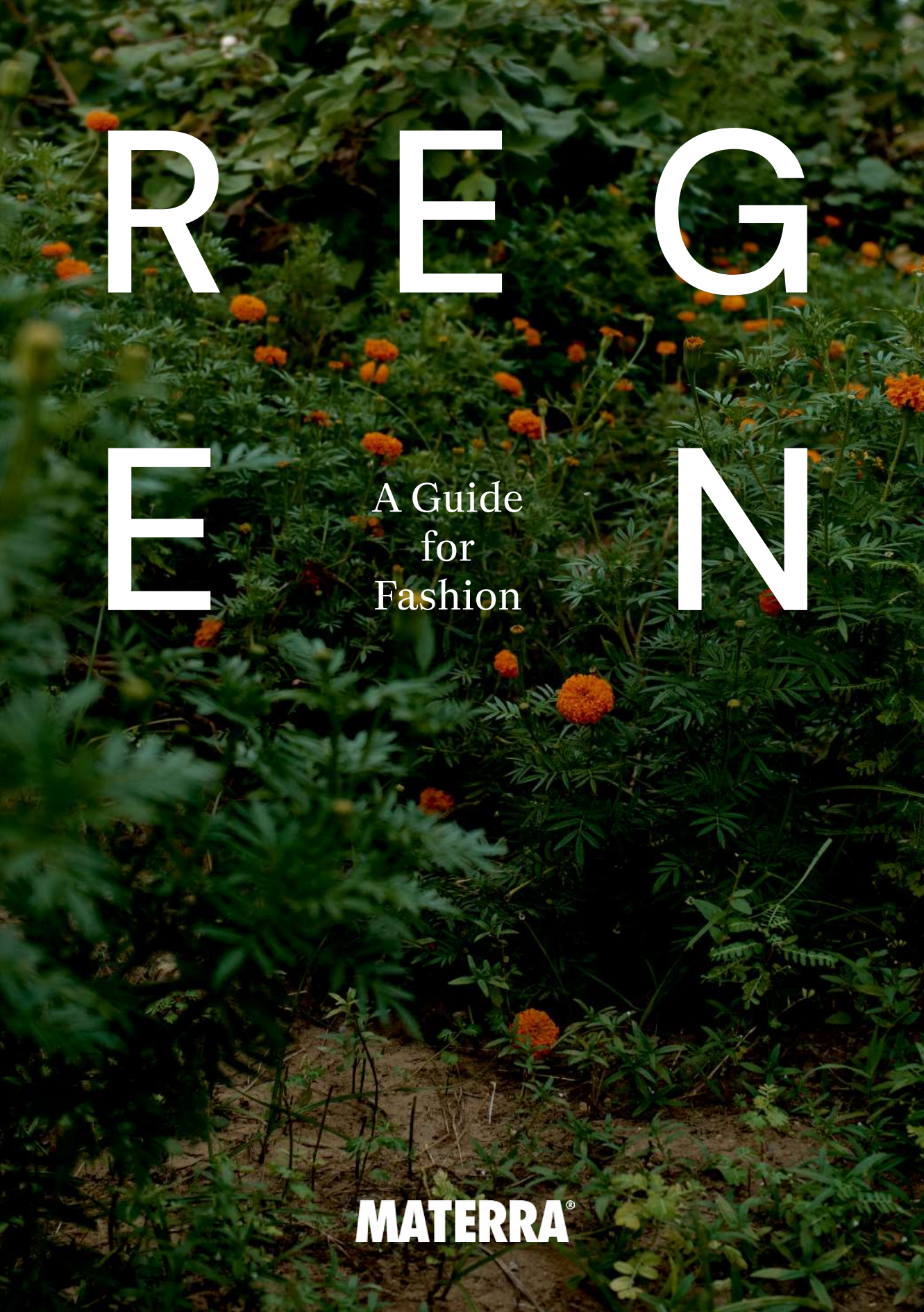
REGEN
A Guide for Fashion
MATERRA®

Regen Farming

NAVJEEVAN KHETI

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01

ABOUT MATERRA

Materra is a regenerative cotton + tech company helping fashion meet its ambitious sourcing and impact goals — with the data to prove it.

Working with and for smallholder farmers, we build custom regenerative cotton farming programs and supply chains that are climate-resilient, traceable and equitable. Through our AI-powered proprietary technology, we are digitalizing the base of the fashion supply chain, providing fashion brands and textile mills with what they most need today: data to stay compliant with regulations, supply chain insurance against climate disruption, true connection with the farmers they partner with and rich stories to communicate with consumers.

Our mission is to make farmers the stewards of the land, give nature a voice, and help fashion set the template for supply chain transparency and verifiable impact.

With over 55 experienced team members in the UK, India and in-field, Materra has a multi-disciplinary team — farmers and scientists, implementation experts who've managed mega cotton programs for decades, and designers crafting purposeful tools and tech.

Learn more about our industry-leading regenerative cotton program at www.materra.tech

02

WHAT IS REGEN?

If you do just five minutes of online research into regenerative agriculture, you'll likely learn two things: Regenerative farming has emerged as THE buzzword in agriculture and the food, fashion, and cosmetics industries over the last decade, and yet no one seems to agree what it means. Here's how we view regenerative (or regen as we often use through this guide, and known as *Navjeevan Kheti* in Hindi) : Regeneration is ultimately about restoring and enhancing life in a system.

Regenerative agriculture is farming in a way that enhances the vitality of the whole farm ecosystem and builds its capacity to evolve, renew, and to regenerate the resources it needs to thrive. A key aspect of regenerative farming is that farmers are supported and incentivized to adopt the growing practices that promote this overall system health.

Regenerative farming principles and practices draw on traditional agroecological and Indigenous knowledge systems and are validated by modern scientific research. While the principles are universally applicable, the specific appropriate practices are place-based and context-specific.

Regenerative agriculture is most fundamentally about relationships – about how we see our relationship to the physical world on which we depend for our sustenance. It is an ecological worldview: seeing the world not as a storehouse of resources to be extracted, but as a web of reciprocal relationships and complex dynamics that supports all forms of life, including human life.

