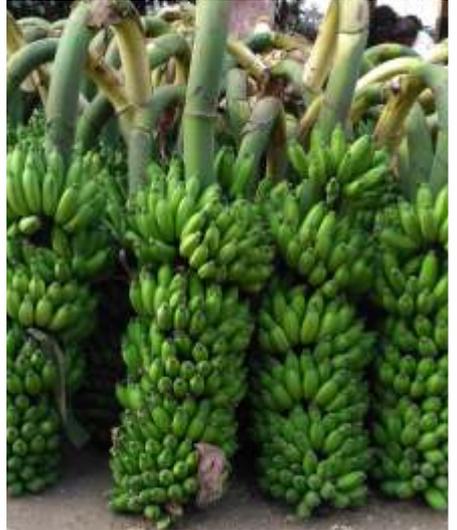




CULTIVATING KNOWLEDGE, CATALYSING CHANGE

A compendium of articles
by Team Ecociate



ecociate

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Introduction



At Ecociate, we stand tall on the fertile ground of agroecology, nutrition and entrepreneurship reaching upwards to nourish sustainable solutions across food, business, and technology to impact the lives of poor and excluded segments of our societies. Our roots, however, are not stagnant, but constantly seeking new pathways to explore. We are driven by a deep aspiration - to delve into the cutting edge of themes that empower rural communities and reshape our relationship with the environment.

Our clients are not just recipients, but collaborators in this journey. We believe in offering the best, not just at the project's end, but throughout its lifespan. This means that our team is in perpetual learning mode, exploring, consolidating, and sharpening our knowledge and skills. Every challenge is a stepping stone, every project a platform to the next level of understanding. We're thrilled to express our gratitude to over 70 national and international clients who have entrusted us with more than 150 projects in the past 7 years. This journey has been enriched by facilitating numerous workshops, sessions, webinars, and training programs, keeping us sharp and at the forefront of cutting-edge knowledge.

Last year, we embarked on ventures that epitomize this spirit. We plunged into the heart of inclusive business, crafted green marketing strategies, and designed business plans woven with the threads of

environmental sustainability. We built supply chains for nutritious products, strategized thriving aquatic enterprises, and meticulously assessed living income-based interventions. Each project brought us closer to the ground, where we witnessed the real-world impact of our work and the intricate dance between government schemes and on-the-ground implementation.

But our dedication doesn't stop with completion. Our motto is simple: treat every assignment as if it were our last, pouring our expertise and relentless energy into each project. Yet, even as we strive for excellence, we never lose sight of the bigger picture. Each project is not just a job, but a stepping stone, a path to unveil the next layer of learning and understanding.

Ecociate is not just a company; it's a living ecosystem of learning and purpose. We believe that by nurturing our own knowledge and collaborating with communities and clients, we can cultivate a more sustainable future, one nourished by shared wisdom and collective action.

This year, as a tribute to this ongoing learning process, we proudly present a compendium of articles penned by our team members. Each piece is a mosaic tile, reflecting the diverse experiences and insights from our journeys. We invite you, our valued stakeholders, to delve into these narratives and offer your feedback. Your words are not just critique, but fertilizer for our growth, guiding us on the path towards deeper knowledge and more impactful contributions.

So, join us on this journey. Read, learn, share, and let's rewrite the narrative of rural livelihoods and environmental harmony together, for a resilient and inclusive future.

Team Ecociate



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Bridging Economic Disparities in India's Agricultural Sector:

An Analysis of Living, Actual, and Feasible Incomes

In the vast and diverse landscape of India, a nation where agriculture is not just an economic activity but a cultural tapestry, understanding the financial nuances of farming communities is imperative. These communities, deeply rooted in traditions yet facing the brunt of climate and market unpredictability, require innovative strategies to secure sustainable and viable livelihoods. This necessitates an in-depth exploration of the economic dynamics shaping their lives, particularly through the lenses of living income, actual income, and feasible income. These concepts, pivotal in the crusade against poverty, provide a multifaceted view of financial well-being, extending beyond mere poverty alleviation towards achieving a life of decency and comfort.

Living Income: The Benchmark

Living income is about more than just escaping poverty; it is about living with dignity and comfort. It encompasses necessities like a nutritious diet aligned with WHO norms, adequate housing, and other essential elements such as healthcare, education, and transport. This benchmark is not just a number but a standard for a decent quality of life, setting the ideal target for financial well-being.



Mamta Gupta

Actual Income: The Present Reality

Actual income is a reflection of the current financial status of individuals or households. It aggregates all sources of revenue, be it wages, agricultural earnings, or other business ventures. However, this income is at the mercy of various external elements like market trends, geographical factors, and resource availability.

FEASIBLE INCOME: The Potential Horizon

Feasible income, in contrast, represents the potential earnings a household or individual could realize. This concept is key in gauging how far or close households are from the living income standard. It involves optimizing existing resources, exploring market opportunities, and enhancing productivity and efficiency. The income gap, a critical metric, is the difference between the living income benchmark and the current actual income, highlighting the disparity between actual and potential earnings, especially in the farming sector.

For instance, Indian farmers often grapple with unpredictable weather patterns and market demands. Crop diversification is a strategic response to this uncertainty. By cultivating a variety of crops, farmers can shield themselves against the failure of a single crop and capitalize on diverse market opportunities, ensuring not only a stable income but also contributing to soil health and environmental sustainability. Beyond diversification in agriculture, expanding into other income streams, such as small-scale enterprises or local crafts, creates a financial safety net, further stabilizing household income.

“ **A LIVING INCOME: The net annual income that enables a family to “afford a decent standard of living for all members of that household” (LICoP, 2020). It considers food, water, healthcare, education, and other essential needs, including provision for unexpected events.** ”

A Case Study: Assam Tea Growers

A recent assessment of the living and feasible income of Assam tea growers provides a tangible example. This assessment was conducted by Ecociate in collaboration with a global leading tea Brand. The study focused on small tea growers in Assam, analysing their current income levels against the backdrop of potential income improvements through interventions in agricultural practices, market access, resource management, and income diversification. This comparison offered valuable insights into the economic challenges and opportunities within this community. The income gap analysis of

the small tea growers revealed the disparities between current earnings and the potential income that could be earned. Small tea growers often struggle to meet the living income threshold due to challenges such as small farm sizes, fluctuating market prices, and limited access to resources and support. The actual annual net income and feasible income is calculated based on the potential for income enhancement within the current income framework. Factors such as the existing practices of small tea growers, the availability of resources, and insights from market players and tea sector experts were all taken into account while determining the feasible income for this community. By understanding and striving towards a living income, there can be a concerted effort to uplift these communities. This involves not just fair pricing strategies but also supporting growers in improving productivity, resilience, and access to markets.

Conclusion: A Path Towards Economic Equilibrium

The intricate interplay between living income, actual income, and feasible income is crucial for comprehending economic disparities and devising effective poverty alleviation strategies. Focusing on these concepts enables stakeholders to target interventions more accurately, aiming not just to meet basic needs but also to foster sustainable economic growth and enhance the quality of life for these communities. This comprehensive approach is vital for transforming the economic landscape of India's agricultural sector, ensuring that it remains not only a testament to cultural heritage but also a beacon of sustainable and prosperous living.



Rediscovering Earth's Legacy: **Ancient Soil Secrets for Today's Environmental Challenges**

In our world today, the soil, the very foundation of life, is facing a crisis unseen in human history. This crisis is not just about dirt; it's about the future of our food, our environment, and our connection to nature. Across the globe, our soils are degrading at an alarming rate. This degradation means the soil is losing its ability to support plants, wildlife, and human life. It's becoming less fertile, losing its structure and nutrients, and this change is happening faster than nature can repair it.

The causes of this degradation are many, but one of the primary culprits is modern agricultural practices. These practices often involve heavy use of chemical fertilizers and pesticides, which, while boosting crop yields in the short term, can harm the soil in the long run. These chemicals can kill beneficial organisms in the soil, disrupt natural nutrient cycles, and lead to soil compaction, erosion, and a loss of organic matter. Additionally, practices like deforestation and overgrazing strip the soil of its natural protectors, leaving it exposed and vulnerable.

To understand the importance of soil, one must look back to ancient times. Throughout history, civilizations have thrived or collapsed, often depending on how they treated their soil. For many ancient cultures, soil was not just a resource; it was a sacred entity, deeply intertwined with their beliefs, rituals, and daily practices.

In ancient India, for example, soil was considered a divine gift. It was the centerpiece of agricultural practices, and its health was a reflection of the community's well-being. The Ayurvedic tradition of India, known for its natural approach to health, recognized different types of soil for their healing properties. Similarly, in ancient China, the art of Feng Shui, which focuses on harmonizing individuals with their surrounding environment, paid great attention to the quality and type of soil, believing it influenced the flow of energy and fortune.



**Rohit Kumar
Yadav**

The ancient Egyptians revered the Nile's black soil, fertile and vital for agriculture in an otherwise desert region. The annual flooding of the Nile, depositing nutrient-rich silt along its banks, was seen as a blessing that sustained their civilization. Similarly, the Mesopotamians, in the fertile crescent, developed intricate irrigation systems to enhance their soil's productivity, showing a sophisticated understanding of soil management.

This article aims to bridge the ancient and the modern, to explore how the wisdom of the past can inform and improve our current and future soil management practices. By looking at how ancient cultures revered and cared for their soil, we can glean insights into sustainable practices that could

be adapted to address today's soil crisis. This exploration is not just an academic exercise; it's a necessary step in finding viable solutions to one of the most pressing environmental challenges of our time.

Throughout this article, we will delve into the specific practices and beliefs of ancient cultures regarding soil, compare these with modern agricultural methods, and explore how integrating ancient wisdom can lead to more sustainable, soil-friendly farming practices today. Our journey through time will not only highlight the importance of soil in human history but also illuminate a path forward for its preservation and rejuvenation.



Wisdom from the Soil - Ancient Practices

India's Sacred Soil

Long before modern agriculture, ancient Indian farmers were deeply connected to their land, understanding its rhythms and needs. One such method was 'Jhum cultivation', practiced mainly in the northeastern regions of India. Jhum, also known as shifting cultivation, involved clearing a small patch of forest, burning the vegetation to enrich the soil with ash, and then planting a variety of crops. This method was sustainable in its original form as it allowed time for the land to regenerate before being cultivated again.



Source: https://commons.wikimedia.org/wiki/File:An_example_of_slash_and_burn_agriculture_practice_Thailand.jpg

Another practice was natural composting, a method that utilized organic waste like plant residue, animal manure, and household waste to create compost. This not only recycled nutrients back into the soil but also maintained its structure and fertility. Unlike modern chemical fertilizers, natural composting enriched the soil without harming its microorganisms, thus preserving its long-term health.

In Ayurveda, an ancient Indian system of medicine, soil and earth materials were used for their therapeutic properties. One notable example is Multani Mitti, also known as Fuller's Earth. This soil, rich in minerals like alumina, silica, and iron oxide, was used for its ability to absorb impurities and provide minerals to the body. It was used in skincare, for treating minor ailments, and even consumed in small quantities for its health benefits. The use of such soils highlights the ancient Indian understanding of the healing properties inherent in natural materials.

In Hinduism, soil is not just a physical substance; it's imbued with spiritual significance. During various religious festivals, soil from specific locations, like river banks or sacred grounds, is used for creating idols and altars. For instance, in

the festival of Ganesh Chaturthi, idols of Lord Ganesha are traditionally made from river clay. After the festival, these idols are immersed back into the water, symbolizing the cyclical nature of creation and dissolution, emphasizing the belief that everything comes from and eventually returns to the earth.

Vastu Shastra, an ancient Indian science of architecture, akin to Feng Shui, places great importance on the type of soil for construction. Different soil types were categorized based on their properties and suitability for building. For example, black soil, known for retaining moisture, was considered unsuitable for building due to its potential instability. In contrast, red soil, known for its firmness and drainage properties, was preferred. This thoughtful consideration of soil types ensured that structures were built in harmony with their natural surroundings, promoting environmental balance and sustainability.

These ancient Indian practices reflect a deep understanding and respect for soil. They showcase a holistic approach to agriculture, medicine, spirituality, and architecture, where soil was not merely a resource to be exploited but a sacred entity to be revered and preserved. As we grapple with modern environmental challenges, these

ancient practices offer valuable insights into sustainable living and environmental harmony.

Chinese Soil Mastery

In ancient China, the practice of Feng Shui, literally translating to "wind and water," intricately linked the quality of soil and landforms with the flow of energy, or Chi, affecting the well-being and fortune of the people. The practitioners of Feng Shui believed that the positioning and quality of soil could influence the harmony between humans and their environment. They meticulously analyzed soil types, colors, and textures, understanding that these elements could significantly impact the energy of a space. For instance, a piece of land with fertile, well-drained soil was considered auspicious, promoting prosperity and health for its inhabitants.

