.4	-800 (1.23)
	(Grade : Fine) Trash - 3% Strength/GPT 30										
		(1.23)		(1.53)					3.5 - 3.6	-400 (0.61)	

Sr. No.	Parameters	Grade				Staple				Micronaire	
		Premium		Discounts		Premium		Discounts		Micronaire	Discount
		Grade	Premium Amount	Grade	Discount Amount	Staple	Premium Amount	Staple	Discount Amount		
23	SA/TL/K/TN/O	Superfine	N.A.	Fully Good	N.A.			31	N.A.	3.0 - 3.2	N.A.
	ICS-106										
	(Staple length 32mm)										
	Micronaire 3.5 - 4.2	Extra S. Fine	N.A.	Good	N.A.					3.3 - 3.4	N.A.
	(Grade : Fine) Trash - 3% Strength/GPT 31										
24	M/M(P)	Superfine	+1200	Fully Good	-1000	35	+1500	33	-1500	2.5 - 2.7	-700
	ICS-107										
	(Staple length 34mm)		(1.84)		(1.53)		(2.30)		(2.30)		(1.07)
	Micronaire 2.8 - 3.7	Extra S. Fine	N.A.	Good	-1500	36	+3000				
	(Grade : Fine) Trash - 4% Strength/GPT 33				(2.30)	(4.60)					
25	K/TN	Superfine	+1200	Fully Good	-1000	35	+1000	33	-1500	2.5 - 2.7	-700
	ICS-107										
	(Staple length 34mm)		(1.84)		(1.53)		(1.53)		(2.30)		(1.07)
	Micronaire 2.8 - 3.7	Extra S. Fine	N.A.	Good	-1500	36	+2500				
	(Grade : Fine) Trash - 3.5% Strength/GPT 34				(2.30)	(3.83)					
26	M/M(P)	Superfine	+1200	Fully Good	-1000	36	+1500	34	-1500	2.5 - 2.7	-700
	ICS-107										
	(Staple length 35mm)		(1.84)		(1.53)		(2.30)		(2.30)		(1.07)
	Micronaire 2.8 - 3.7	Extra S. Fine	N.A.	Good	-1500						
	(Grade : Fine) Trash - 4% Strength/GPT 35				(2.30)						
27	K/TN	Superfine	+1200	Fully Good	-1000	36	+1500	34	-1000	2.5 - 2.7	-700
	ICS-107										
	(Staple length 35mm)		(1.84)		(1.53)		(2.30)		(1.53)		(1.07)
	Micronaire 2.8 - 3.7	Extra S. Fine	N.A.	Good	-1500						
	(Grade : Fine) Trash - 3.5% Strength/GPT 35				(2.30)						

Conversion factor – 651.97 based on the RBI closing exchange rate of 1 US \$ = Rs.83.16 prevailing on 22nd December 2023

Figures in bracket denotes value difference in Cents per Lb.

Note :

- (1) These Value Differences are applicable to domestic trade.
- (2) The above differences are merely indicative in nature. Cotton Association of India gives no warranty as to the accuracy or completeness of information contained herein and accepts no legal responsibility howsoever arising in relation to such information.
- (3) Premium and Discount mentioned in Indian Rupees above will remain constant for one month whereas the same mentioned in Cents per Lb. will vary as per the exchange rate fixed by the Reserve Bank of India.