Our work with smallholder cotton farmers in India is guided by the same principles that guide Materra at a company level: a holistic consideration of whole-system health, maximising diversity, fostering relationships and trust, evolving the capacity of all stakeholders, and respecting place-based and traditional knowledge–all while being innovative, forward-looking, and open to change. But regenerative agriculture goes beyond practices and outcomes. Crucially, it centres farmers as partners and ensures adequate compensation and risk-sharing mechanisms as they make the transition to regenerative.

Right now, farmers around the world are under pressure to maximise yields and increase productivity at all costs, just to make a decent livelihood. It is very rare that a farmer has the resources and the buffer (financial and otherwise) to transition to a different land management regime and to bear the risk, such as new infrastructure investments combined with lower initial yields for a few years, that such a transition will inevitably entail.

The regenerative agriculture movement as a whole – if we can call it a movement – has not adequately addressed equity, social and economic justice issues such as access to farmland and the economic struggles of farmers worldwide, or the indebtedness of modern “regen ag” to indigenous and traditional agroecological farming approaches.

Whatever our definition of regenerative agriculture is, it needs to include people. It needs to include what is needed for the farmers to farm regeneratively. Farmers need to be provided agronomic support or financial incentives, or preferably both, to adopt practices that are better for the health of the entire system. This is not an icing on the cake, or a nice-to-have; it’s foundational.

Regeneration is not a flip of a switch: it’s a process and a journey that takes time and requires a long-term commitment. It has the potential to completely transform our materials supply and farming systems. But we need to both zoom in and zoom out: zoom in to see the nuance and complexity of what ecological dynamics are at play in a particular place or context, and zoom out to see the whole system within which the farmers are farming, and make regenerative farming viable at that level.

REGENERATIVE AGRICULTURE
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(A) WHAT DO REGENERATIVE PRACTICES LOOK LIKE?

Key takeaways:

- Materra's three-pronged approach focuses on reducing resource use, restoring biodiversity, and raising farmer livelihoods.
- Regen practices focus on fostering biodiversity, reducing off-farm inputs and building soil health and farm resilience.
- This also benefits farmers by lowering input costs, improving health, and enhancing financial and food security.

Materra's approach is based on three pillars:

- Reducing resource use: This includes reducing carbon impact, improving water stewardship, reducing reliance on chemical inputs and implementing biological pest management practices.
- Restoring biodiversity: This includes helping living ecosystems flourish with better soil management, crop diversity and the use of beneficial insects.
- Raising farmer livelihoods: This includes co-designing with farmers, increasing farmer profits, incorporating local knowledge and building resilience in the field.

The appropriate regen farming practices vary depending on context, type of farming enterprise, crop, climate, and so on. The following practices apply to the context in which Materra works: cotton production in India.

- Keep nutrients, water and other resources circulating within the farm system as long as possible. This includes using fertilisers made with organic farmyard ingredients instead of chemical inputs, using on-farm plant residue as mulch, or implementing water catchment systems in fields.

- Increase biodiversity and maximise mutually beneficial relationships to keep the whole system in balance.

- In general, foster diversity rather than monocultures consisting of a single crop, through practices such as intercropping, cover cropping, green manuring, farm border tree planting etc. A diverse landscape is more resilient than a monocrop or monoculture landscape: the interactions and synergies between different species create dynamic flows of resources, nutrients and energy that, in turn, activate new biological processes.

A diverse system is resilient and adaptable to shocks and changes: a single pest invasion, disease, or adverse weather event can wipe out a monocrop field, whereas in a diverse system, different species are adapted to different conditions, and also support each other.

For example, one crop may tolerate drought or flooding better than another, so the farmer can count on at least one crop; or one plant species can attract insects that are a predator for the pests of another plant species.

- Eliminate or drastically reduce the amount of synthetic chemicals (for example, by using bio-inputs as fertilisers or pesticides, or using physical traps or trap crops to reduce pests). Many synthetic agrochemicals are harmful to soil life, wildlife, and humans.

- Build soil organic matter to increase fertility, water-holding capacity, and overall soil health (for example, through using organic mulches, and cover cropping and green manuring). Soil health is the foundation of a healthy farm. A diversity of microorganisms in the soil helps plants to access nutrients better. Having earthworms, insects, and a good amount of organic matter creates good soil structure: well-aerated, porous soil can absorb and retain more water, whereas in the case of depleted, compacted soil, rainwater does not percolate and instead washes away, eroding precious topsoil and creating a vicious cycle of soil degradation.

- Increase farm climate resilience and adaptive capacity, for example by improving soil water holding capacity so that it can act as a buffer in case of either drought or flooding, or by reducing erosion through practices such as mulching, cover cropping or planting border trees or shrubs.

All of these practices benefit farmers as well. Replacing synthetic chemicals with bio-inputs reduces the toxicity load that farmers are exposed to, thus protecting their health. When less money is spent on external inputs, farmers get to keep more of their profit. Incorporating a diversity of plants and crops, including food crops, increases farmers' financial and food security. Building healthy soil and more diverse farming systems is an asset for the future, ensuring productivity, better adaptability, and a viable farming livelihood in a changing climate.

However, regenerative agriculture should not be reduced to a set of practices alone. The starting point should be, rather: What are we trying to achieve in the landscape or system, and why? Once you're clear with that, it's easy to start identifying the appropriate practices for a given context.

(B)
THE DIFFERENCE BETWEEN REGEN AND ORGANIC COTTON

The organic cotton movement has done invaluable work supporting farmers to transition to better land management practices, and raising awareness among consumers about the impacts of conventional farming practices – especially chemical pesticides and fertilisers – on ecosystem and human health. Where organic cotton has not succeeded is in scaling at a global level to meet the market; Organic and Fair Trade today account for only a sliver of agricultural production. Many excellent farmers face barriers to organic cotton certification, such as the often eye-watering costs of paperwork and logistics, and may choose to not get certified even though they follow organic practices.