One of the most remarkable agricultural achievements of ancient China was the development of terrace farming. In regions with hilly terrains, where traditional farming was challenging, the Chinese ingeniously carved terraces into the slopes. These terraces reduced soil erosion significantly, as they prevented rainwater from rushing down the hillsides and taking valuable topsoil with it. Moreover, terrace farming optimized water usage, allowing for

effective water management in these steep landscapes. This practice not only sustained agricultural productivity but also transformed rugged landscapes into beautifully contoured fields.

In Traditional Chinese Medicine (TCM), soil and its components played a crucial role. Various minerals found in soil were used for their medicinal properties. For example, certain clays were ingested to detoxify the body and treat mineral deficiencies. This deep understanding of the healing properties of earth materials exemplifies the ancient Chinese connection to the natural

world, where soil was not only a medium for growth but also a source of health and healing.

In the Wu Xing or the Five Elements Philosophy of ancient China, Earth, represented by soil, was considered the central element. It was believed to be the source of stability, balance, and nourishment. This philosophy underscored the belief that just as soil nurtures plant life, the Earth element is central to the balance and harmony of life itself. It symbolized grounding, fertility, and the ability to grow and sustain life, reflecting the deep-rooted respect and understanding the ancient Chinese had for soil.



Egypt's Nile Silt

The civilization of ancient Egypt was intrinsically tied to the Nile River, particularly its fertile silt. The annual floods of the Nile were eagerly awaited, as they deposited a rich layer of mineral-laden silt on the riverbanks. This silt was incredibly fertile, making the otherwise arid lands of Egypt suitable for farming. The Egyptians developed an agricultural system that was heavily reliant on this cycle, planning their planting and harvesting around the flooding seasons.

Source: https://commons.wikimedia.org/wiki/File:Subsistent_Farming_Southern_China.jpg

The fertility of the Nile's silt was not just a matter of agricultural significance but also held deep cultural and religious meaning. The floods and the subsequent fertility were seen as blessings from the gods, vital for the survival of the entire civilization. This reverence is evident in the numerous artworks and hieroglyphs depicting the Nile and its life-giving properties. The Egyptian reliance on the Nile's silt for agriculture was a striking example of a civilization adapting to and thriving in its natural environment, showing a profound understanding of the rhythms of nature and the bounty it can provide.



Source: https://commons.wikimedia.org/wiki/File:Nile_River_Valley,_Egypt_by_Planet_Labs.jpg

Mesopotamian Water Management

The ancient Mesopotamian civilization, flourishing in the harsh, arid environment of the Fertile Crescent, showcased remarkable ingenuity in water management and irrigation techniques. Faced with unpredictable river flows and a challenging climate, they developed sophisticated irrigation systems that transformed the agricultural landscape.

- **Canal Systems:** Mesopotamians constructed extensive canal networks to divert water from rivers like the Tigris and Euphrates to their fields. These canals enabled them to distribute water evenly across large areas, ensuring that crops received adequate moisture even during dry periods.
- **Control of Water Flow:** They developed methods to control water flow, such as sluices and gates, allowing them to manage the amount and timing of water reaching the fields. This was crucial in preventing both flooding and drought.
- **Raised Fields:** To combat soil salinity, a common problem in arid regions due to irrigation, they built raised fields with better drainage. This technique helped prevent waterlogging and salt buildup, preserving soil health.

- **Crop Rotation:** Mesopotamians practiced early forms of crop rotation, alternating crops that depleted soil nutrients with those that replenished them. This not only enhanced soil productivity but also reduced pest and disease cycles.

These irrigation practices were not merely functional; they reflected a deep understanding of their environment and a commitment to working in harmony with it. The Mesopotamian approach to water management stands as a testament to human ingenuity in adapting to and thriving within challenging landscapes.

Native American Soil Practices

Native American agricultural practices, particularly the “Three Sisters” method of companion planting, exemplify a sustainable and ecologically harmonious approach to farming. This method involved planting corn, beans, and squash together, each serving a unique role in supporting the others and benefiting the soil.

- **Nutrient Balancing:** Beans, being legumes, fixed nitrogen from the air into the soil, providing essential nutrients for the other plants. This reduced the need for artificial fertilizers, maintaining soil fertility.

- **Structural Support:** The cornstalks served as natural trellises for the beans to climb, reducing their vulnerability to pests on the ground and maximizing space utilization.
- **Soil Moisture and Weed Control:** Squash, with its broad leaves, shaded the ground, keeping the soil moist and cool. This also helped suppress weeds, reducing the need for manual weeding or herbicides.
- **Pest and Disease Resistance:** The diversity of plants reduced the spread of pests and diseases that could occur in a single-crop system. It also promoted a healthier ecosystem, attracting beneficial insects and birds.
- **Resilience and Productivity:** This method of planting resulted in a resilient and self-sustaining system, yielding a balanced and nutritious diet from a single plot of land.

The “Three Sisters” method is a powerful example of understanding and working with nature’s systems. It demonstrates how ancient practices, deeply rooted in respect for the earth, can provide modern agriculture with models for sustainable, efficient, and environmentally friendly farming. These practices, passed down through generations, highlight a profound knowledge of ecological

interconnections and the importance of preserving soil health for future generations.



Source: https://commons.wikimedia.org/wiki/File:Three_Sisters_companion_planting_technique.jpg

The Modern Soil Crisis

The advent of chemical fertilizers in modern agriculture marked a significant turning point in how we approach soil management. Initially hailed as a solution for boosting crop yields, the overuse of these fertilizers has led to severe soil degradation and widespread environmental pollution.

- **Nutrient Imbalance:** Excessive use of chemical fertilizers disrupts the natural nutrient balance in the soil, leading to a decrease in soil fertility over time. The high concentrations of certain nutrients can inhibit the absorption of others, disrupting plant growth.
- **Soil Acidification:** Many chemical fertilizers contribute to soil acidification, which can harm plant roots, reduce nutrient availability, and lead to the leaching of harmful substances into waterways.
- **Harm to Soil Microorganisms:** The chemicals in fertilizers can harm the beneficial microorganisms in the soil. These microorganisms are crucial for organic matter decomposition, nutrient cycling, and overall soil health.
- **Water Pollution:** Runoff from fields treated with chemical fertilizers contaminates rivers,

lakes, and groundwater with nutrients like nitrogen and phosphorus, leading to algal blooms, eutrophication, and the destruction of aquatic ecosystems.

Modern farming practices, characterized by extensive monoculture and heavy machinery use, have also contributed significantly to soil erosion and a loss of biodiversity. Several case studies highlight these issues:

- **Monoculture Practices:** Large-scale monoculture depletes the soil of specific nutrients, making it vulnerable to erosion. The lack of diversity also means that if pests or diseases attack the crop, the impact is much more devastating.
- **Deforestation for Agriculture:** Clearing forests for agriculture has led to a loss of topsoil and a decline in soil quality due to the removal of trees that help to hold the soil together and maintain its nutrient content.
- **Heavy Machinery:** The use of heavy machinery compacts the soil, reducing its porosity and ability to retain water, making it more prone to erosion.
- **CASE STUDY - The Dust Bowl:** The Dust Bowl of the 1930s in the United States is a classic example of soil erosion caused by

inappropriate agricultural practices. Over-cultivation and lack of proper soil conservation methods led to massive dust storms, stripping away the fertile topsoil.

Comparing ancient and modern practices reveals significant differences in soil management and the long-term effects on soil health.

- **Sustainable vs. Short-term Focus:** Ancient practices were inherently sustainable, focusing on long-term soil health. Modern practices, however, often prioritize short-term yield over long-term sustainability.
- **Chemical vs. Organic Inputs:** Ancient farming relied on organic inputs like compost and manure, which enhanced soil structure and fertility. Modern farming often relies on synthetic chemicals that can degrade soil quality over time.
- **Soil Erosion:** Ancient techniques like terrace farming and crop rotation helped prevent soil erosion, while modern practices have often accelerated it.
- **Biodiversity:** Ancient farming practices maintained biodiversity by cultivating a variety of crops and integrating natural landscapes into farming practices. Modern monoculture, in contrast, reduces biodiversity, making ecosystems more fragile.



Source: [https://commons.wikimedia.org/wiki/File:Soil_culture_and_modern_farm_methods_\(1916\)_\(14595962480\).jpg](https://commons.wikimedia.org/wiki/File:Soil_culture_and_modern_farm_methods_(1916)_(14595962480).jpg)

The modern soil crisis is a complex issue stemming from various factors, primarily driven by current agricultural practices that prioritize immediate gains over long-term soil health. This approach contrasts sharply with ancient practices, which showed a deep understanding of the need to maintain the balance and health of the soil. As we face increasing soil degradation and environmental challenges, it becomes clear that revisiting and learning from these ancient practices could be crucial in addressing the current crisis.

Bridging Ancient Wisdom with Modern Needs

In the face of the current soil crisis, integrating traditional farming methods into modern agriculture offers a pathway to sustainable and resilient food systems. These ancient practices, refined over millennia, hold valuable lessons for restoring soil health and biodiversity.

- **Crop Rotation and Diversity:** Mimicking ancient practices like crop rotation can

replenish soil nutrients and break pest and disease cycles. Integrating diverse crops, as done in traditional polycultures, enhances soil structure and fertility, while reducing the need for chemical inputs.

- **Natural Fertilizers:** Replacing chemical fertilizers with organic matter such as compost and manure, as practiced traditionally, can restore soil organic matter levels, enhance microbial activity, and improve soil structure.
- **Conservation Tillage:** Ancient farming often involved minimal disturbance of the soil. Modern conservation tillage methods, such as no-till or low-till farming, can reduce soil erosion, conserve moisture, and maintain soil structure.
- **Water Harvesting and Management:** Techniques like terracing and rainwater harvesting, used in ancient cultures, can be adapted for efficient water use, helping to combat water scarcity and soil erosion.
- **Soil Cover and Mulching:** Emulating the ancient practice of maintaining soil cover can be achieved through mulching and cover cropping, which protect the soil from erosion, retain moisture, and suppress weeds.

Several modern farms and agricultural projects have successfully implemented ancient techniques, demonstrating their viability and benefits in contemporary settings.

- **Permaculture Farms:** Permaculture, a design system inspired by traditional agriculture, mimics natural ecosystems to create sustainable and self-sufficient farms. Farms like Zaytuna Farm in Australia have implemented permaculture principles, integrating tree planting, water management, and crop diversity, resulting in enhanced soil health and productivity.
- **Organic Farming Initiatives:** Many organic farms globally have adopted practices like crop rotation, organic fertilization, and polycultures. For example, Rodale Institute in the United States has been a pioneer in organic farming research, demonstrating how organic practices can match or exceed conventional yields while significantly improving soil health.
- **Rice Terraces Revival:** In places like the Philippines and China, ancient rice terraces are being revived. These terraces, which prevent erosion and conserve water, are being recognized not only for their cultural value but also for their sustainable agricultural potential.

- **Community Supported Agriculture (CSA):** CSAs often employ traditional methods like diversified cropping and community involvement. Farms like Angelic Organics in Illinois, USA, use biodynamic farming methods, a holistic approach considering soil fertility, plant growth, and livestock care, leading to a thriving and sustainable farm ecosystem.
- **Regenerative Agriculture Practices:** Farms adopting regenerative agriculture aim to restore soil health through practices like cover cropping, rotational grazing, and reduced tillage. The Paicines Ranch in California, for example, practices rotational grazing and cover cropping, which have led to significant improvements in soil carbon sequestration and biodiversity.

These success stories illustrate how ancient wisdom, when adapted to modern needs, can address current environmental and agricultural challenges. They serve as models for how we can rethink our relationship with the land and farming, moving towards practices that nurture rather than deplete our soils. This blend of ancient knowledge and modern science paves the way for a future where agriculture is not only sustainable but also regenerative, healing the land it uses.

The principles of ancient agricultural wisdom are not only being revived but are also inspiring innovative technologies in modern farming. These innovations, blending old knowledge with new science, are creating sustainable solutions for the challenges facing today's agriculture.

- **Soil Health Monitoring Tools:** Drawing from ancient observations of soil quality, modern technology has given rise to advanced soil health monitoring tools. These tools, like sensors and drones, provide precise data on soil moisture, nutrient levels, and microbial activity, enabling farmers to make informed decisions akin to the intuitive understanding of ancient farmers.
- **Precision Agriculture:** This technology, inspired by the ancient practice of tailored land management, uses data analytics and GPS technology to optimize field-level management. It mirrors the ancient approach of understanding and responding to the variations in a plot of land but does so with modern precision and efficiency.
- **Permaculture Design Software:** Emulating the holistic approach of ancient agricultural systems, new software tools are helping in designing permaculture setups. These tools assist in planning farms that mimic natural

ecosystems, integrating plant and animal species, water bodies, and terrain features.