UPCOUNTRY SPOT RATES								(Rs./Qtl)					
Standard Descriptions with Basic Grade & Staple in Millimetres based on Upper Half Mean Length [By law 66 (A) (a) (4)]								Spot Rate (Upcountry) 2022-23 Crop January 2024					
Sr. No.	Growth	Grade Standard	Grade	Staple	Micronaire	Gravimetric Trash	Strength /GPT	15th	16th	17th	18th	19th	20th
3	GUJ	ICS-102	Fine	22mm	4.0 – 6.0	13%	20	11867 (42200)	11810 (42000)	11810 (42000)	11754 (41800)	11698 (41600)	11698 (41600)
4	KAR	ICS-103	Fine	22mm	4.5 – 6.0	6%	21	13413 (47700)	13413 (47700)	13413 (47700)	13357 (47500)	13357 (47500)	13357 (47500)
								Spot Rate (Upcountry) 2023-24 Crop					
1	P/H/R	ICS-101	Fine	Below 22mm	5.0 – 7.0	4%	15	13048 (46400)	13048 (46400)	13048 (46400)	12991 (46200)	12963 (46100)	12963 (46100)
2	P/H/R (SG)	ICS-201	Fine	Below 22mm	5.0 – 7.0	4.5%	15	13188 (46900)	13188 (46900)	13188 (46900)	13132 (46700)	13104 (46600)	13104 (46600)
5	M/M (P)	ICS-104	Fine	23mm	4.5 – 7.0	4%	22	14904 (53000)	14904 (53000)	14904 (53000)	14904 (53000)	14904 (53000)	14904 (53000)
6	P/H/R(U) (SG)	ICS-202	Fine	27mm	3.5 – 4.9	4.5%	26	14566 (51800)	14566 (51800)	14566 (51800)	14510 (51600)	14510 (51600)	14538 (51700)
7	M/M(P)/SA/TL	ICS-105	Fine	26mm	3.0 – 3.4	4%	25	-	-	-	-	-	-
8	P/H/R(U)	ICS-105	Fine	27mm	3.5 – 4.9	4%	26	14707 (52300)	14707 (52300)	14707 (52300)	14650 (52100)	14650 (52100)	14679 (52200)
9	M/M(P)/SA/TL/G	ICS-105	Fine	27mm	3.0 – 3.4	4%	25	13638 (48500)	13638 (48500)	13582 (48300)	13582 (48300)	13582 (48300)	13610 (48400)
10	M/M(P)/SA/TL	ICS-105	Fine	27mm	3.5 – 4.9	3.5%	26	14341 (51000)	14341 (51000)	14341 (51000)	14341 (51000)	14341 (51000)	14369 (51100)
11	P/H/R(U)	ICS-105	Fine	28mm	3.5 – 4.9	4%	27	14875 (52900)	14875 (52900)	14847 (52800)	14819 (52700)	14819 (52700)	14847 (52800)
12	M/M(P)	ICS-105	Fine	28mm	3.7 – 4.5	3.5%	27	15016 (53400)	15016 (53400)	14988 (53300)	15016 (53400)	15044 (53500)	15100 (53700)
13	SA/TL/K	ICS-105	Fine	28mm	3.7 – 4.5	3.5%	27	15072 (53600)	15072 (53600)	15044 (53500)	15072 (53600)	15100 (53700)	15157 (53900)
14	GUJ	ICS-105	Fine	28mm	3.7 – 4.5	3%	27	15297 (54400)	15297 (54400)	15241 (54200)	15297 (54400)	15297 (54400)	15353 (54600)
15	R(L)	ICS-105	Fine	29mm	3.7 – 4.5	3.5%	28	15157 (53900)	15157 (53900)	15129 (53800)	15100 (53700)	15100 (53700)	15129 (53800)
16	M/M(P)	ICS-105	Fine	29mm	3.7 – 4.5	3.5%	28	15297 (54400)	15297 (54400)	15269 (54300)	15297 (54400)	15325 (54500)	15382 (54700)
17	SA/TL/K	ICS-105	Fine	29mm	3.7 – 4.5	3%	28	15353 (54600)	15353 (54600)	15325 (54500)	15353 (54600)	15382 (54700)	15438 (54900)
18	GUJ	ICS-105	Fine	29mm	3.7 – 4.5	3%	28	15522 (55200)	15522 (55200)	15466 (55000)	15522 (55200)	15522 (55200)	15578 (55400)
19	M/M(P)	ICS-105	Fine	30mm	3.7 – 4.5	3.5%	29	15494 (55100)	15494 (55100)	15466 (55000)	15494 (55100)	15522 (55200)	15578 (55400)
20	SA/TL/K/O	ICS-105	Fine	30mm	3.7 – 4.5	3%	29	15550 (55300)	15550 (55300)	15522 (55200)	15550 (55300)	15578 (55400)	15635 (55600)
21	M/M(P)	ICS-105	Fine	31mm	3.7 – 4.5	3%	30	15775 (56100)	15775 (56100)	15747 (56000)	15775 (56100)	15803 (56200)	15860 (56400)
22	SA/TL/K/TN/O	ICS-105	Fine	31mm	3.7 – 4.5	3%	30	15832 (56300)	15832 (56300)	15803 (56200)	15832 (56300)	15860 (56400)	15916 (56600)
23	SA/TL/K/TN/O	ICS-106	Fine	32mm	3.5 – 4.2	3%	31	N.A. (N.A.)	N.A. (N.A.)	N.A. (N.A.)	N.A. (N.A.)	N.A. (N.A.)	N.A. (N.A.)
24	M/M(P)	ICS-107	Fine	34mm	2.8 - 3.7	4%	33	21652 (77000)	21652 (77000)	21652 (77000)	21652 (77000)	21652 (77000)	21652 (77000)
25	K/TN	ICS-107	Fine	34mm	2.8 - 3.7	3.5%	34	21934 (78000)	21934 (78000)	21934 (78000)	21934 (78000)	21934 (78000)	21934 (78000)
26	M/M(P)	ICS-107	Fine	35mm	2.8 - 3.7	4%	35	22215 (79000)	22215 (79000)	22215 (79000)	22215 (79000)	22215 (79000)	22215 (79000)
27	K/TN	ICS-107	Fine	35mm	2.8 - 3.7	3.5%	35	22496 (80000)	22496 (80000)	22496 (80000)	22496 (80000)	22496 (80000)	22496 (80000)

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