Key takeaways:

- Organic cotton focuses on avoiding synthetic inputs, but its check-box approach doesn't always guarantee biodiversity, soil health, or healthy farms and farmers.
- Compared to a practice-driven approach, regen at Materra takes a more outcomes-driven, contextual, and adaptable approach, meeting farmers where they are at.

One of the downsides of organic is that the focus has been excessively on the certification, which has promoted a "checking boxes" mentality. Insofar as organic certification primarily signals what is being avoided, i.e. synthetic pesticides and fertilizers, their removal does not automatically mean that a farm ecosystem or the soil becomes healthy. There are additional land management practices that need to be adopted. While many organic farmers, especially family and smallholder farmers, do adopt the full range of these practices (such as compost, intercropping and multicropping, biological pest management etc.), the certification is not in any way a guarantee that they are all adopted.

There are many heavily tilled, large-scale organic monoculture farms in the world that lack biodiversity, have lifeless soils and are "organic in name only" (Carter *et al.*, 2019). The "organic" label is not an automatic guarantee that what you'll find at these farms is soil squirming with life, or pollinators buzzing across a diverse range of plants, or a sense of health and vitality.

Organic is a centralised standard focused on practices; regenerative agriculture (for us at Materra) is rather an outcomes-based approach that can be adapted and adjusted based on context. Context is important because what makes sense on one farm in India may not make sense on a farm in a different district, state or country. What is "regenerative" for a thousand-acre grain and soybean farm in the American Midwest looks very different from what might be appropriate practices for a coconut and aquaculture system in Southeast Asia, or a smallholder cotton farm in India.

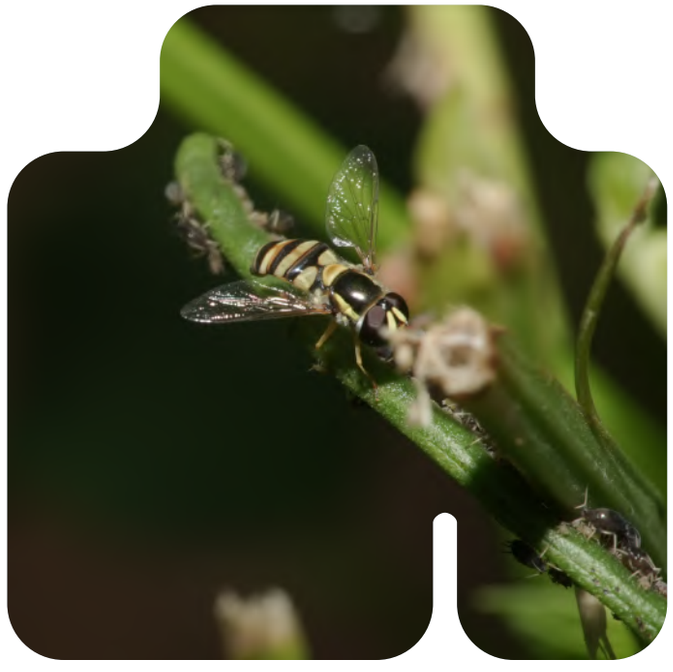
And while the organic standard requires the immediate stop of synthetic fertilisers and pesticides, regenerative farming at Materra adopts a phased reduction approach instead.

But crucially, because regenerative is a holistic approach, it seeks to increase biodiversity and most importantly to foster the social and economic well-being of the farmer community, whereas these are not part of the organic requirement.

It will not be equally easy for all farmers to immediately make the switch from conventional to regenerative practices. With that in mind, Materra seeks to meet farmers where they are at and set goals that are realistic and attainable for that particular farmer and their particular situation.

The relationship between organic and regen has been subject to some lively debate. On the one hand, some feel that regenerative should not take the path that organic has taken, separating itself into a rigid certification and potentially risking becoming siloed. But others express concern that removing the requirement of "organic" from the definition of regenerative may have "opened the door to the potential use of the term regenerative agriculture for green-washing agricultural practices that are irreversibly tied to agrochemical inputs" (Tittonell *et al.*, 2022).

Organic and regenerative cotton both aim to change the resource-intensive, conventional methods of farming. However the approaches can be vastly different, making it important to not rely on a certificate.



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HEAVILY TILLED, LARGE-SCALE ORGANIC MONOCULTURE FARMS IN THE WORLD

THAT LACK BIODIVERSITY

HAVE LIFELESS SOILS AND ARE

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THE “ORGANIC” LABEL

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THAT WHAT YOU’LL FIND AT THESE FARMS