- **Climate-Resilient Crops:** Inspired by ancient practices of cultivating diverse, locally adapted crops, modern genetic research is focusing on developing climate-resilient crop varieties. These varieties are designed to withstand extreme weather conditions, a principle rooted in the ancient understanding of working harmoniously with local environmental conditions.
- **Water-Saving Irrigation Techniques:** Innovations like drip irrigation and hydrogel technology, which help in conserving water, draw inspiration from ancient water

management practices. These techniques optimize water use, mirroring the efficiency seen in ancient terracing and canal systems but employing modern technology to maximize effectiveness.

While the integration of ancient practices into modern agriculture holds great promise, several challenges hinder widespread adoption.

- **Economic Constraints:** The initial cost of transitioning to sustainable practices can be high, deterring farmers, especially smallholders. Solutions include financial incentives, subsidies, and support from governments and NGOs to ease the transition.



Source: https://commons.wikimedia.org/wiki/File:Natural_farming.jpg

- **Knowledge and Training:** Many modern farmers are accustomed to conventional farming practices and may lack knowledge about traditional methods. Educational programs, workshops, and extension services can bridge this knowledge gap.
- **Market Pressures:** The current market often favors large-scale, intensive farming operations. Creating market opportunities for produce grown using sustainable methods, such as certification programs for organic and sustainably grown food, can help shift this balance.
- **Policy and Regulation:** Existing agricultural policies often support conventional farming practices. Advocacy for policy changes that encourage sustainable farming practices is crucial. This could include reforming agricultural subsidies to favor ecological farming practices.
- **Technological Adaptation:** While ancient practices are sustainable, they need to be adapted to suit modern contexts. Research and development in agricultural technologies that align with sustainable principles are essential to make these practices more efficient and applicable to contemporary farming needs.

Overcoming these challenges requires concerted efforts from various stakeholders, including governments, agricultural organizations, research institutions, and the farming community. By addressing these barriers, we can pave the way for a more sustainable agricultural future, deeply rooted in the wisdom of the past but geared towards the challenges of the present and future.

Future Pathways and Action Steps

As we look towards a future where sustainable agriculture is the norm rather than the exception, specific strategies and actions are necessary to make this vision a reality. Key areas of focus should include policy reform, education on soil health, and global collaboration.

Policies play a crucial role in shaping agricultural practices. To support sustainable farming, policy changes are needed at multiple levels:

- **Incentivizing Sustainable Practices:** Governments can offer incentives such as tax breaks, grants, or subsidies to farmers who adopt sustainable practices. This approach would help offset the initial costs of transitioning to sustainable methods.

- **Supporting Research and Development:** Increased funding for research in sustainable agriculture, particularly in areas like soil health, organic farming, and water conservation, can lead to more innovative and efficient practices.
- **Regulating Harmful Practices:** Implementing stricter regulations on the use of chemical fertilizers and pesticides can encourage farmers to seek out sustainable alternatives.
- **Promoting Local and Organic Farming:** Policies that support local and organic farming systems can help create a market for sustainably produced food, encouraging more farmers to adopt these practices.
- **Land Use Policies:** Implementing land use policies that prevent soil degradation, such as restrictions on deforestation and overgrazing, is crucial for soil conservation.

Education is key to changing attitudes and practices regarding soil management. A comprehensive educational approach should involve multiple stakeholders:

- **Educational Curricula:** Integrating sustainable agriculture and soil health into school curricula can raise awareness from a young age.

- **Farmer Training Programs:** Offering training programs for farmers on sustainable soil management practices can help bridge the knowledge gap and encourage the adoption of these methods.
- **Public Awareness Campaigns:** Public campaigns can highlight the importance of soil health and how consumers can support sustainable agriculture through their choices.
- **Extension Services:** Strengthening agricultural extension services to provide practical, on-the-ground advice and assistance to farmers can facilitate the transition to sustainable practices.

The challenges facing soil health and agriculture are global, and thus require a collaborative approach:

- **Sharing Knowledge and Resources:** International cooperation in research and sharing of knowledge about sustainable practices can lead to more effective solutions. For example, techniques successful in one region can be adapted and applied in another.
- **Global Agreements and Initiatives:** Strengthening and creating new global agreements focused on sustainable agriculture and soil conservation can help align international efforts.

- **Support for Developing Countries:** Developed countries can play a role by providing financial and technical support to developing countries to adopt sustainable practices. This support is crucial, as these countries often face the most significant agricultural challenges and have the least resources to address them.
- **Cross-Cultural Exchanges:** Encouraging cross-cultural exchanges and learning opportunities among farmers and agricultural scientists can foster a global community united in the pursuit of sustainable agriculture.

By implementing these policies, enhancing education, and fostering global collaboration, we can create a future where sustainable agriculture is not just a niche practice but a widespread and integral part of our global food system. This approach will not only help in preserving soil health but will also contribute to broader environmental goals such as biodiversity conservation, climate change mitigation, and sustainable development. The journey towards sustainable agriculture requires concerted effort and commitment from all stakeholders, including governments, farmers, scientists, and consumers. Through collective action, we can ensure that our soils remain healthy and productive for future generations.

Conclusion

As we conclude our exploration into the ancient practices of soil management and their relevance today, it becomes evident that these time-honored techniques hold significant potential for addressing many of the modern agricultural challenges. Ancient practices, from the diverse crop rotations of India to the water-efficient terrace farming of China, not only offer insights into sustainable farming but also remind us of the importance of living in harmony with nature. These practices, developed over centuries, were inherently sustainable, aimed at preserving soil health and ensuring long-term agricultural productivity.

The wisdom of these ancient methods, when integrated with modern agricultural technology and science, presents a powerful approach to sustainable farming. By combining traditional knowledge with contemporary innovations, we can develop agricultural systems that are both productive and sustainable, systems that nourish the soil rather than deplete it. This integrated approach can lead to healthier soils, more resilient ecosystems, and ultimately, more sustainable food systems.

The future of agriculture can be one where traditional wisdom and modern techniques coexist

and complement each other. Imagine farms where soil health is prioritized, where biodiversity is celebrated, and where the ecological balance is maintained. This vision of sustainable agriculture is not just a return to the past but a forward-looking synthesis that can ensure food security and environmental sustainability for generations to come.

To make this vision a reality, a collective effort is required. Farmers, policymakers, scientists, educators, and consumers - each one of us has a role to play in this journey towards sustainable agriculture. We must advocate for policies that support sustainable practices, invest in research that combines ancient wisdom with modern science, educate future generations about the importance of soil health, and make conscious choices that support sustainable farming.

By taking these steps, we honor the legacy of our ancestors, safeguard our present, and secure a healthy, sustainable future for our planet. The soil, the foundation of life, deserves nothing less. Let us commit to nurturing it with the same care and respect that our ancient forebears did, for in doing so, we nurture the future itself.

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**Changing livelihood pattern in
Indian Sundarbans with extreme
weather events**

Abstract

Sundarbans, a world heritage and largest mangrove forest of the world which covers an area of about 10,000 km². About 40% of the total landmass shared by India and remaining with Bangladesh. The ecosystem of Sunderbans is dynamic and in the development stage by formation of new islands through soil erosion and sedimentation. It is a low-lying area with an average elevation below high tide line. Traditional method of rice-based farming is a common practice in the coastal land of Sunderbans. Raising of temperature and sea level along with frequent cyclone have a vast impact on crop production, cropping pattern and social life of coastal Sunderbans area. The agriculture system is totally hampered after the strike of “Aila” in 2009 and super cyclone “Amphan” in 2020 due to increase of salinity and pH condition of soil. Use of salt tolerant variety of crops, land shaping, use of organic manure, rain water harvesting are the key majors to manage the soil. Migration is a common phenomenon here due to extreme poverty condition and at least one member form 70% of the family working in other states.



**Krishnapada
Sasmal¹**

Existing livelihood opportunities – Different kind of livelihood observed in Sunderban area which can be classified into four different broad groups, viz. (a) Agriculture (b) Aquaculture (c) NTFP collection from the forest and (d) Others (livestock, handicrafts, tourism etc)

Agriculture scenario in the changing weather events: The nature of farming in Sunderban is seasonal. Paddy based agriculture is the main economic activity in Sundarban to sustain the basic livelihood of the people. Paddy is planted by the farmers in July-August and harvested in November-December. In the recent time, nature of agriculture mainly crops production and productivity, cropping pattern and land

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Geopolitical map of Sunderban

use is gradually changing because of frequent extreme weather events. The crop production is gradually declined due to high salinity and pH in the soil. Agricultural area had shrunk between 2002 and 2009 from 2,149.615² kilo meters to 1,691.246² kilo meters due to the cyclone Aila. Majority of the land in Sunderban area is rainfed. Only 12% (Bisai 2023) of total cropped area of the region is irrigated through rainfed ponds, canals and tanks. The inland water bodies have also been affected due to floods during Amphan in 2020 and Yaas in 2021 and reduce irrigation coverage. It has been observed that rainfall has become erratic and its intensity has increased causing further damage to the agricultural yield. There is hardly any household without migration. This practice has now become a rule after Aila, the super cyclone in 2009 and now because of climate related constraint (Bhusan and Ghosh 2012)³.

² Dr, Santanu Bisai, Associate Professor, Sidho Kanho Birsha University

³ Chandra Bhusan and Aditya Ghosh, Centre for Science and Environment 2012



The plight of agriculture due to salinity



Inland water aquaculture in Indian Sunderban

TABLE 1: Last Four Tropical Cyclones & Storms and its impact

Name	Date of land fall	Strom Velocity	Strom Surge	Flood Height
Fani	03.05.2019	90 km/hr	Nil	Nil
Bulbul	09.11.2019	110 km/hr	Nil	Nil
Amphan	20.05.2020	125 km/hr	5 m	3 m
Yaas	26.05.2021	135 km/hr	6 m	4 m

TABLE 2: Sea level raise in the coming years

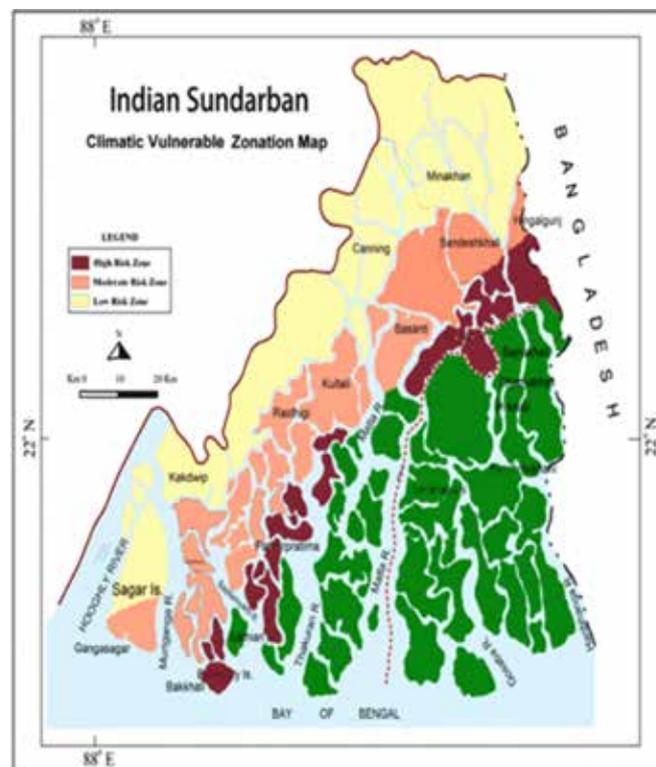
Year	2020	2050	2100
Sea Level Rise	10 cm	25 cm	1 m (high end estimated)
Land below sea level raise	2% of land (2,500 sq km)	4% land (6,300 sq km)	17.5% of land (25,00 sq km)
Ecosystem	Inundates 15% of Sunderban	Inundates 40% of Sunderban	The Sunderbans would be lost
Salinity	Increase	Increase	Increase

Source: <http://seors.unfcc.int/>

Aquaculture in the changing scenario: Marine fishing is the second highest source of income for the people of Sunderban. Around 4,000 individuals from this are fish daily⁴. Although, fishing activities continue throughout the year, the production starts increasing at the time of monsoon and reaches its peak during the winter season (November to January). Inland aquaculture is becoming more popular now a days. Increasing production of IMC is taking a major role to enhance household income besides shrimp farming and brackish water aquaculture. A large portion of households has shifted to brackish water shrimp production besides IMC in the flood affected lands that are no longer suitable for agricultural production. The cyclones and periodic floods create a large impact on both the marine fishing and inland aquaculture in respect of production and income of the households involved in aquaculture. Many saltwater fisheries have been developed on both sides of the river embankment by destroying mangroves and other vegetations, that leading to destruction of biodiversity in the region.