IS SOIL SQUIRMING WITH LIFE,

OR
POLLINATORS BUZZING ACROSS A DIVERSE RANGE OF PLANTS,

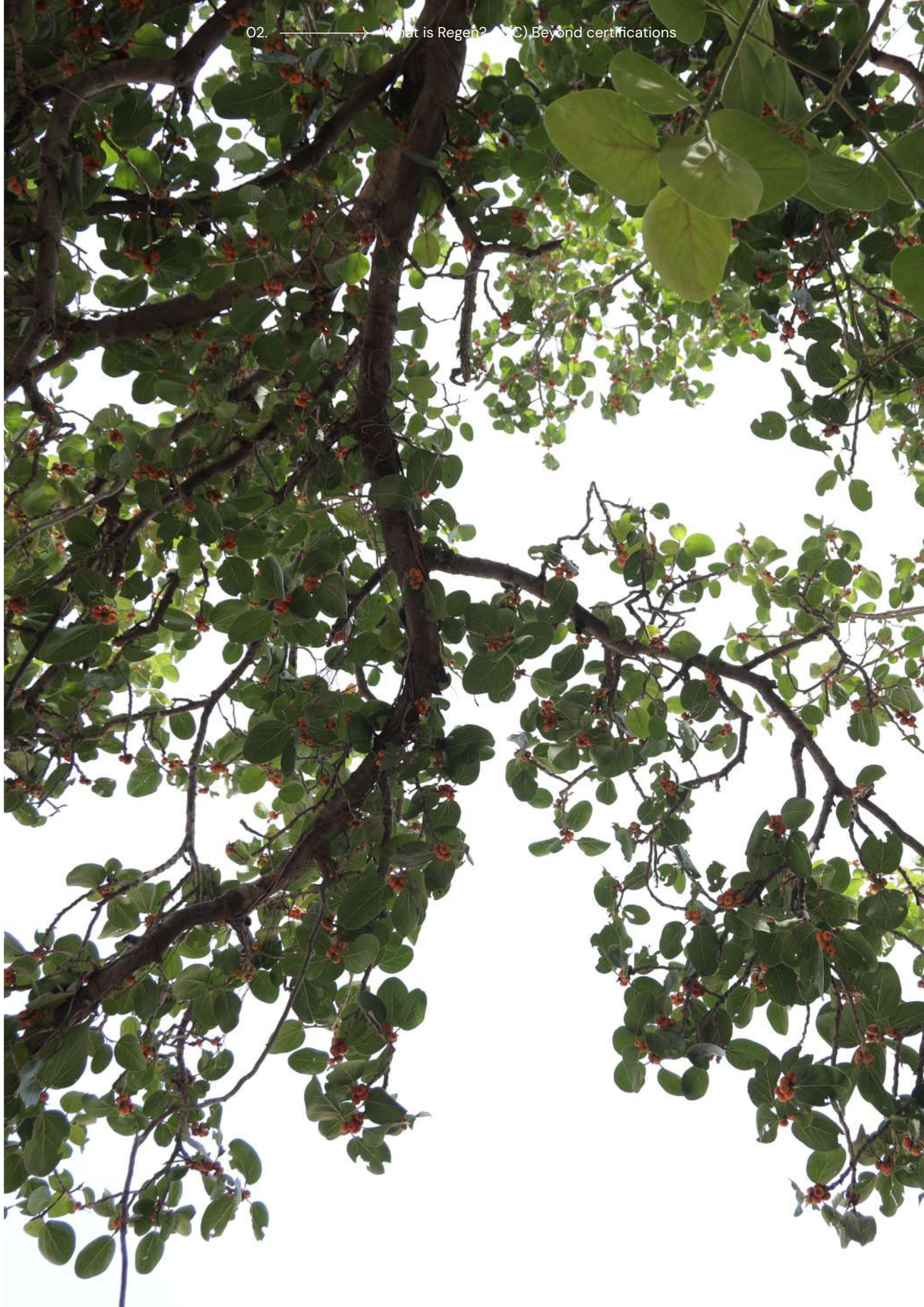
OR
A SENSE OF HEALTH AND VITALITY.

(C) BEYOND CERTIFICATIONS

At Materra, our approach to organic is essentially the same as our approach to any accreditation or certification. We seek to go beyond certification. Rather than an accurate measure of ecological and social wellbeing, certification often becomes a mechanical tick-box process and isn't adapted to the unique context of a particular farming project. Many certification schemes are plagued by data fraud, inadequate standards, and a foundational lack of farmer support.

We believe that certification can play a role but it should not be the only thing to aspire to. We are currently working with the Regenagri and ROC (Regenerative Organic Cotton) certifications, and could theoretically add any certification to our toolbox that aligns well with our approach. But the certification is not the end point – it's the starting point. We aim to do much more, because that is what is necessary for the fashion industry.

To take just one example, we are committed to paying a farmer incentive even though it is NOT required by the certification programs we work with. That is because farmer support is at the core of the Materra ethos, independent of what any certification prescribes.



03

DEBUNKING MYTHS

In partnership with

Cotton Diaries

Regen often has several inaccurate beliefs associated with it. We've partnered with the experts at Cotton Diaries to debunk some of them. Cotton Diaries is a global collective of cotton experts, passionate about making cotton systems more resilient and just. They're the incredible folks behind *Cotton at The Source* (along with A Growing Culture), and *Cotton: A Case Study in Misinformation* (along with Transformers Foundation).

About the writers, Ani Wells and Simon Ferrigno: Ani is the Founder of Simply Suzette that aims to democratize access to information on best practices in apparel production, as well as amplify the voices of the unsung heroes in our industry through digestible content.

Simon is a writer and researcher focusing on cotton and sustainability. He has previously worked at the International Institute for Environment and Development, as well as Pesticide Action Network UK. Currently, he writes for Ecotextile News while consulting with various NGOs and brands.

MYTH 1: “REGENERATIVE IS ALL ABOUT SOIL CARBON SEQUESTRATION”

Written by Ani Wells

When we hear the term “regenerative,” many of us immediately think of carbon sequestration. But, regenerative does not equate to carbon sequestration. It means so much more than that. It’s like when people assume my role as a communications director is solely about marketing, yet my comms colleagues know it involves a vast array of strategic, creative, and relational facets beyond mere promotion. Regenerative agriculture, much like the diverse world of communications, offers so much more than one might initially believe. It nurtures ecosystems, enhances soil health, bolsters food security, and fosters local biodiversity.

What is Carbon Sequestration?

At its core, carbon sequestration in agriculture is the process of capturing and storing atmospheric carbon dioxide in soils and plant biomass through photosynthesis, and a focus on long-term storage in soil organic matter (Budiman Minasny *et al.*, 2023). Photosynthesis is only part of the journey: it draws down CO_2, but storage is from healthy, (relatively) undisturbed soils.

Carbon sequestration is a critical function of natural and agricultural landscapes, reducing the amount of CO_2 in the atmosphere. However, the captured carbon is not permanent and can be reversed without ongoing management. That’s why enhanced soil health and increased organic matter, a potential benefit of regenerative agriculture, are so important for ongoing management and why regenerative agriculture means so much more than carbon sequestration.

Practices Beyond Carbon Capture

Carbon sequestration is often the headline because it’s quantifiable and directly tied to climate change mitigation. For those who love numbers, the inability to measure certain benefits can be uncomfortable, especially as reporting measures increasingly demand climate data. Regenerative agriculture gets narrowly defined by this aspect because of the urgency to address global warming, as well as communicate how one is addressing it. But focusing exclusively on carbon capture is like going to a concert and wearing earplugs–you miss out on the full experience.

Techniques like crop rotation, and cover cropping can lead to carbon sequestration, but they will also improve soil health, boost food security, and enhance local biodiversity.