NTFP collection from forest: Considerable number of populations from the forest fringe villages are engaged in collecting honey, wax and other NTFP from the forest. Honey collected from both natural and artificial captive boxes. Every

⁴ C Bhusan, A Ghosh, Centre for Science and Environment 2012



3 Climatic Vulnerable Zonation Map of the Indian Sundarban Region. Data Source: India Meteorological Department Records

year in the month of April-May, many of the people enter into the reserve forest with or without permit from the forest department to collect honey and wax. Small processing units are established with the support of the forest department where people running the unit in a collective mode. Private players are also present along with individual collectors who collect honey. The extreme weather events affect bees by affecting the floral resources

and natural enemies of bees. Changed temperature could create Temporal and spatial mismatches with severe demographic consequences of Involved Specie. Changing climate may affect plant by pollen deposition and bees will experience reduced food availability.

Other source of income (Livestock): In the current scenario, livestock rearing is playing a major role in increasing the income of the family. Poultry and goat rearing are the most popular livestock in which many people are involved. Most of the female members of the family are involved in poultry and goat rearing, while the male members usually migrate to other states to earn wage income. Interestingly, the number of cattle in the Sundarbans has decreased after Super Cyclone Aila. Natural disasters also play a significant role in animal husbandry, when the production of animal feed is disrupted.

Strategical Measures to be taken: A deeper look in to the issues and challenges of the area is needed to create better and sustainable impact. Strategies suggested to mitigate the imbalance are

- a) Growing of salt tolerant variety of paddy is the only option for the most of the area to increase land utilization
- b) Paddy cum fish culture in rainwater harvesting structure (2/3 devoted for agriculture and 1/3 devoted for fish farming)
- c) Mangrove plantation to protect river banks from the flood
- d) Enhance water availability for crop cultivation. e.g., promote, excavate farm ponds for enhancing water availability for irrigation
- e) Enhance resource utilization of field crops through re-introduction of lost crops like green gram
- f) Reduce costs of inputs and consumables. e.g., Collective procurement of inputs and services through FPO
- g) Beneficiary specific intervention planning where intervention points will be customized for agriculture asset, geography, access to water etc.
- h) Build value chain efficiency of multiple products. e.g., appropriate PoP for productivity enhancement of homestead garden and plantation crops, breed improvement in poultry, vaccination services in goat rearing etc.
- i) Promote Sustainable vegetable farming through adoption of agroecological practices for enhanced soil quality and outputs
- j) Collective marketing of the produces for higher realization
- k) Better production planning for aquaculture to enhance returns

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Navigating India's Aquatic Food Systems Labyrinth:

**Charting a Sustainable Course for Food Security,
Empowerment, and Nourishment**

Background

India, a land nourished by diverse water bodies, finds itself at a crossroads regarding food security and environmental sustainability. In this scenario, aquatic food systems emerge as a beacon of hope, offering a pathway towards inclusive development, nutritional abundance, and sustainable resource management. India's aquatic food systems, like a vast network of rivers, seas, and mangroves, are vital for nourishment, livelihoods, and economic growth of this highest populated country in the world. Encompassing both capture fisheries and aquaculture, the aquatic food systems are crucial for food security and livelihoods for 60 million people in India who are engaged in the fisheries and aquaculture sectors (FAO)

But beneath the surface, challenges like overfishing, pollution, climate change, and outdated infrastructure threaten this delicate balance. To ensure a sustainable future, India must adopt a holistic approach that prioritizes environmental stewardship, economic empowerment, gender inclusion, and nutrition.

This article delves to discuss the importance of India's aquatic food systems, challenges faced, proposed strategies to address the challenges and initiatives already underway in this direction.

Why is Aquatic food systems important for India

A deep dive into the potential of aquatic food systems brings for the following;

- **Inclusive Development on a Current of Opportunity:**

India's aquatic food systems, encompassing not just fish but also algae, lotus stems, and aquatic plants, provide a critical avenue



Nirmallya Mandal

for inclusive development, particularly for smallholder farmers. Unlike deep-sea fishing, often dominated by men, aquaculture opens doors for women's participation. Data from the Indian Council of Agricultural Research (ICAR) reveals that almost 50% of India's aquaculture workforce comprises women, making it a significant source of income and empowerment for marginalized communities. Take the case of Andhra Pradesh, where women's self-help groups have spearheaded shrimp farming initiatives, leading to a 50% increase in household income within a decade. Such stories inspire and pave the way for a more equitable food system.

- **Anchoring Food Security and Combating Hidden Hunger:**

Beyond employment, aquatic food systems play a pivotal role in addressing India's food security challenges. 33% of children under 5 years suffer from stunting. Fish and other aquatic animals are rich sources of essential nutrients, often missing in staple diets. This combats hidden hunger, a prevalent issue affecting children and women, leading to stunting and developmental delays. For instance, a study by WorldFish, an international research organization, found that incorporating

carp and small pelagic fish into the diets of pregnant women in Odisha increased the intake of vitamin A by 40%, a crucial nutrient for foetal development and immunity. Additionally, fish provide bioavailable sources of iron, zinc, and vitamin B12, often lacking in vegetarian diets, enhancing the nutritional well-being of vulnerable populations.

- **More Than a Catch: Unveiling the Income Potential:**

Contrary to popular belief, aquatic food systems hold immense potential for income generation, often surpassing agriculture for smallholder farmers. A report by the Food and Agriculture Organization (FAO) states that aquaculture contributes over 6.3% of India's agricultural GDP, with a potential to climb even higher. Examples like M.G. Ramakrishna, a fish farmer from Andhra Pradesh, who earns over Rs. 5 lakhs per year from his integrated fish-poultry farm, serve as testaments to this hidden potential. By adopting sustainable practices and accessing new technologies, smallholder farmers can unlock significant economic opportunities within the aquatic food system.

■ **A Symphony of Sustainability: Aligning with the SDGs:**

Aquatic food systems, when practiced responsibly, are a textbook example of agroecological and sustainable food production. They contribute to several Sustainable Development Goals (SDGs), including poverty alleviation (SDG 1), responsible consumption and production (SDG 12), and gender equality (SDG 5). Initiatives like the Blue Revolution program, championed by the Indian government, promote sustainable aquaculture practices like bio-floc technology and integrated farming, minimizing environmental impact while maximizing productivity. By embracing such approaches, India can ensure long-term food security without compromising ecological well-being.

■ **Beyond the Surface: Embracing the Ripple Effect:**

The significance of aquatic food systems extends far beyond economic and nutritional benefits. These systems foster community resilience, contribute to cultural heritage, and provide recreation opportunities. Fishing communities, for instance, play a vital role in coastal protection and resource management. Additionally, aquatic plants like lotus hold cultural significance in Indian tradition,

weaving themselves into religious ceremonies and culinary expressions. Recognizing these multifaceted benefits ensures a holistic approach to the development and management of aquatic food systems.

What is stopping us? The bottlenecks

Despite being a major fish producer, India faces a fish consumption paradox: 200 million people rely on fish for protein, yet per capita consumption remains below the global average (FAO). This reflects deeper issues that disproportionately impact women and marginalized communities. Challenges like pollution, overfishing, and inadequate access to infrastructure threaten the sustainability of aquatic food systems. The challenges identified include, the following;

■ **Environmental Challenges:**

- **Overfishing:** Unsustainable fishing practices have led to the depletion of several fish stocks, particularly in coastal areas. This not only impacts food security but also disrupts the entire marine ecosystem.
- **Water scarcity and pollution:** Aquatic food systems are heavily dependent on freshwater resources. However, India faces growing water scarcity due to climate

change, groundwater depletion, and pollution from agricultural runoff and industrial waste. This directly impacts the productivity of aquaculture and the health of fish populations in natural water bodies. In Odisha, pollution from industrial and agricultural runoff has damaged biodiversity and fish stocks in the once-thriving Chilika Lagoon, highlighting the urgent need for pollution control measures.

- **Environmental Degradation and Habitat destruction:** Activities like mangrove deforestation, coastal development, and sand mining damage critical fish breeding grounds and disrupt migration patterns.
- **Promotion of unsustainable fish production:** The focus to enhance productivity and market conditions have driven intensive fish cultivation and storage using chemicals and antibiotics in some cases.
- **Climate change:** Rising sea temperatures, ocean acidification, and extreme weather events pose significant threats to marine ecosystems and aquaculture production. e.g. Rising sea levels, erratic rainfall, and cyclones, driven by climate change, are disrupting livelihoods and fish habitats in the Sundarbans mangrove forests of West Bengal.

■ **Socioeconomic Challenges:**

- **Lack of infrastructure and technology:** Limited access to cold storage facilities, processing units, and efficient transportation networks leads to post-harvest losses and reduces the value of fish and other aquatic food.
- **Market inefficiencies:** Fragmented markets, inadequate market information, and the dominance of middlemen often lead to low producer prices and price volatility, impacting the livelihoods of fisherfolk and fish farmers. Fish and aquatic products markets remain uncoordinated across most states resulting in gluts and shortages at the same points. Markets for non-fish aquatic products like algae and aquatic plants are also unexplored and underdeveloped in India.
- **Limited access to credit and insurance:** Small-scale fishers and aquaculture farmers often struggle to access financial resources, hindering their ability to invest in better technology and adopt sustainable practices.
- **Gender inequality:** Women play a significant role in post-harvest activities and fish processing, yet they often face limited access to resources, training, and decision-making power.

■ Policy and Governance:

- **Ineffective regulations and enforcement:** Weak enforcement of fisheries regulations and inadequate monitoring of illegal fishing activities contribute to overfishing and unsustainable practices.
- **Fragmented policy landscape:** Overlapping jurisdictions and a lack of coordination between different government agencies hinder effective management of aquatic resources.
- **Limited investment in research and development:** Insufficient funding for research on sustainable aquaculture practices, fish stock assessment, and climate change adaptation hampers the development of long-term solutions.
- **A large gap in capacities of government extension system** is also observed in the aquatic food space. Updated technical knowledge, adequate human resources and on-field linkage and technical service providers continue to remain the pain points of the system.

What should we do now? A call to dive deeper

Embracing aquatic food systems as a critical pillar of India's food security and sustainability roadmap demands a collective effort. In a multi-pronged approach, India needs concerted efforts from multiple stakeholders, including government, research institutions, and local communities.

- Enhancing research and development efforts to develop climate-resilient aquaculture and fisheries management strategies and strengthening policies and governance frameworks for effective management of aquatic resources is the road ahead for both central and state governments. Implementing stricter regulations and enforcement mechanisms, investing in pollution control measures, and promoting responsible fishing practices as part of fisheries management plans are crucial steps towards safeguarding these vital resources.
- By supporting smallholder farmers, promoting inclusive development, and prioritizing responsible practices, India can harness the ripple effect of aquatic food systems, ensuring a future where nutritional abundance, environmental harmony, and equitable

prosperity flow abundantly for all. Addressing gender inequalities in the sector through targeted interventions and empowerment programs is also the need of the hour.

- Additionally, initiatives like capacity building programs for not only farmers but all important stakeholders in the value chains, adopting advanced technologies, and developing efficient financial linkages can unlock the full potential of aquatic food systems. Initiation and development of specialized Fisheries Producers' Organizations are particularly important here.
- Strengthening market infrastructure, improved technology use and improving market access for fishers and farmers to reduce the market inefficiencies and enhance remunerative market linkages will be key factors to regulate and increase demand for aquatic food products. The market players need formalization and support to enhance their roles in the value chain. Linking various state and national level markets like 'e-NAM' for aquatic food products may be crucial for smoother information and product flow.

Where are we now? Recognizing initiatives

India's vast aquatic resources hold immense potential for food security, economic growth, and environmental sustainability. Several initiatives are already transforming the country's aquatic food systems, promoting responsible practices, and empowering stakeholders. A glimpse into some key efforts are as follows;

- **Enabling Policy, the driver of change**

Launched in 2017, this flagship Blue Revolution Scheme aimed to double fish production by 2024-25, focusing on sustainable aquaculture practices. It incentivizes fish farmers through subsidies, infrastructure development, and capacity building programs. Later, Pradhan Mantri Matsya Sampada Yojana (PMMSY) launched in 2020, aims to invest over Rs. 20,000 crore in fisheries infrastructure development, technology adoption, and market linkages. It focuses on holistic improvement of the entire fisheries value chain, from fingerling production to post-harvest handling and marketing. Efforts are underway to improve market access for fish farmers through cold chain infrastructure development, branding initiatives, and promotion of value-added products like fish fillets, canned fish, and fish oil under PMMSY

for enhancing farmer income and consumer affordability.

Kisan Credit Card Scheme provides easy access to credit for fish farmers, enabling them to invest in technology, infrastructure, and working capital in addition to other farmers. This financial support empowers fish farmers to scale up their operations and improve livelihoods.

Research and Development institutions like ICAR-Central Institute of Freshwater Aquaculture and CMFRI are actively involved in developing new fish varieties, feed formulations, and sustainable aquaculture practices. This research strengthens the scientific foundation for the sector's growth. Initiatives like bio-floc technology, integrated farming systems, and recirculating aquaculture systems are being encouraged to reduce environmental impact and improve resource efficiency in aquaculture. These practices minimize water use, waste generation, and antibiotic reliance.