Consider the practice of *multirão* (Bem Viver, 2022), a communal effort where neighbours come together to work on each other’s land, sharing labour and resources seen in cultures from Brazil to Burkina Faso. When one farmer uses agroecology or regenerative principles, he shares this knowledge with his community, allowing everyone to implement these techniques. For example, farmers might plant or harvest crops collectively, ensuring the efficient and timely completion of tasks. This not only strengthens the community bonds but also allows for the exchange of farming techniques, enhancing community resilience and prosperity.

Initially unaware of the vibrant life within the soil, Materra Master Farmer, Ghanshyambhai, discovered the magic of Navjeevan Kheti (regenerative farming) and began nurturing the soil’s organisms. This transformation reduced his farming costs, increased his income, and allowed him to provide a better life for his family. Meeting Materra opened his eyes to the beauty of regenerative farming and the importance of healthy soil. Inspired, his entire community followed his lead, embracing chemical-free farming and creating their own natural inputs. Now, they grow essential food grains and vegetables at home, reducing costs and increasing yields, all while enriching the earth.

We could also look at agroforestry, another practice under the regenerative umbrella that involves planting woody plants among other crops, offering significant benefits such as increased farmer revenues due to farmers having additional products to sell. These practices not only rebuild soil fertility but lead to improving resilience, which in turn can lead to better food security and economic stability for local communities.

Solutions are very much locally determined and there is no universal toolbox. It’s about understanding and appreciating the myriad of benefits regenerative practices offer rather than only searching for data. You can’t see the vitality and symbiotic relationships that begin in the soil and extend to the cotton plant.

Let’s move beyond buzzwords and engage with these practices. Support local farmers, get involved in community efforts, and start building relationships that reinforce the fabric of our ecosystems. Regenerative agriculture isn’t just about sequestering carbon, it’s about nurturing life.

It’s essential to look past certifications and labels. While they provide a starting point, the true beauty of regenerative practices lies in their complexity and interconnectedness.

MYTH 2: “SMALL-SCALE FARMERS DON’T KNOW HOW TO REGENERATE”

Written by Simon Ferrigno

Farming rests on a simple truth: if you don’t look after the land, the soil, the seeds, and the farmers’ friends, you will not be able to sustain crop growing over time. In such a system, you must constantly renew, or regenerate, your soils (or move on, or die; history is replete with examples of “civilizations” falling because they pass their carrying capacity), replenish your seeds, and understand your resources (land, water, manure, people, sun) and threats (weather, pests, diseases, raiders, landlords) (Fergusson *et al.*, 2017). This is especially true when you don’t have access to research centres and cheap ways of making pesticides and fertilizers derived from fossil fuel byproducts. Ancient traditions, both written and

oral, refer to this. Recorded human knowledge, ranging from the Vedic traditions of India to ancient Rome (Rai & Rai, 2024), emphasizes the importance of keeping land productive. Archaeology and anthropology also teach us this. It is not just tradition, but sacred. In the case of the Vedas (The Vedas are the foundational texts of Hinduism, and some of the oldest scriptures from India; they are however not only a religious document, but rather a record of a culture), for example, skillful human management of the land is seen not only as a valued human tradition (Mark, 2020), but a sacred responsibility: natural resources possess sanctity, even a divine nature (Rai & Rai, 2024). Ancient traditions are big on annual renewal– what we call today regeneration– bringing back the light after night, spring after winter. However, knowledge is also a concept that can and is controlled or directed, and so an instrument of power, which can disadvantage small farmers and marginal communities, given the power of the food and agribusiness industries over global policy (Global Alliance For The Future of Food, 2021).

In the past, farmers often mixed farming with other activities, with farming being just one element in a mix of activities, and with people not necessarily even being in any way permanently settled. As recently as the late Middle Ages in Europe (and probably much more recently elsewhere), stability was an essential goal in farming, traded off against riskier higher productivity (Pretty, 1990). Local stability however only tends to last until some intense and/or rapid stress destabilises the system: competition, population growth, powerful interests, climate change, pests, labour shortages, disease, war, politics, a technical or scientific innovation, etc … sound familiar? Today, that fragility is held at bay by high chemical use and constant research and innovation in a never-ending treadmill race. External events can overrun a system’s stability, which is why people are seeking new/old solutions like “regenerative” farming. However, regenerative is also a concept that lacks an agreed definition, meaning it is also at risk of co-option by powerful interests that could take it away from local interests and meanings.

Farmers and rural communities have always struggled with the vagaries of unpredictable weather. They have sought ways to be resilient, or protected from threats such as pest attacks (which is why the siren calls of seed, pesticides, and tech purveyors are so attractive).

The need for “regeneration” is because innovations are often highly disruptive. While the last few decades have seen farm productivity increase, they have also seen a lot of damage to ecosystems. Sustainable agriculture (as a broad concept covering interventions ranging from reducing damage to repairing systems) is trying to fix this.

Locally-adapted seeds are critical because they are selected for their ability to produce and resist local pests and diseases from long selection to their “terroir” by farmers (a hard to translate concept that places farming, and produce, within its landscape of land, culture, people, tradition, biodiversity, and so on. It is often used in viticulture, to describe how adapted crops produce locally-distinct wines), who know these seeds, and how to combine and cycle their planting (American Heritage Publishing Company, 2011). Good soils are also crucial and the key to regeneration. This is why many projects are also seeking to rediscover traditional or indigenous seeds, including in cotton (Mowbray, 2020; Quest, 2022). One project by FIBL, *Seeding the Green Future*, is working on seed supply and research (Research Institute of Organic Agriculture FiBL, 2017).

Adaptation and regeneration

Farmers through history have not just regenerated but adapted, living within boundaries of available resources, weather patterns and community needs. We talk about adaptation to climate change as if it is something new, but it's what farmers have always done. It's why science needs to talk to farmers, and why policy makers, and business, need to listen to and follow both.

Smallholder farmers and rural landscapes hold a wealth of biological diversity and knowledge. Traditional and small-scale farming doesn't focus on productivity of one crop for one market, but on the resilience of many crops working together to provide food and fibre security as well as surplus for either storage or sale. It's the whole system that counts. The best at enduring and renewing are farmers with their eyes both backwards and forwards, drawing on traditional and ancestral knowledge, as well as science and new learning.

A food spray research project in Benin is a good example of how local knowledge and science can work together. The idea was to create an attractant using food wastes and other products to produce a "supplement-spray" that would support build up of the natural enemies of pests, ready for the emergence of the pests. It was co-developed by a scientist, Robert Mensah, working with local people in Benin, who provided local knowledge and ran test sites. It is an example of a project between farmers and scientists to improve the control of cotton pests, and increase small farmer benefits (Mensah *et al.*, 2012).

It helped farmers produce more over time (16% yield increase on cotton alone), with a greater profit margin, while reducing dependence on external inputs (Traid, 2024).

A recent project by Cotton Diaries and A Growing Culture highlighted several smallholder farmer projects innovating in India, Benin and Brazil, and how traditional or "natural" farming knowledge is helping build sustainable projects (Cotton Diaries, & A Growing Culture, 2024). Farmers in Benin also mentioned the importance of intergenerational knowledge transfer, and learning from elders, to maintain traditional knowledge, blending it with new knowledge. One example was linking cropping diversity to diet diversity, underpinned by a philosophy that greater diversity is better. Farmers also use traditional knowledge for safe food storage. Traditional farming is also seen not just as healthy but as "healing", according to the Indian project lead, Rajneesh Vishwakarma (Cotton Diaries & A Growing Culture, 2024).

The Seeds, Soil, and Culture project (Deccan Development Society, 2018) helps elders in Telangana, India, share their knowledge of seed stewardship with younger people using song. This song was created by the participants to be used in training sessions.

"During Rohini and Bharani Star cycles,
What seeds do we sow, Nabi Allah?
During Rohini and Bharani Star cycles,
We sow foxtail millets and sesame, Nabi Allah."

(The Seeds, Soil, Culture and Voices Project, 2023).

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– SIMON FERRIGNO

MYTH 3: “USING NON-GM SEEDS AUTOMATICALLY GRANTS FARMERS MORE SOVEREIGNTY AND CONTROL”

Written by Simon Ferrigno

Is having access to non-GM (or traditional) seed a mark of farmer sovereignty? Or could it be a case of one special interest (agribusiness) against another (ethical fashion)? This might seem a little David versus Goliath, but the ethical fashion sector has an interest in non-GM seed for its premium markets, and to showcase its pro-farmer credentials. Contentious? Sure. But farmers often seem to be mere onlookers in decisions that shape the cotton sector and approaches to regenerative agriculture. However, like most things in sustainability and cotton, it’s not that simple.

Farmer sovereignty is the choice of what to grow, when, where, and how. *To grow or not to grow*. It is also being able to influence decisions relating to farming and markets. To be consulted and heard by decision-makers. To choose seeds and inputs. To save them, breed them, or at the very least to influence research. To adapt planting to climate, weather, and season.

Seeds originate from farmer and community knowledge which is public. Farmer-scientists have observed, selected, bred, tested, and maintained seeds, and shared them.

Much of the germ-plasm used today in private and government research is the result of lifetimes of citizen, public, and people’s science.

Farmer discovery is the mother of invention. Legally, discovery cannot be patented because they are not considered new. This is why companies try to take ownership of existing seeds: they use them to create new, modified varieties that can be patented and legally protected. In other words, companies rely on these discoveries to develop something they can claim as an invention and profit from. Science is about discovering how things work, like learning that fermented flour and water make dough rise. Similarly, if you plant the seed from the wild cotton with the longest and strongest fibres, the resulting fibres will be longer and stronger than others, that you can make fishing nets from it. Bags. Handy little strings with knots as a way to record knowledge and messages. It belongs to no one and everyone. It was considered a public good until patent law really got going in the imperial and industrial eras, turning these shared resources into private property from which companies profited for longer periods of time.

Cotton and many other global commodity seeds are now considered a private good, owned and patented by companies, and developed on company campuses and in universities, then marketed by private companies (early ones effectively granted monopolies).

Where science and knowledge are neutral (they just are), their application is not: it is economic and political. GMOs give agribusiness greater power over markets they already dominate, and reduce the value of farmer knowledge. Seed companies are often part of agrochemical companies who like to sell packages of inputs to farmers: seeds, pesticides, and fertilisers. That’s only for seeds.

The need to ensure consistent spinning dictated the use of medium staple-length cotton varieties in the colonial era, serving the needs of industry and plantations, not smallholders and their land. Cotton is a product of industry’s search for streamlined costs. It’s why seed saving is not typical, and Upland dominates the market (that, and colonisation and empire). This shapes what cotton spinners request from ginners and farmers, dictating the specific qualities and blends they need for their production.

In cotton, industry requirements for uniform fibre, consistent quality, and the legacy of colonialism mean that farmers have long lost control over seed. Seed goes to gins. In some cases, rare but best, some seed comes back from there to farmers. In others, it goes to breeders, who grow and then harvest cotton seed for planting under strict quality control.

In countries like India, only hybrids are available, with decision making even further removed from farmers in terms of control. But ginning, separating cotton lint from cotton seed, means seed saving is not an easy option. Further, the need to adapt to changing pest, disease and climatic conditions means new varieties of seed are also being bred. This is one reason why just focusing on supplying non-GM seed to farmers is a little simplistic. Farmers would still not be saving their own seed.

The last thing of concern is what farmers want and how the land is cared for.

Ethical fashion's response has been in part to promote the use of non-GM seeds. Farmer sovereignty is mentioned, but of course, the reality is that a lack of sovereignty disturbs certification programmes.

Sustainable brands want non-GM seeds because their market demands them. It's also true that many farmers like growing without chemicals too, so it is not just a question of someone with more power dictating. Sustainable markets can be more secure. But it's not an equal relationship: standards requiring no GMOs were created without input from small farmers in the majority world, meaning these farmers often have little say in the rules they are expected to follow. Programs like Fairtrade, which come closest to supporting farmers, tend to focus more on income and rights rather than other aspects. They may even be flexible in areas like GM contamination, ensuring that farmers aren't penalized for issues beyond their control.