Adoption of technologies like mobile apps for market linkages, fish health monitoring systems, and precision feeding systems is transforming the sector. These innovations improve transparency, efficiency, and resource management in fisheries and aquaculture.

■ Empowering Women, Transforming Communities

Recognizing the significant role women play in fisheries, programs like 'Mahila Matsya Sahyog' and 'Matsya Sarathi' provide training, financial assistance, and market access to women fish workers and entrepreneurs. This promotes gender equity and improves women's livelihoods. Fisheries Producer Organizations (FPOs) and associated microfinance initiatives offer promising pathways for the same. e.g. Kerala's state-run FPO, Matsyafed, has empowered women fish vendors and ensured fair prices for small-scale fishers, demonstrating the positive impact of collective action. Likewise, in Andhra Pradesh, the Sakhi Matsya Mahila Producer Company has enabled women to gain control over pricing, reduce reliance on middlemen, and establish a successful fish processing unit, showcasing the potential of women-led FPOs.

Integrated Fish Farming financial model has been successfully piloted in Odisha where the Umbrella Program in Natural Resource Management (UPNRM) under NABARD had launched an integrated fish farming finance model in Kendrapara district, improving upon the fish farmers' income and nutrition and serving as an example of the transformative power of microfinance in rural communities.

Odisha is also one of the first states in the country to effectively implement a policy to allot Panchayat ponds and common property aquatic resources to exclusive women SHGs across the state.

■ **Nourishing Lives, Protecting Resources**

Nutrition-sensitive aquaculture and integrated farming systems can enhance both economic gains and nutritional well-being. Nutrition-Sensitive Aquaculture in Odisha, Assam and Jharkhand by the respective state departments of Fisheries are promoting cultivation of small fish species rich in iron and calcium to combat anaemia and malnutrition, particularly among women and children.

Integrated aquaculture-agriculture systems, like those in Tripura, where farmers cultivate fish alongside rice and vegetables, showcase sustainable practices that reduce input costs, improve soil fertility, and diversify food production.

■ **Innovation and Collaboration: Weaving Technology and Partnerships**

Technological advancements and collaborative partnerships can play a crucial role in navigating India's aquatic labyrinth. Precision Fishing in Gujarat: GPS-enabled fishing vessels in Gujarat are demonstrating the potential of precision fishing to reduce bycatch, fuel costs, and increase catch efficiency, promoting sustainable fishing practices.

Blockchain for Traceability in Andhra Pradesh's fisheries department is using blockchain technology to track fish from catch to consumption, ensuring transparency, food safety, and traceability in the supply chain.

The Chilika Development Authority's co-management program, involving local communities in resource management and conservation efforts, highlights the importance of participatory approaches in ecosystem restoration.

Conclusion

Navigating India's aquatic food labyrinth demands a collective effort, weaving threads of environmental sustainability, economic empowerment, gender inclusion, and a focus on nutrition. By prioritizing these interwoven elements, India can chart a course towards a thriving future where aquatic food systems nourish millions, empower communities, and safeguard this intricate tapestry of life for generations to come. Let us ensure that this labyrinth, once a symbol of challenge, becomes a model for sustainable development, showcasing the power of innovation, collaboration, and inclusive solutions.

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Empowering India's Organic FPOs to Tap into Growing Organic Food Market: Challenges and Strategies

The organic food market in India is on an impressive trajectory, with projections showing a growth rate of approximately 16.27% CAGR from 2023 to 2027, potentially reaching a value of INR 287 billion by 2027. This expanding market presents a substantial opportunity for Farmer Producer Organizations (FPOs) to capitalize on the increasing demand for organic products.

A Farmer Producer Organization (FPO) is a collective of farmers, offering comprehensive support and services like technical assistance, marketing, and processing. Its main goal is to improve farmers' income through a structured, self-organized system. FPOs enable farmers to pool resources for better access to quality inputs, technology, credit, and market opportunities, leveraging economies of scale for improved income realization.

These organizations have been transformative in the organic farming landscape, where adherence to specific standards and practices can be daunting for individual small farmers. By providing collective certification and training in organic farming practices, FPOs empower these farmers to effectively participate in the organic market. They not only help in aggregating produce and ensuring compliance with organic standards but also facilitate access to premium markets, both domestically and internationally. This enables small and marginal farmers to tap into the growing demand for organic produce, thereby positioning them more effectively in the lucrative organic market.

Despite their substantial potential role, FPOs face numerous challenges that could hinder their ability to effectively compete with other established entities in the market. Addressing these challenges is crucial for FPOs to fully leverage the potential of the burgeoning organic food sector.



**Venugopal
Midivelli**

Challenges faced by FPOs

Access to financial funding

Access to initial financial resources is a significant hurdle for Farmer Producer Organizations (FPOs), especially when establishing processing units, and investing in marketing and branding. The challenge is compounded by the complexities and strict requirements of government schemes and bank loans. Simplifying these funding processes and providing clearer guidelines would significantly benefit FPOs

Branding and Marketing challenges

In the realm of branding and marketing, numerous FPOs face challenges due to a lack of proper branding strategies for their commodities, which affects their visibility in the market. This issue is often exacerbated by a lack of time and expertise in effective branding and marketing practices.

Certification and Compliance Challenges

FPOs also encounter challenges in certification and compliance. Meeting customer demands for certification, along with ensuring high-quality packaging and branding, can significantly impact the profitability of FPOs. The difficulty lies in passing the increased costs of certification and compliance onto customers, particularly in a market sensitive to price fluctuations. Maintaining a balance between fair compensation and market competitiveness remains a constant struggle. Additionally, consistently upholding high-quality standards and ensuring the regular availability of products are crucial for establishing consumer trust and loyalty, which demands efficient production, harvesting, and supply chain management, posing a significant challenge for small-scale organic producers.

“ We are the farmers, not marketing experts. We dedicate our time to cultivating quality food. Do not have the time or expertise to brand and market our products. There is a need for support from others like NGOs, organic retailers, etc.” by a representative from Friends of Earthworm FPC Ltd.

Customers are price sensitive; we are not able to pass on the cost of certification and packaging to customers like private companies. This affects our profit margins greatly by a representative from Friends of Earthworm FPC Ltd.

Market Challenges

Market access is another area where FPOs often lack adequate support. Establishing connections with potential markets and finding reliable, profitable outlets for their produce is a significant barrier, limiting their capacity to sell their products effectively. This challenge underscores the need for better market linkage support for FPOs to enhance their market reach and profitability.

Infrastructure Challenges

Infrastructure challenges significantly impede small-scale farmers in the organic sector, particularly those in Farmer Producer Organizations (FPOs). The lack of adequate processing and storage facilities undermines the quality and shelf-life of organic products, consequently limiting market access. Additionally, small farmers face substantial hurdles in aggregating and transporting their produce effectively. Efficient and cost-effective transportation is crucial for timely and safe product delivery, yet its absence hampers market reach and profitability. Addressing these infrastructure gaps is essential to enhance the efficiency and market presence of organic farming initiatives.

Solutions and Strategies

Addressing the challenges faced by FPOs in India's organic sector requires a multi-faceted approach encompassing government support, technological innovation, market development, and capacity building.

Government Policies and Support: Government interventions are vital. Policies that provide financial assistance, reduce bureaucratic hurdles, and offer tax incentives can significantly aid FPOs. The Government of India's initiatives like the Pradhan Mantri Kisan Samman Nidhi (PM-KISAN) and the Organic Value Chain Development in North East Region (MOVCDNER) scheme are examples. These initiatives provide direct income support and promote organic farming in specific regions.

Technology and Innovation: Leveraging technology for better crop management, market access, and information dissemination is crucial. Digital platforms can connect FPOs with markets and provide real-time data on weather and market prices. Innovations in organic farming techniques and the use of mobile applications for farmer education are practical solutions.

Market Development and Access Strategies: Developing a robust market infrastructure is essential. This includes establishing direct

links with buyers, participating in organic trade fairs, and utilizing e-commerce platforms. FPOs like Sahaja Aharam Producer Company have successfully linked organic farmers with urban markets.

Training and Capacity Building: Regular training programs to educate farmers about organic farming practices, certification processes, and market trends are necessary. Collaborative efforts with agricultural universities and NGOs can facilitate such programs. The Krishi Vigyan Kendras (KVKs) play a significant role in this regard.

Role of Government and Other Stakeholders

The Government of India plays a pivotal role in supporting FPOs through policies and schemes. Beyond financial assistance, policy frameworks that streamline the operation of FPOs and facilitate easier market access are critical. The involvement of NGOs, private sector players, and international agencies is equally important. NGOs can provide grassroots-level support and training, while the private sector can offer market linkages and investment. International agencies bring in global best practices and additional funding.

Policy recommendations include simplifying the process of organic certification, providing subsidies for organic inputs, and enhancing the marketing

skills of FPO members. A cohesive effort from all these stakeholders is required for the holistic development of FPOs.

Future Prospects and Conclusion

The future outlook for FPOs in India's organic sector is promising. With increasing global and domestic demand for organic products, FPOs have a significant role to play. However, realizing this potential requires addressing the current challenges effectively.



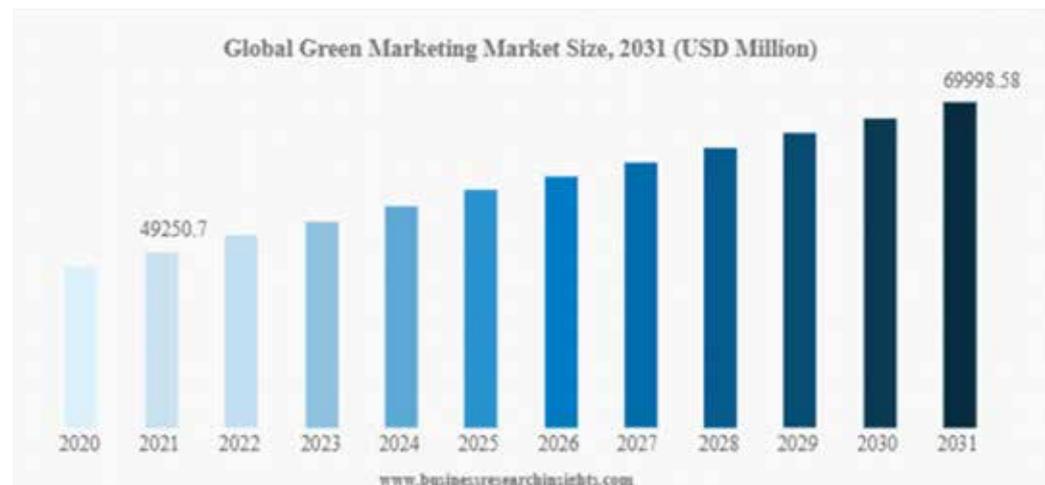


India stands at a crossroads, grappling with a unique environmental challenge. Among the top five countries for the highest carbon emissions, its journey towards sustainability is not just a choice but a necessity. Yet, in this challenge lies an opportunity: the burgeoning field of green marketing, a sector that's not only gaining momentum globally but is also ripe with potential in the Indian market.

Green marketing is a transformative approach that blends environmental stewardship with business strategy. It's about creating, promoting, and selling products or services based on their environmental benefits. This concept extends beyond mere eco-friendly products to encompass a holistic strategy that includes sustainable supply chains, ethical resource acquisition, and a commitment to reducing environmental footprints. It's an approach that integrates environmental consciousness into the core of brand messaging, influencing both production and consumer behavior.



Ayush Mondal



For stakeholders in India, embracing green marketing is no longer optional, but a strategic imperative. With a rapidly growing economy and a large consumer base increasingly aware of environmental issues, green marketing offers a dual benefit: it meets the evolving consumer demand for sustainable products while also addressing critical environmental concerns. Indian businesses and entrepreneurs have the opportunity to lead the way in sustainable practices, setting a precedent not just for profit but for a healthier planet. Adopting green marketing can give Indian businesses a competitive edge, opening up new markets and building trust with environmentally conscious consumers. Green marketing remains a topic of significant global interest, with Google Trends indicating that India leads in the number of searches for this term, more than any other country.

Green Marketing in the Indian Context

Cultural and Economic Relevance

In India, a country deeply rooted in traditions and values that respect nature and sustainability, green marketing finds fertile ground. The ancient Indian philosophy of 'Vasudhaiva Kutumbakam' — the world is one family — reflects a mindset that reveres the environment as an integral part of human existence. Economically, India is on a trajectory of rapid growth and development. With this growth comes an increased responsibility towards sustainable practices. Green marketing in India is not just a business strategy but resonates with the cultural ethos of living in harmony with nature. It is an approach that aligns with the economic need for sustainable development in a country grappling with environmental challenges like air pollution, water scarcity, and waste management.

Specifics of the Indian Market

The Indian market, characterized by its diversity and complexity, offers unique challenges and opportunities for green marketing. It's a market where consumer awareness about environmental issues is rising, yet price sensitivity remains a key decision-making factor. The challenge for green marketers in India lies in balancing affordability with sustainability. Additionally, the preference for local and traditional products opens avenues for integrating green marketing with indigenous practices. The Indian government's push towards renewable energy and sustainable development also creates a conducive environment for green marketing initiatives.