This does suggest that we need to look more closely at decision-making, and increase the share of value-added in cotton that goes to farmers. Small farmers need to be able to join in the policy mechanisms that make decisions.

Not just those lucky enough to be in the USA, Australia or (large farmers in) Brazil, but all smallholders in the majority world. And they need to be able to influence and push research in a direction they like, and the same with markets. It might be organic. It might be to request gene edits that reduce water use or improve nutrient uptake. And it might be something else entirely.

It's worth remembering that much of the opposition to GMOs was initially driven by groups in the minority world. While many farmers opposed GMOs due to concerns over sovereignty, with prominent majority world campaigners like Vandana Shiva taking a stand, the campaigns were largely led by northern NGOs. These efforts mainly focused on consumer risks, which seed companies tried to exploit. In fact, GM companies even flew South African farmers to Brussels to "demand" GMO cotton as part of their strategy.

Many people seeking non-GM seed may genuinely want the best for smallholder farmers. However, they are operating within a system that is already biased against the interests of smallholder farmers, particularly those in the majority world. We need to hear from those farmers, and allow them to direct research goals, working collaboratively with scientists to ensure their needs and insights are at the forefront. When we talk about "fashion-narratives" or "industry-needs," it is not about going back to some ideal world. There isn't one. Worlds shift and change. That's why we have farmed cotton in the first place. What's important is putting the farmer back at the heart and root of decision-making, creating a cooperative fashion system that delivers for everyone.

A pertinent question here is: why can farmers not afford to fly around the world to say what they want?

The answer is that inequities in supply chains marginalize them. This is true even in ethical fashion. Farmer groups from the majority of the world still need funding to come to global conferences.

04

A CASE STUDY: RAVAJI THAKOR

Ravaji Mangaji Thakor is one of Materra's Master Farmers, born and raised in Golathra Village in the Grambharti cluster. Master Farmers are farmers identified in the community as already implementing excellent practices on the field and who can influence other farmers in the region. Ravaji has practised sustainable farming for the last 15 years, having joined Materra's regen programme back in 2023. Hailing from a family of farmers, he is passionate about teaching and training the younger generations, having collaborated with several agricultural centres (such as the *Krishi Vigyan Kendra* in India), universities and other associations.

A trip to his farm can surprise newcomers — across Ravaji's fields, you will find a wide variety of crops: one *bigha* of his land alone (over half an acre) contains 13 different types of crops.

When asked why he has planted many crops within a single field, Ravaji explained that it helped "to reduce risks, because if one crop fails, another can give income, reduce pest attacks and mitigate costs".

His commitment to regenerative techniques, such as mixed cropping and intercropping, has proven to be a success. Ravaji uses cucumber and sesbania as intercrops for example, providing him with additional income while reducing the cost of weeding. To minimise off-farm inputs, he has also started repurposing leftover sesbania stalks this year into mulches for his cotton crops, providing them with a protective cover that regulates soil temperatures.

Before being formally acquainted with regenerative farming, Ravaji and his ancestors had plenty of experience with regenerative practices. As a child, his father reminded him every September after the monsoon to not pluck out the grass, which grew on the same soil as pearl millet, in order to feed the livestock. Had it been removed, the humidity and heat could prove fatal for the millet.

Ravaji now understands that his father's actions were a form of cover cropping. "Our ancestors did not have scientific knowledge about farming," he explains to us. "But they had very, very good practical knowledge about it." His story is a wonderful example of how the regenerative movement ties directly into traditional systems of knowledge.

Today, Ravaji remains highly optimistic about the future of regenerative farming. He continues to regularly train local farmers in his community, and has expanded his trials of no-till farming across all of his lands. Although nearly 74 years old, he claims to tend the land as hard as a man in his twenties!

05

WHY REGEN IS TRULY NEXT-GEN

Next-Gen, like Regen, has a bit of a definition problem. “There is no industry agreed upon definition of ‘Next Gen’ in fashion,” notes the report on the subject, *Next Gen to This Gen: Scaling Material Innovation in the Fashion Sector* (Sustainabelle, 2024). They go on to state,

“For the purpose of this report, we will define Next Gen as renewable materials and processes, not yet at scale, that aim to reduce our dependence on finite resources such as petroleum, land, and water; minimise risks to human health, human rights and animal welfare; and which often enable more circular ways of production.”

But at the industry level, our working definition might be: materials and processes that reduce dependence on finite resources and improve overall planetary impact.

The emphasis with Next-Gen has typically been on innovation — think algae bioplastic, pineapple leather and mycelium-based leather alternatives. Does cotton have a place within Next-Gen? After all, it wasn’t invented last week. Humans have grown, processed, and worn cotton for thousands of years. But if you look at the **intent** behind the label “Next-Gen” – namely, the impact on earth’s limited resources – then regeneratively grown cotton absolutely qualifies as a Next-Gen material.

Regenerative cotton:

- is a renewable, biodegradable material
- involves the reduction of synthetic agricultural chemicals, thus reducing the GhG impact of farming, the dependence on petroleum-based products, along with reducing air pollution
- increases biodiversity, by incorporating more plant diversity into the cropping plans
- reduces reliance on water through more efficient irrigation methods and approaches
- offers opportunities for more circular ways of production. For example, biochar, if produced from cotton stalks, represents the cycling of nutrients back into the system and improves the carbon storage potential of cotton farms, while the use of farmyard-based organic inputs utilises organic materials already available at the farm

In Materra’s case, thanks to our digital approach to agricultural program implementation, the cotton fibre is paired with primary data enabling traceability to farm-level, and providing an accurate picture of the impact achieved. Again, that’s an innovation compared to conventional cotton, most of which comes to us through a vast and opaque supply chain.

To come back to Sustainabelle’s definition, “minimise risks to human health, human rights and animal welfare” — the reduction of agrochemicals in regenerative land management reduces the toxic load on humans and other living beings. In Materra’s case, social equity is also a non-negotiable part of regenerative. We pay farmers a fair incentive payment and provide free agronomic support, while seeking to further gender-inclusivity through skill-building and income-generating opportunities for female farmers.

The bottom line is this: a textile material does not have to be made in a lab or require intensive technological solutions to be Next-Gen. The question is: what is the impact of the material? Does it help to reach the goal of reducing dependence on non-renewable resources? Does it improve ecosystem, human and animal health? Does it integrate climate adaptation and mitigation?

For Materra, regenerative cotton is a yes, yes, and yes.

Key takeaways

- Next-Gen materials lack a unified definition but generally aim to reduce dependence on finite resources, minimise environmental and human risks, and enable circular production.
- Regenerative cotton can qualify as a Next-Gen material because it improves biodiversity, reduces water and synthetic input use, and uses on-farm inputs, promoting circularity within the farm.
- In Materra’s case, building social equity and a data-led approach to traceability fostering innovation, makes regen truly Next-Gen.

6. Glossary

- **AGROECOLOGY:** A holistic approach to designing and managing sustainable agricultural and food systems that applies ecological and social concepts. It stresses not only ecological principles such as resilience, diversity and recycling, but also community principles such as responsible governance, solidarity, food sovereignty and land sovereignty. It is often associated with peasant movements and traditional agricultural knowledge.
- **AGROFORESTRY**: The intentional combination of trees with agricultural crops and/or livestock. Agroforestry allows for the diversification of farm income through the production of timber, fruits or nuts, sequesters carbon, and has a number of other benefits.
- **BIGHA:** A traditional unit of measurement for land in India, varying from region to region.
- **BIOLOGICAL PEST MANAGEMENT:** A method of managing pests using other organisms instead of pesticides.
- **BIO-INPUTS:** Inputs made of biological or organic materials, such as plants (as opposed to synthetic or mineral-based inputs) to increase agricultural production.
- **COVER CROP:** A crop which provides a live cover to the soil. It is used to check erosion, improve soil health, increase water availability, suppress weeds, help manage pests and diseases, boost biodiversity etc.
- **CROP ROTATION:** Growing different crops one after another on a piece of land year round.
- **GREEN MANURING:** The practice of growing a crop specifically to enhance soil health by adding nutrients and organic matter and improving soil structure. Green manures are typically incorporated into the soil while still green.
- **INTERCROPPING:** Growing two or more crops close together in the same crop season — a kind of multiple cropping. This technique provides a buffer in case one of the crops is impacted by pests or disease, allowing the others to be harvested.
- **IPM:** Integrated Pest Management, an environmentally sensitive decision-making process for controlling pest damage, relying on an understanding of pest biology, environmental data, technology, and common-sense practices.
- **MONOCULTURE:** An agricultural system or field with only a single crop.
- **MULCH:** A a layer of materials – preferably consisting of organic, biodegradable materials such as straw, woodchips, or plant residue – applied to the soil surface for various purposes such as conserving soil moisture, reducing soil erosion etc.
- **NO-TILL/ZERO-TILLAGE FARMING:** Farming where tillage before sowing is not permitted while the tillage practices in standing crops can be performed in the root zone area only.
- **SOIL ORGANIC MATTER (SOM):** The fraction of soil consisting of decomposed plant, animal, and microbial material.
- **WATERSHED:** An area of land within which all the drainage from rainfall or snowmelt ultimately drains to the same point, whether a lake, a wetland, or ocean.

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Page 16: Zala Karansinh Halusinh Rupal
Pages 30 and 43: Atmaram Prajapati
Page 35: Ghanshyambhai Madhavbhai Solanki
Pages 36 and 39: Rekhaba Jayendrasinh Chavda
Page 40: Prasnba Vijaysinh Rathod
Pages 46, 47 and 49: Ravaji Thakor

If you've enjoyed reading this guide, head on to www.materra.tech/explore to explore the map of the clusters we work along with fresh stories from the farm. You might also enjoy reading our guide to soil carbon sequestration, available to download for free at www.materra.tech/soil-guide.

8.
Materra's Theory of Change

Materra has been a change-making company since its inception — bringing about a radical change in the textile industry has been at the heart of its mission.

The root cause of the current lack of equity, transparency and sustainability in the cotton value chain is the disconnect between the farmers and brands. Due to the distance and obscurity that global commodity supply systems create, companies and consumers lack visibility into the origins of the raw materials they rely on – the farmers and the landscapes that produce the materials.

This disconnect is what poses challenges to the effective and rapid scaling of regenerative agriculture among both cotton farmers and apparel brands. Here we illustrate our Theory of Change in how we braid a bridge between the two to forge a path ahead, through specific interventions and activities, with our stakeholders.

PROBLEMS

FARMERS
Conventional growing practices result in depleted soils and ecosystems, and unprofitable farmer livelihoods.

Transition to regenerative farming takes time, involves risk, and requires support.

BRANDS
Brands face a climate and supply risk, a tightening regulatory landscape, and consumer pressure to source sustainably.

Regeneratively produced materials would help address these challenges but require energy and investment.

FOCUS OF CHANGE

Materra's interventions with farmers:

Collaboration where farmer interests and brand interests meet

Robust agronomic support

Long-term offtake agreements

Materra's interventions with brands

Farmers incentivised to adopt regen

INTERVENTIONS

Economic incentives lead to better livelihoods

Regenerative cotton supply

See

Data creates transparency

Data is used to better advise farmers

Meaningful impact data meets regulations and mitigates supply & climate risk

Measure

Measurable outcomes

Farm school & local inputs production

Brands are supported in communicating about regen

Exchange

Trust and dialogue

Farmers feel like valued partners & have a sense of ownership

Powerful storytelling engages consumers/ shareholders around regen

Partner

Brand & farmers collaborate to achieve combined goals

OUTCOMES

Increased biodiversity

Availability of regen cotton

Meaningful impact data

Improved farmer health

Improved soil health

Reduced climate risk for farmers & brands

Farmer perspectives & stories spotlit

Better farm livelihoods

GOAL

Transparent textile industry that rewards farmers as environmental stewards, leading to revitalized land and livelihoods.

GUIDING PRINCIPLES — Trust — Diversity — Growing capacity — Curiosity →


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