Some key insights

1. **Cultural Integration:** Successful green marketing in India often involves integrating environmental initiatives with cultural values and practices.
2. **Innovation and Problem-Solving:** There is a significant opportunity for businesses that use innovative solutions to address environmental challenges.
3. **Corporate Responsibility:** Large corporations have the potential to lead the way in sustainability, demonstrating that environmental responsibility and profitability can go hand in hand.
4. **Consumer Awareness:** The growing environmental consciousness among Indian consumers presents a valuable opportunity for businesses to align their marketing strategies with sustainability goals.

Implementing Green Marketing Strategies

Developing a Strategy

To craft an effective green marketing strategy, we begin by deeply understanding the environmental concerns and preferences of our target audience. This starts with identifying the unique selling proposition (USP) of our eco-friendly products or services. It involves recognizing what makes our offerings not only beneficial to the environment but also appealing to consumers. Then, we integrate this USP into our brand's narrative, ensuring it aligns with our overall mission and values. Conducting market research is essential to comprehend the environmental values and purchasing behaviors of our target audience. This research will steer the creation of a marketing strategy that promotes environmental benefits and resonates with the values and lifestyles of our consumers.

CASE 1: Leading Eco-Innovation: State Bank of India's Green IT Initiative

SBI has also introduced the "Green Channel Counter" for paperless banking, enabling transactions through SBI shopping and ATM cards, eliminating the need for traditional banking forms. Furthermore, SBI ventured into renewable energy by setting up a 15-megawatt wind farm developed by Suzlon Energy, spanning Tamil Nadu, Maharashtra, and Gujarat, marking a significant step in its green banking initiative aimed at reducing its carbon footprint and promoting energy-efficient practices.

Actionable Steps

1. **Product Assessment:** Assessing our products or services for their environmental impact, ensuring they meet sustainability standards.
2. **Market Research:** Engaging in surveys and studies to understand our target market's environmental concerns and preferences.
3. **Sustainability Messaging:** Developing clear and honest messaging that accentuates the environmental benefits of our products or services.
4. **Channel Selection:** Choosing marketing channels that align with our target audience's preferences and our sustainability goals, like digital platforms for their lower environmental impact.
5. **Partnerships and Certifications:** Collaborating with environmental organizations and seeking certifications to bolster the credibility of our green claims.

Tools and Avoiding Mistakes

Avoiding greenwashing – making false or exaggerated claims about the environmental benefits of a product – is crucial. To do this, ensure transparency in your marketing communications.

Provide clear, substantiated claims about your product's environmental benefits. Tools such as life cycle assessments can help determine the true environmental impact of your product. Additionally, adhering to established environmental standards and obtaining certifications from reputable organizations can lend credibility to your claims. It's also important to engage in continuous learning and stay updated on the latest environmental issues and sustainable practices.

CASE 2: Agartala: Pioneering the Green City Revolution in India

Tripura announced a plan to transition all vehicles in Agartala to compressed natural gas (CNG) by 2013, aiming to make it India's first green city. The initiative, led by Tripura Natural Gas Co Ltd (TNGCL), a joint venture involving GAIL and the Tripura and Assam governments, focuses on converting private and government vehicles to CNG. This change extends to machinery currently powered by electricity, petrol, or diesel. TNGCL also plans to extend PNG connections to 10,000 new domestic consumers, reinforcing Agartala's path to becoming a green city within three years.

The Future of Green Marketing in India

India's green marketing landscape is evolving rapidly, with several key trends shaping its future. One prominent trend is the growing consumer preference for sustainable and eco-friendly products, driven by increased environmental awareness. There's also a notable rise in the use of digital platforms for green marketing, leveraging social media and online communities to promote sustainable brands. Another emerging trend is the integration of green practices in traditional industries, such as agriculture and textiles, where there is a shift towards more sustainable production methods. Additionally, the use of innovative technologies like AI and blockchain for tracking and ensuring the sustainability of products is gaining traction.

Sustainability and marketing experts anticipate a significant shift towards more authentic and holistic green marketing practices. They predict a move beyond superficial green claims, with businesses increasingly adopting genuine sustainability measures. Experts also foresee a rise in consumer activism, where buyers not only prefer but demand sustainable products, influencing companies to prioritize environmental responsibility. The importance of transparency

CASE 3: Eco-Innovation: The New Direction at Tata

Tata Motors is developing an environmentally-friendly showroom with natural materials and energy-efficient lighting. The Indian Hotels Company, owner of the Taj hotel chain, is creating eco-rooms featuring energy-efficient minibars, organic linens, and recycled paper napkins, eschewing carpets due to cleaning chemicals. These rooms will use CFL or LED lighting, with 5% of Taj hotel rooms adopting this eco-friendly design. The Taj Green Cove in Kovalam innovates with a biogas plant using hotel waste for cooking. Additionally, Tata Motors is working on the Indica EV, an electric car for select European markets.

and accountability in green marketing is another aspect highlighted by experts, foreseeing stricter regulations and more rigorous certification processes.

Comparing Indian green marketing trends with global patterns reveals both similarities and unique challenges. Like many parts of the world, India is seeing a rise in consumer environmental

consciousness and a preference for sustainable products. However, the challenge in India lies in balancing sustainability with affordability, given the price-sensitive nature of the market. Globally, there is a stronger emphasis on regulatory compliance and certifications, aspects that are still developing in the Indian context. Additionally, while global markets might be more advanced in terms of technological integration in green marketing, India presents a unique blend of traditional practices and modern approaches.

The future of green marketing in India is replete with opportunities. One significant area is the development of sustainable products that cater to the price sensitivities of the Indian market, thus broadening the consumer base. There's also potential in harnessing traditional Indian practices and local knowledge in sustainable production, presenting a unique selling proposition globally. Another growth area lies in the education and awareness sector, where businesses can play a role in educating consumers about the importance

of sustainability. Furthermore, the evolving regulatory landscape presents opportunities for businesses to lead in compliance and innovation in green practices.



Conclusion

This article has navigated the multifaceted landscape of green marketing in India, highlighting its cultural and economic relevance, unique market characteristics, successful case studies, and insightful analyses. We've explored the strategic development of green marketing, detailing actionable steps for effective implementation, and offering tools and guidelines to avoid common pitfalls like greenwashing. The future of green marketing in India is painted with emerging trends, expert insights, comparative analyses, and burgeoning opportunities. These elements collectively sketch a roadmap for Indian stakeholders looking to embrace green marketing as a pathway to sustainable business success and environmental stewardship.

Mahatma Gandhi once said, "Earth provides enough to satisfy every man's needs, but not every man's greed." This thought resonates deeply with the essence of green marketing. It's a call to balance our needs and aspirations with the health and well-being of our planet. As we stand at the crossroads of environmental challenges and economic opportunities, let Gandhi's words guide our journey toward a more sustainable and equitable future.

As stakeholders in one of the world's most dynamic markets, the time is now to embrace the principles of green marketing. Let's take these insights and turn them into action. Engage with your community, rethink your business strategies, and be the change you wish to see in the world of commerce. The future is green, and it starts with us.



Bridging the Divide:

Supporting Inclusive Business in Agriculture to support smallholder farmers and promoting sustainable agriculture

Introduction

In India, agriculture is not just a livelihood; it is the backbone of the nation's economy, supporting millions of farmers and their families. However, the agricultural landscape in India is diverse, with varying levels of prosperity and challenges. This sector, pivotal for the economy and sustenance of a large part of the population, requires urgent and inclusive interventions. This article delves into these challenges and explores how inclusive business models can offer solutions.

Inclusive businesses provide goods, services, and livelihoods on a commercially viable basis, either at scale or scalable, to people living at the base of the economic pyramid (BOP) by making them part of the value chain of companies' core business as suppliers, distributors, retailers, or customers. In addition to these commercially inclusive activities, businesses may also pursue broader socially inclusive goals.⁵

Inclusive business in agriculture is a model that seeks to integrate smallholder farmers, women farmers and other marginalized or economically disadvantaged farming communities into the value chain. In India, where a significant portion of the population relies on agriculture and allied sectors such as dairy, livestock, NTFP collections etc. for their livelihoods, fostering inclusivity is essential for the overall well-being of the nation.



**Santosh Kumar
Gupta**

⁵ Definition of Inclusive business as per G-20 (<http://g20.org.tr/wp-content/uploads/2015/11/G20-Inclusive-Business-Framework.pdf>)



FIGURE 1: Key Characteristics of Inclusive Businesses

Need for Promoting Inclusive Business in India

Indian farmers face multifaceted challenges that hinder their economic and social progress. These challenges include fragmented land holdings, lack of access to credit, outdated farming techniques, lack of access to modern equipment and technologies, and vulnerability to climate change along with the absence of timely extension and advisory services. Additionally, due to lower marketable surplus, smallholder farmers often find it difficult

to access remunerative markets for their produces, especially for sustainably produced commodities as traditional agriculture markets do not offer a fair and remunerative price. The promotion of inclusive business models has the potential to address some of these challenges sustainably.

Smallholder farmers constitute a significant portion of India's rural population. According to data from the National Sample Survey (NSS), around 86% of farmers in India are categorized as small and marginal farmers, owning less than 2 hectares of land. Smallholder farmers typically face lower income levels compared to larger landholders. The economic viability of farming for these individuals is often compromised due to limited resources, access to markets, and vulnerability to climatic variations.

Women Farmers in India play a vital role in Indian agriculture, constituting nearly 50% of the agricultural workforce. However, their contributions often go unnoticed and undervalued, as they are engaged in various agricultural activities such as sowing, harvesting, and post-harvest processing. Despite their significant involvement in agriculture, the ownership of agricultural

land by women remains disproportionately low. Only about 13.9% of rural women own land in India⁶. Women farmers often face challenges in accessing crucial resources such as credit, seeds, and technology. The gender gap in access to these

resources contributes to disparities in productivity and income levels between male and female farmers.

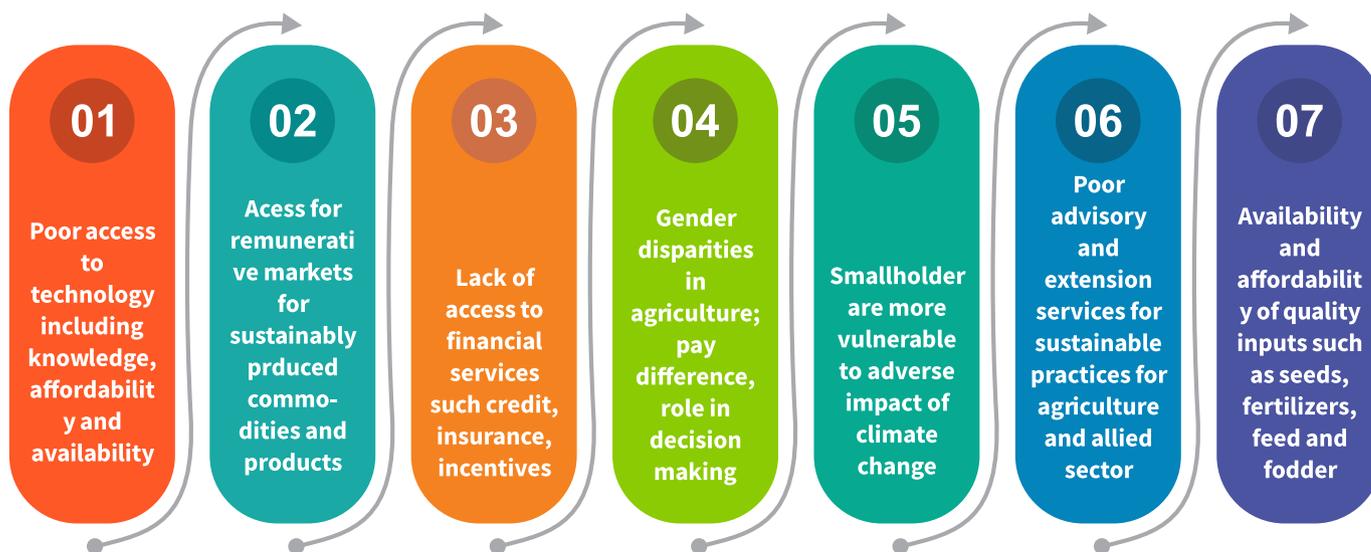


FIGURE 2: Major Challenges faced by smallholder farmers in India

⁶ National Family Health Survey (NFHS),

Inclusive Business Opportunities for Companies in Agriculture

Several inclusive business models can be employed to promote sustainable agriculture among Indian farmers. Inclusive business models and approaches address these challenges and create a more equitable and sustainable

sector in a commercially viable approach.

Inclusive models prioritize the integration of smallholder and marginal farmers, ensuring that the benefits of agricultural growth are shared among all stakeholders. Some of the key areas of interventions for inclusive businesses are as follows.

Inclusive business opportunities for Companies

Knowledge Transfer to smallholder farmers

Providing farmers knowledge training, extension and advisory services.

Infrastructure and logistics

Warehousing, cold storage, processing infrastructure, transportation.

Climate-Resilient Practices

Support farmers in adopting climate smart and regenerative agriculture practices

Access to Inputs

Creating access to quality agriculture inputs such as seeds and planting material, bio-fertilizers and bio-inputs, compost.

Technology led solutions

IOT, Farm equipment, weather forecasting, smart devices for soil testing, irrigation etc.

Financial Inclusion

Credit linkages, Crop insurance, micro-finance

Market linkages

Remunerative prices to farmers: BI Program, direct farmers support programs, working with FPOs

Empowering women

Providing women farmers with equal access to resources, training programs, and financial support.



FIGURE 3: Inclusive business opportunities for companies in India

1. **Providing access to appropriate and affordable technology to smallholder farmers:** Implementing inclusive business models involves providing smallholders with access to modern, farmer-friendly technologies. This could include but is not limited to mobile applications for weather forecasting, soil testing devices suited for smallholder farmers' needs and precision agriculture tools that optimize resource utilization. Some of the examples of companies already providing such solutions are as follows.



CORNEXT has customised the Balers to meet smallholder dairy farmers need for Silage preparation



Deltathings is working with smallholder farmers with its smart light traps that are designed to kill pests



AgroNxt has innovated a potable smart Soil testing device to help farmers with an instant soil testing

2. **Market Linkages for smallholder farmers:** Creating direct market linkages is crucial to reducing the dependency of smallholders on intermediaries. Farmer-producer organizations (FPOs) and cooperatives can serve as powerful vehicles to aggregate produce, negotiate fair prices, and provide a collective voice for farmers in the market. Specifically, farmers need support and linkages from market players for organic and sustainably produced commodities due to the absence of traditional

markets. In India, several agribusinesses work with farmers to provide them with market access as part of their core value chain through initiatives like direct farmer support programs, Backward integration models, farm gate sourcing, engagement with FPOs and contract farming.



Sid's Farm, A premium dairy brand in Hyderabad is directly procuring milk from farmers at remunerative prices



Jayanti Herbs, a leading spice company in India, procuring sustainably produced spice from farmers as part of its direct farmers support program



Azad Agro Enterprise, an spice exporter in India, supporting farmers in linking their products with export markets

3. **Credit linkages and Financial Inclusion:** Inclusive financial solutions, such as microfinance and community-based credit programs, can address the credit constraints faced by smallholder farmers. Tailored financial products with reasonable interest rates can enable farmers to invest in inputs, machinery, and sustainable farming practices.



Dvara E-Registry is supporting smallholder farmers and FPOs in accessing various financial services through its 'Khet Score' and other initiatives



Satya Micro Capital is providing credit and other support to women farmers to invest in agriculture and set-up enterprise units in rural areas



Varaha, is helping smallholder farmers in accessing additional funds through instruments like 'Carbon Credits' to incentivize their sustainable agriculture practices

4. **Empowering Women in Agriculture:** Inclusive business models must actively address gender disparities in agriculture. Providing women farmers with equal access to resources, training programs, and financial support can empower them to play a more significant role in decision-making processes and contribute to the overall growth of the sector.



Be'nishan producer company in Telangana is supporting close to 0.1 million women farmers and their institutions with market linkages and other initiatives



Safe Harvest, is working with women farmers and their FPOs to establish processing units for processing of Non pesticide based products. In turn it is also procuring these commodities from FPOs.

5. **Promoting Climate-Resilient Practices:** Promoting climate-smart agriculture, regenerative agriculture and other forms of sustainable agriculture through inclusive business models not only helps farmers adapt to and mitigate the effects of climate change but also provides enormous opportunities for Agri-business to strengthen their supply chains and create new market opportunities for themselves.



AVT McCormick is working closely with smallholder farmers to help them in adopting sustainable farming practices.

SAHAJA Aharm is supporting farmers in adopting organic and natural farming practices by providing them training, inputs and market led support

Verstegen, a Global spice company is promoting regenerative and Bio-diversity friendly cultivation practices all across its supply chain.

6. **Quality and Affordable agriculture inputs to the farmers:-** Creating access to quality agriculture inputs such as seeds and planting material, bio-fertilizers and bio-inputs, compost etc. plays a vital role in improving farm productivity and managing the cost of cultivation. Access to quality and affordable bio-inputs is critical for organic and sustainable agriculture.



IFFCO KISAN is offering a range of inputs and services to farmers to adopt sustainable agriculture and livestock management practices. Besides offering these products, it works closely with farmers.



Grassroots Energy is establishing the decentralized bio-energy units to produce organic inputs and energy at the same time. It's solutions are helping farmers in scaling-up the sustainable agriculture practices.

7. **Supply chain and logistics solutions:-** Access to appropriate infrastructure and logistic facilities such as warehouses and cold storage, cooling chambers, facilities for grading, sorting and primary processing, and transportation facilities are important for smallholder farmers. Creating such facilities offers a great opportunity for agribusiness to engage with smallholder farmers and promote inclusive business models.

role in creating a more inclusive value chain. For instance, farmer-producer organizations (FPOs) empower smallholders by providing collective bargaining power, access to resources, and market linkages. Partnerships with such organizations can help agribusiness in setting up more dependent and responsive supply chain mechanisms while also ensuring benefits to smallholder farmers.

The development of the Agritech and Fintech start-ups in India, some of the policies and initiatives of the Government and increased demand for sustainably produced agriculture commodities from both domestic and export markets have created an enabling environment for inclusive business in India. Some of the key factors enabling this ecosystem are as follows.

Enabling Ecosystem for Fostering Inclusive Business in India

Collaborative partnerships between farmers, government agencies, NGOs, private enterprises and multi-lateral organizations can play a pivotal

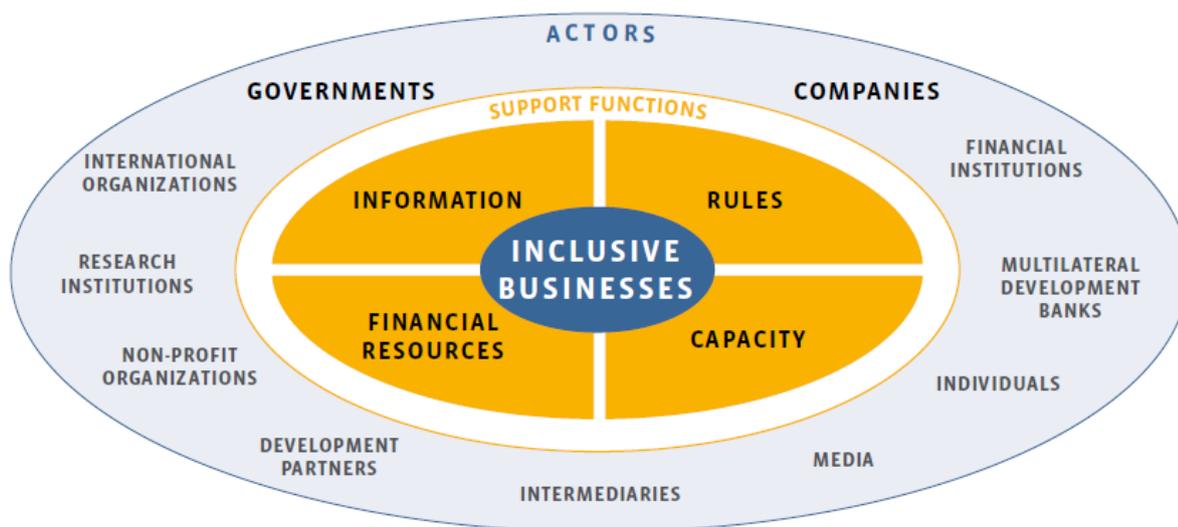


FIGURE 4: Inclusive Business Ecosystem Framework by G-20

A. Growing Indian Agriculture market and Agtech opportunities

As of 2022, the Indian agriculture market value stood at USD 435.9 billion and is expected to reach USD 580.82 billion by 2028, growing at a CAGR of around 4.9% between 2023 and 2028. India had around 450 agritech start-ups in 2022, with the number growing at 25% year-on-year. Further, a report estimates that agritech start-ups in India offer a \$24 billion opportunity, and the industry's potential is still largely untapped. The growing size of the Indian agriculture market and Agritech space offers a great opportunity for companies to develop appropriate technology-led solutions for catering to the needs of smallholder farmers and tap-in the opportunities for themselves.

B. Government Policies and Interventions:-

Some of the key initiatives and policies of the Indian government offer collaboration and partnership opportunities for inclusive business in the agriculture sector for empowering smallholder farmers, and women entrepreneurs, and leveraging technology. These initiatives aim to create sustainable agricultural practices, enhance market access, and improve overall agricultural productivity. Here's a detailed look at these key initiatives:

- **Strengthening of National Rural Livelihood Mission (NRLM):** The NRLM program has been strengthened to promote

women-based entrepreneurship and encourage natural farming practices. This initiative allows businesses to collaborate with women-based community institutions, fostering inclusive growth and empowering women in the agricultural sector.

- **Focus on Farmer Producer Organizations (FPOs):** Recognizing the challenges faced by smallholder farmers, the government has emphasized the development of FPOs. These organizations help in addressing market-related problems, offering an avenue for companies to collaborate with FPOs to develop sustainable supply chains.
- **Agriculture Infrastructure Fund:** This initiative aims to develop appropriate infrastructure for agriculture, such as cold storage, warehousing, and logistics facilities. The Agriculture Infrastructure Fund offers excellent opportunities for companies to invest in or collaborate with projects that improve the agricultural value chain, thereby enhancing the efficiency and profitability of the agricultural sector.
- **Focus on Innovations, Technology Upgradation, and High-Speed Internet:** The government is heavily investing in bringing technological advancements and high-speed Internet to rural areas. This focus is crucial for modernizing agriculture through innovations like precision farming,

digital platforms for agricultural advice, and online marketplaces. The availability of high-speed internet is pivotal in enabling these technological solutions to reach the farmers.

- **Start-up India:**- Aiming to build a strong ecosystem for nurturing innovation and start-ups in the country, this initiative provides funding support, and incentives, and simplifies the start-up process.

C. Investment and Funding Opportunities for Inclusive Business

Investment and funding opportunities in the realm of inclusive business, especially through impact

investment, have been growing globally, including in sectors like sustainable agriculture, affordable healthcare, education, and financial inclusion. These investments are not only financially beneficial but also aim to generate a positive, measurable social and environmental impact. Since 2005 International Finance Cooperation (IFC) alone has committed \$27 billion in investment for inclusive businesses⁷. A report by IBAN and BoP Innovation Centre has summarized the various investment and funding opportunities available for inclusive business in agriculture and other sectors. The following diagram captures the names of these opportunities⁸.

Innovative Finance Opportunities for Inclusive Agri-Business

Blended Finance

It is a mechanism that uses public and philanthropic funds to leverage private capital to meet the financing needs of an inclusive business

Result Based Financing

In such financing results, or end goals are pre-defined, and the payment is tied to their achievement

Impact Investment Funds

Such funds offer investors opportunities to become part of businesses that have a measurable social and/or environmental impact, while getting positive financial returns, which may be below-market rates.



Public Private Partnership

A PPP is a long-term, contractually based mutual cooperation between public and private sector aimed at the provision of public services.

Project Finance

This mainly targets large-scale and long-term projects. In such cases the entire project is financed by creating a special project specific entities.

Thematic Bonds

Thematic bonds are expected to become the largest private source of development financing. Based on their area of impact these are classified as green bonds, social bonds and sustainability bonds.

⁷ <https://www.ifc.org/en/what-we-do/sector-expertise/gender/inclusive-business>

⁸ https://www.inclusivebusiness.net/sites/default/files/2018-12/Innovative_finance_for_inclusive%20agri.pdf

D. Market-linked opportunities for Inclusive Businesses

India is one of the world's largest producers and consumers of food products such as milk, rice, wheat, nuts, various fruits and legumes, amongst others. Post-COVID-19, there is a growing demand for sustainably produced commodities both in domestic markets in India and also from the export markets. In 2021, India's organic products exports surpassed \$ 1 Bn, with the United States absorbing 54% of these exports. Exports to the US is followed by the EU and Canada. It is noteworthy that in 2020, India's organic products market was estimated to be \$815 Mn. However, there is still much scope to grow as the global market is over \$ 133 Bn. The US Department of Agriculture estimates that India's organic products market (encompassing food and beverages, health and wellness, beauty and personal care, and textiles) will grow to \$10.1 Bn by 2026. Along with organic produce, there is also a growing demand for regenerative, sustainable and naturally produced commodities.

Meeting these demands requires close collaboration with farmers and their institutions such as farmers' producer organizations. Companies need to work with farmers around the array of services such as crop advisory, selection of the right kind of inputs, harvesting and post-harvest support to ensure that procured

commodities meet the compliances for destination markets. Inclusive businesses working with smallholder farmers share improved relations with the farmers and they have better chances of procuring such commodities. Not only in agricultural commodities but also in the Dairy, Poultry and meat industries inclusive businesses have better opportunities to thrive and tap the potential as these industries require close collaboration and partnership with smallholders.

E. Support from multilateral organizations

Inclusive businesses are being recognized as one of the key actors in addressing the challenges being faced by smallholders and people at the base of the pyramid. Keeping that in mind multilateral organizations such as the World Bank, the United Nations, and International Finance Cooperation among others have designed and developed the mechanism for supporting inclusive business from low and middle-income countries. The world's multilateral development banks have invested over \$15 billion in inclusive business approaches and private investors have raised \$6 billion in funds for businesses with not only commercial viability, but also explicit social objectives⁹. At the G20 Antalya Summit in November 2015, the Leaders of the G20 formally endorsed the G20 Leaders' Call on Inclusive Business, the G20 Inclusive Business

⁹ A G-20 report on inclusive business

Framework and called for the establishment of the G20 Global Platform on Inclusive Business. Numerous global partnerships and platforms are developing the frameworks and mechanisms to further share the learnings, enhance investment opportunities, and provide technical support and coaching services to IBs to foster the overall agenda of strengthening the inclusive business.

As a part on such an initiative United Nations-ESCAP, with the support of the Bill & Melinda Gates Foundation, is working with Invest India to promote inclusive business in agriculture and food systems in India. To do so, it is conducting a comprehensive landscape study of inclusive business in agriculture and the food sector in India that will help identify opportunities and critical actions to support inclusive businesses. ESCAP is also providing business coaching services to 20 agribusinesses to support them in developing and expanding their IB models. Ecociate Consultant and Endeve¹⁰ are the coaching partners for this program and working with the 20 Agribusiness to coach them for incorporating inclusive business opportunities.

¹⁰ Endeve is a Germany-based consulting organization working as an international partner with UN-ESCAP in India and Vietnam for IB coaching

Conclusion

The need for promoting inclusive business in India's agricultural sector is clear and urgent. Inclusive business in agriculture, with a focus on sustainable practices, holds immense potential for transforming the lives of Indian farmers. By addressing the unique challenges faced by smallholder farmers and promoting environmentally friendly farming methods, these agribusinesses can create a more resilient and equitable agricultural sector. As India strives for economic growth and development, it is crucial to recognize the pivotal role that inclusive and sustainable agriculture plays in shaping a brighter future for the nation. The recent initiatives of the Government of India and the innovations in India's Agritech and Fintech sectors have opened a door for partnership and collaborations between the public and private sectors to address the issues in the Agriculture sector and bring sustainable changes.



Earthy n Green:

An Action Learning initiative by Ecociate

Empowering small and marginalized farmers through sustainable agriculture

Ecociate, an expert in sustainable agriculture and food systems, has been working hand-in-hand with Farmer Producer Organizations (FPOs) since its inception. Our mission is clear: to empower these small and often marginalized farmers by making a significant impact on agricultural value chains. We see the immense potential of FPOs in revolutionizing the agri-business sector, particularly in the domains of natural, regenerative, and organic farming.

During our work with farmer producer organizations (FPOs) and development sector organizations promoting agroecology based practices, we realized, One of the biggest challenges faced by Farmer Producer Organizations (FPOs) is bridging the gap between their products and urban consumers. Despite the superior quality and environmental advantages of their organic and naturally grown products, FPOs find it hard to attract urban markets. This issue mainly arises from challenges in packaging, branding, and offering a diverse range of products that align with urban consumer preferences.



Sudhir Shukla

The Earthy n Green Solution

In response to these challenges, Ecociate introduced Earthy n Green (EG), an innovative e-marketplace platform. This platform serves as a bridge between FPOs and urban consumers. EG ensures that each FPO's uniqueness is maintained by sourcing the right products from the right organizations. For instance, Karnataka FPOs offer oils, spices, and millet, while those from Uttarakhand provide wheat flour, jaggery products, pulses, and FPOs from Ladakh apricots. This diversity enables consumers



to enjoy a wide range of unique and quality products linked with their origin and specific geographies.

Our Mission: Earthy n Green (EG) was founded with the following key objectives

Boost Farmer Incomes: We aim to increase the earnings of farmers. By empowering Farmer Producer Organizations (FPOs) with the tools and knowledge they need, we help them tap into the

market for value-added foods, such as ready-to-eat and ready-to-cook items, that are both safe and healthy.

Support Local Food Systems: Our goal is to reduce the distance food travels – known as 'food miles' – and improve nutrition security. We achieve this by fostering connections between Resident Welfare Associations (RWAs) and groups of FPOs located within 100 to 200 kilometres. This encourages the consumption of local and regional foods.

Encourage Sustainable Farming: We are committed to promoting sustainable agricultural development. This is done by advocating and implementing agroecological principles, ensuring farming practices are environmentally friendly and sustainable in the long term."

Key takeaways from our pilot program in Noida, a city in the National Capital Region (NCR)

- **Onboarded 18 FPOs:** We successfully built partnerships with farmer producer organizations, providing them with a platform to sell their products directly to consumers.
- **100+ certified SKUs:** We offered a wide variety of certified organic products, catering to diverse consumer needs.
- **50 RWAs:** We established relationships with resident welfare associations, reaching a large

number of potential customers.

- **Meaningful personal relationships:** Close personal connections were established with FPOs and consumers through in-person visits and consultations.
- **Due diligence:** We ensured the authenticity and quality of products by conducting thorough checks on the implementing agency and their systems.
- **Promoting regional values:** We highlighted unique products like Ladakh's "Rakstey Karpo," (Apricot) showcasing the diversity and special qualities of organic produce from different regions.
- **Affordable organic:** By offering high-demand items like organic wholewheat flour at non-organic prices, we made organic more accessible to a wider audience.

Partnership Opportunities for Sustainable Agriculture Growth

1. **FPO Empowerment:** Farmer Producer Organizations, particularly those run by smallholders require sustained financial, technical, and managerial support to become strong, independent entities. While government initiatives like India's Central

Sector Scheme offer three years of support, FPOs need assistance for up to eight years to fully develop. They also require advanced technology and infrastructure to create value-added products that meet stringent food safety standards. This gap presents a unique opportunity for development agencies and the private sector to collaborate in enhancing the business acumen, financial strength, and technological capacity of FPOs.

- a. Informed decision making and crop planning based on the market dynamics and demand patterns.
- b. Partnership with relevant agencies to provide training and capacity building around improved package of practices, Integrated pest management, nutrient management, and efficient use of water for irrigation
- c. Linkages with the ecosystem players such as insurance service providers, financing agencies, input suppliers etc. to provide their services and products to the FPOs.
- d. Orientation around quality checks of procured material, lab test for chemical residues, moisture, foreign material, size, and appearance of the product.
- e. Support FPOs in developing the price discovery mechanism so that they can fix

the prices of produced procured from their members.

2. **Consumer Outreach and Education:** Despite a general awareness of organic and chemical-free food's benefits, consumers need more information about the rigorous efforts and extended time frame—often three years or more—that farmers invest to meet certification standards. There's also a need to gather and analyse data on consumer preferences and behaviours. Creating products together with consumers and investing in traceability systems can provide assurances that consumers are increasingly seeking.
 - f. EnG do the procurement of packed and branded products of FPOs in retail packs to reach out to the consumers through both online and offline modes.
 - g. Listing of FPOs products at the online platform of EnG
 - h. Developing the traceability systems for the FPOs
3. **Supporting FPOs in becoming market-ready and Marketplace Innovation:** Platforms like Earthy n Green are crucial in creating efficient, low-cost supply chains for local and regional foods, which in turn helps to reduce food miles and carbon emissions. However, to elevate

and expand such a marketplace, dedicated investment is needed for a minimum of five years.

- a. Eco friendly and green packaging solutions; linkages with packaging material and packaging machine suppliers.
 - b. Labelling: Help in designing the attractive labels which is appealing and meets all the statutory requirements of labelling such as 'nutritional values', ingredients, display of certificates and other standards, MRPs.
 - c. Branding: - We also help FPOs in developing their branding strategies based on available product categories and consumer segments they wish to target.
4. **Expansion into Global Markets:** The international demand for certified ready-to-cook and ready-to-eat products often comes with the promise of premium pricing. Establishing a dedicated export e-marketplace could transform FPOs into significant global players, tapping into lucrative markets abroad.
 - a. Knowledge and information around the maximum residue limit (MRL) levels for export markets
 5. **Partnership with Retail Store:** Earthy n Green is partnering with a retail store in Noida to promote FPO (Farmer Producer Organization)

products to Resident Welfare Associations (RWAs) and that you've gained valuable insights from the pilot program. Expanding the reach of FPO products and dedicating space in a supermarket can be an excellent way to introduce these products to a wider audience. Based on the insights gained from the pilot, work closely with FPOs to enhance the quality and packaging of their products.

Services provided by Earthy n Green to FPOs

1. Pre-Production and Production Stage
 - a. Digital extension services to farmers around cultivation of safe and organic produces through audio and video based dissemination.
2. Organic Certification and Quality standards
 - a. Information to FPOs around entire certification regime; Process, cost, benefits, statutory requirements
 - i. Production certificates (NPOP/PGS)
 - ii. Processing certification
 - iii. Transportation certification
 - b. Support in establishing linkages with the certification agencies
 - c. Orientation of FPOs around quality standards such as FSSAI, ISO, Agrmark etc.

3. Post-Harvest Management and Primary Processing

EnG do provides training and handholding support to FPOs for efficient management of post-harvest operations and conduct primary processing operations to fetch better prices.

- a. Efficient and safe methods for drying, curing and other such operations
- b. Commodity specific market oriented methods for cleaning, sorting, and grading to fetch better prices.
- c. Improved farm gate packaging systems to reduce the possibilities of contaminations.
- d. Information around efficient storage solutions to have a better shelf life of the products.

4. Aggregation and collection

Aggregation and collection of agriculture commodities from its members is one among the important functions of FPOs. EnG helps FPOs in establishing the proper systems and procedures for the aggregation and collectivization of the farmers produce.

6. Packaging, labelling, and branding
7. Market support (Connecting with consumers)

8. **Institutional Building**

We help FPOs in developing better governance, leadership, and management systems through handholding and capacity building initiatives.

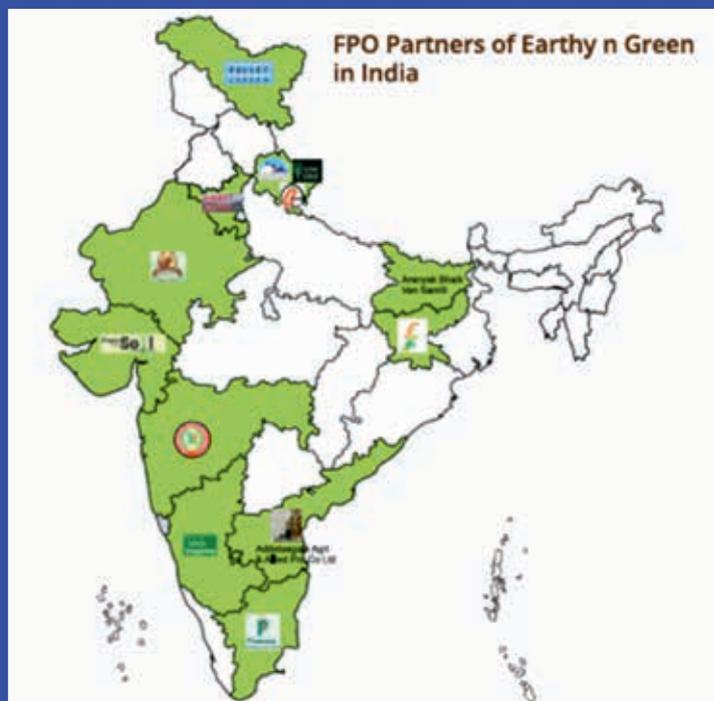
9. **Business Plan Development**

Team at EnG has expertise in developing the bankable business plans for the FPOs. We support FPOs in developing the business plans which help them in long term business planning and accessing the finance from financial institutions.

Key Learnings and Future Directions

Over the past year, key insights have emerged. These include the need for greater investment in building FPO capacities for steady quality product supply, the economic benefits of transitioning from raw produce to finished products, the necessity of continuous consumer education about healthy agricultural practices, the potential for integrating technology in production and marketing, the importance of exploring sustainable financing options for FPOs, and the crucial role of platforms like EG in supporting these organizations for long-term success.

Network Map of Earthy n Green's FPO Partners Across India



**Eat Good
Feel Good
Taste Good
Source Good**

Buy Natural & Organic Products directly from farms.



KISAN KE KHET SE, AAPKE PLATE TAK





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